MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

FACULTY OF COMPUTER APPLICATIONS
DEPARTMENT OF COMPUTER APPLICATIONS

CURRICULUM AND
SCHEME OF EXAMINATION

(MASTER OF COMPUTER APPLICATIONS)
ONLINE DEGREE PROGRAMME

BATCH: 2021-2023
**PREAMBLE**

The program MCA is adapted to an outcome based education system which would enable the students to acquire the capabilities to meet the demands of society and industry at regional, national and global level. The Program Education Objectives (PEOs) of MCA are consistent with the Vision and Mission of the Department as well as the University, and aim to produce globally successful IT professionals who are empowered to contribute to nation building through sound knowledge, technical skills and research aptitude. The POs and PSOs address the PEOs and aim to produce innovators, IT professionals, entrepreneurs and technocrats with high professional and social ethics.

The curriculum exhibits the requisite balance among the fundamental, core and elective subjects. This is to create a MCA student talent pool that can serve the IT technological needs of the software industry. Many courses are meant to meet the IT technological needs such as Big Data Analytics, Python Programming, R Programming, Network Security and Cryptography, Android Application Development, Mobile Computing and Database Administration etc. .

The curriculum includes courses focusing on employability, entrepreneurship and skill development which map strongly with the PO defining demonstration of technical knowledge and engagement in independent and life-long learning. Examples of such courses are Analytics of Business Strategy, Managing Sales Process and so on.

Certain courses are meant to create awareness about the environment and sustainability and inculcate professional ethics, meeting the requisites of POs defining these characteristic such as Employability Skills Enhancement etc.

The design of curriculum is done in accordance with the predetermined Program Education Objectives. The syllabus content of each course is meticulously created to develop thorough understanding and gain in-depth knowledge in the subject. A number of theory courses are accompanied with laboratory courses to inculcate the practical skills. In order to ensure the effectiveness of teaching-learning process and true implementation of the curriculum, the course outcomes of each course are developed to meet the program outcomes and program specific outcomes, which are also reflected in the Course Articulation Matrix. Course outcome and program outcome attainment is measured through direct and indirect tools including internal assessments, assignments, end semester examinations, dissertations and projects etc.

Although the curriculum had been designed after thorough deliberations involving experts from academia and industry, and considering the feedbacks obtained from various stakeholders, there is always a scope of regular revision and updation of the syllabus keeping in view the changing needs of the industry and society. Thus a well-articulated process is followed to revise the curriculum from time to time. The process begins with obtaining feedbacks from various stakeholders i.e. students, faculty, alumni, parents and industry experts. The feedbacks are analyzed and relevant suggestions are incorporated in the curriculum through a Curriculum revision workshop under the supervision of Departmental Academic Committee (DAC). The revised curriculum is scrutinized by the Board of Studies (BOS) and suggestions of the BOS are also incorporated. The revised curriculum is then placed before the Board of Faculty for consideration which is further reviewed and approved by the Academic Council.
## INDEX

<table>
<thead>
<tr>
<th>Contents</th>
<th>Page Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision and Mission of the Department</td>
<td>1</td>
</tr>
<tr>
<td>About the Department</td>
<td>1</td>
</tr>
<tr>
<td>Programme Educational Objectives and Programme Outcomes/Programme Specific Outcomes</td>
<td>1-5</td>
</tr>
<tr>
<td>Semester System and Choice Based Credit System</td>
<td>6-7</td>
</tr>
<tr>
<td>Study Scheme-MCA</td>
<td>8-12</td>
</tr>
<tr>
<td>Course Contents in Detail</td>
<td>13-157</td>
</tr>
<tr>
<td>Appendix A: List of courses having relevance to the Local/Regional, National and Global Development needs.</td>
<td>158-159</td>
</tr>
<tr>
<td>Appendix B: List of courses having focus on Employability, Entrepreneurship and Skill Development</td>
<td>160</td>
</tr>
<tr>
<td>Appendix C: List of courses and proposed activities relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability</td>
<td>161</td>
</tr>
</tbody>
</table>
VISION AND MISSION

VISION

Through online education, Manav Rachna stands tall to bring the most efficacious environment for providing higher quality academic and research oriented education to the aspirants. Manav Rachna Online Education facilitate the goal of increasing access to enduring learning prospects to students and providing opportunities to make efficient use of scarce resources in light of the new economic realities of higher education.

MISSION

To provide an exclusive learning environment to students with flexible and meticulous online learning opportunities that will guide students to acquire the knowledge and skills as per the requirements of society at large. The aim of Manav Rachna Online Education is:

- To develop emerging skills through online learning methodologies to pursue their Academic and Professional goals.
- To impart profound knowledge and understanding of conceptual aspects of multidisciplinary learning.

ABOUT THE DEPARTMENT

Department of Computer Applications is one of the oldest departments of the university engaged in teaching and research in computer applications. Currently, it is offering BCA, B.Sc (IT) and MCA programmes with latest, industry-ready curriculum which is being kept regularly updated in the light of latest developments in the IT industry. There is great thrust on practical applications. We provide a highly interactive learning environment so that the students get a full feel of the subject and get fully involved in the acquisition of computer skills. Students are encouraged in innovative and critical thinking in various computer languages, platforms and protocols. They are exposed to live industry projects to enable them to gain insights into the working of the industry.

PROGRAM EDUCATION OBJECTIVES (PEOs)

The objective of the programme is to develop students to work in fields of Computer Applications in various sectors together with internet technologies, e-business applications etc. The MCA program is focused on exposing students to business application areas. The program provides a strong foundation with an integrated understanding of Information Technology based applications. The program is designed to impart the concepts, values, challenges, opportunities and latest trends in the field of Computer Science to develop a broad practical understanding of its context, purpose, and underlying functional areas. The MCA programme tends more towards software application
development and exposure to the latest software tools and techniques to develop the applications. Following are Program Educational Objectives of MCA:

**PEO 1.** To prepare graduates who will be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms in the field of Computer Applications.

**PEO 2.** To provide students a solid foundation in computing fundamentals and techniques required to solve related problems and also to pursue higher studies and research.

**PEO 3.** To inculcate students in professional and ethical attitude, effective communication skills, multidisciplinary approach and an ability to relate computing issues to broader social context.

**PEO 4.** To provide students an academic environment for excellence, leadership and continuous learning, on technology and trends needed for a successful career.

**PROGRAM SPECIFIC OBJECTIVES & PROGRAM OUTCOMES**

**PROGRAM SPECIFIC OBJECTIVES (PSO):**
When the PEO’s are achieved, the post graduates will be:

**PSO 1.** Ability to pursue careers in IT industry/ consultancy/ research and development, teaching and allied areas related to computer science.

**PSO 2.** Comprehend, explore and build up computer programs in the areas allied to Algorithms, System Software, Multimedia, Web Design and Big Data Analytics for efficient design of computer-based systems of varying complexity.

**PROGRAM OUTCOMES (POs)**
Programme outcomes are attributes of the graduates from the programme that are indicative of the graduates’ ability and competence to work as an IT professional upon graduation. Program Outcomes are statements that describe what students are expected to do now or do by the time of post graduation. They must relate to knowledge and skills that the students acquire from the programme. The achievement of all outcomes indicates that the student is well prepared to achieve the program educational objectives down the road. The department of Computer Applications has following PO’s.

**PO1. Computational Knowledge:** Understand and apply mathematical foundation, computing and domain knowledge for the conceptualization of computing models from defined problems.

**PO2. Problem Analysis:** Ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.

**PO3. Design / Development of Solutions:** Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies
**PO4. Conduct Investigations of Complex Computing Problems:** Ability to devise and conduct experiments, interpret data and provide well informed conclusions.

**PO5. Modern Tool Usage:** Ability to select modern computing tools, skills and techniques necessary for innovative software solutions.

**PO6. Professional Ethics:** Ability to apply and commit professional ethics and cyber regulations in a global economic environment.

**PO7. Life-long Learning:** Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.

**PO8. Project Management and Finance:** Ability to understand, management and computing principles with computing knowledge to manage projects in multidisciplinary environments.

**PO9. Communication Efficacy:** Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.

**PO10. Societal & Environmental Concern:** Ability to recognize economical, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practice.

**PO11. Individual & Team Work:** Ability to work as a member or leader in diverse teams in multidisciplinary environment.

**PO12. Innovation and Entrepreneurship:** Identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.
<table>
<thead>
<tr>
<th>Program Outcome(PO)/ Program Specific Outcome (PSO)</th>
<th>PEOs that are attained through concerned PO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PO1</strong> Computational Knowledge: Understand and apply mathematical foundation, computing and domain knowledge for the conceptualization of computing models from defined problems.</td>
<td>1,2</td>
</tr>
<tr>
<td><strong>PO2</strong> Problem Analysis: Ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.</td>
<td>1,2</td>
</tr>
<tr>
<td><strong>PO3</strong> Design / Development of Solutions: Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies.</td>
<td>1,2,3</td>
</tr>
<tr>
<td><strong>PO4</strong> Conduct Investigations of Complex Computing Problems: Ability to devise and conduct experiments, interpret data and provide well informed conclusions.</td>
<td>2,3</td>
</tr>
<tr>
<td><strong>PO5</strong> Modern Tool Usage: Ability to select modern computing tools, skills and techniques necessary for innovative software solutions</td>
<td>2</td>
</tr>
<tr>
<td><strong>PO6</strong> Professional Ethics: Ability to apply and commit professional ethics and cyber regulations in a global economic environment.</td>
<td>3</td>
</tr>
<tr>
<td><strong>PO7</strong> Life-long Learning: Recognize the need for and develop the ability to engage in continuous learning as a Computing professional</td>
<td>3,4</td>
</tr>
<tr>
<td><strong>PO8</strong> Project Management: Ability to understand management and computing principles with computing knowledge to manage projects in multidisciplinary environments.</td>
<td>2,3</td>
</tr>
<tr>
<td><strong>PO9</strong> Communication Efficacy: Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.</td>
<td>3,4</td>
</tr>
<tr>
<td><strong>PO10</strong> Societal &amp; Environmental Concern: Ability to recognize economical, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to</td>
<td>3,4</td>
</tr>
</tbody>
</table>
professional practice.

| PO11 | Individual & Team Work: Ability to work as a member or leader in diverse teams in multidisciplinary environment | 3,4 |
| PO12 | Innovation and Entrepreneurship: Identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society. | 1,3 |
| PSO1 | Ability to pursue careers in IT industry/ consultancy/ research and development, teaching and allied areas related to computer science. | 1,2,4 |
| PSO2 | Comprehend, explore and build up computer programs in the areas allied to Algorithms, System Software, Multimedia, Web Design and Big Data Analytics for efficient design of computer-based systems of varying complexity. | 1,2,3 |
SEMESTER SYSTEM AND CHOICE BASED CREDIT SYSTEM

Credit based system of study and student’s performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grade obtained by the student, grade point average is calculated.

(a) Course credits assignment

Each course has a certain number of credits assigned to it depending upon its duration in periods for lecture, tutorial and laboratory/clinical practice in a week. A few courses/activities are without credit(s) and are referred to as Audit Pass Courses (APC) but are mandatory to pass as a partial fulfillment of award of degree.

(b) Earning of credits

At the end of every course, a letter “Grade” shall be awarded in each course for which a student has registered. On obtaining a minimum Pass Grade, student shall accumulate the course credits as Earned Credits. A student’s performance shall be measured by the number of credits that he/she has earned and by the weighted grade point average. Grades obtained in the audit courses shall not be counted for computation of grade point average, however shall be mandatory to pass as a partial fulfilment of award of degree.

For Award of Degree of a programme Masters of Computer Applications, he/she has to earn minimum 80 credits during the 2 year duration of the programme in 4 semesters.

The total credits required to be earned have been further classified under two baskets of courses: “Compulsory Courses Basket”, and “Elective Courses Basket”. The total 63 credits required to be earned under “Compulsory Courses Basket” and 17 credits under ”Elective Courses Basket”.

All courses under “Compulsory Courses Basket”, are required to be qualified and cleared/pass by each and every students enrolled under the programme and are semester-wise listed in the study scheme along with credits assigned to each course.

Under Elective Courses Basket, there will be three types of courses:

- Semester-wise courses offered by the department itself
- Open/Inter-disciplinary courses offered at the Institute/University level notified from the office of Dean-Academics.
- Massive Open Online Courses (MOOCs) available on SWAYAM Platform or any other platform as recommended by UGC/AICTE and notified from the office of Dean-Academics.

Each course shall have credits assigned to it. Student shall be required to register courses every semester for as many courses/credits specified under “Elective Courses Basket” depending upon his/her interest, capability/pace of
learning and availability of time slot (without any clash in time table) so as to earn all required total credits under the “Elective Courses Basket” during the entire programme duration.

However, for registration of courses [including courses under “Compulsory Courses Basket”, “Elective Courses Basket” and Previous Semester Courses (wherein he/she was declared in-eligible on the basis of attendance or he/she could not clear the course within permissible given chances)], if any, the maximum limit in a semester shall be 30 credits.
### SEMESTER WISE STUDY SCHEME WITH CONTACT HOURS, ASSIGNED CREDITS & DISTRIBUTION OF MARKS

#### SEMESTER- I

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Course Code</th>
<th>Title of Course</th>
<th>Pre-requisite Course, if any</th>
<th>Periods/Week</th>
<th>Marks</th>
<th>Duration of Exam</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compulsory Courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-101</td>
<td>Linear Algebra and Statistical Techniques</td>
<td>NA</td>
<td>3 1 4</td>
<td>30 70 100</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-102</td>
<td>Data Structures</td>
<td>NA</td>
<td>3 3</td>
<td>30 70 100</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-103</td>
<td>Object Oriented Programming in Java</td>
<td>NA</td>
<td>3 3</td>
<td>30 70 100</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-152</td>
<td>Data Structures Lab</td>
<td>NA</td>
<td>2 2</td>
<td>30 70 100</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-153</td>
<td>Object Oriented Programming in Java Lab</td>
<td>NA</td>
<td>2 2</td>
<td>30 70 100</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-156</td>
<td>Python Programming Lab</td>
<td>NA</td>
<td>2 2</td>
<td>30 70 100</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Domain Specific (Elective)</td>
<td>OMCA-DS-104</td>
<td>Computer Graphics</td>
<td>NA</td>
<td>3 3</td>
<td>30 70 100</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Domain Specific (Elective)</td>
<td>OMCA-DS-105</td>
<td>Web Applications Development using PHP</td>
<td>NA</td>
<td>3 3</td>
<td>30 70 100</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Domain Specific (Elective)</td>
<td>OMCA-DS-154</td>
<td>Computer Graphics Lab</td>
<td>NA</td>
<td>2 2</td>
<td>30 70 100</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Domain Specific (Elective)</td>
<td>OMCA-DS-155</td>
<td>Web Applications Development using PHP Lab</td>
<td>NA</td>
<td>2 2</td>
<td>30 70 100</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Bridge Course</td>
<td>OMCA-DS-001</td>
<td>Fundamentals of Computer Programming</td>
<td>2</td>
<td>30 70 100</td>
<td>3</td>
<td>Audit Pass* **</td>
<td></td>
</tr>
<tr>
<td>Bridge Course</td>
<td>OMCA-DS-002</td>
<td>Elements of Mathematics</td>
<td>2</td>
<td>30 70 100</td>
<td>3</td>
<td>Audit Pass* **</td>
<td></td>
</tr>
</tbody>
</table>

**Total**

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per maximum limit for maximum credits and for the category of Elective Courses under University Rules.

**The students from non-technical background are required to pass these subjects which are non-creditable courses.***
<table>
<thead>
<tr>
<th>Course Type</th>
<th>Course Code</th>
<th>Title of Course</th>
<th>Pre-requisite Course, if any</th>
<th>Periods/Week</th>
<th>Marks</th>
<th>Duration of Exam</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>OMCA-DS-201</td>
<td>Data Communications</td>
<td>NA</td>
<td>3</td>
<td>30</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-202</td>
<td>Analysis &amp; Design of Algorithm</td>
<td>Data Structures</td>
<td>3</td>
<td>30</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-203</td>
<td>Artificial Intelligence</td>
<td>Data Structures</td>
<td>3</td>
<td>30</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-260</td>
<td>Android Application Development Lab</td>
<td>Object Oriented Programming in Java Lab</td>
<td>4</td>
<td>40</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-261</td>
<td>R Programming Lab</td>
<td>NA</td>
<td>4</td>
<td>30</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-262</td>
<td>Vocational Training/Capstone Project</td>
<td>NA</td>
<td>4 Week</td>
<td>100</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>Domain Specific (Elective)</td>
<td>OMCA-DS-204</td>
<td>Cyber Security</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Specific (Elective)</td>
<td>OMCA-DS-205</td>
<td>Mobile Computing</td>
<td>Data Communications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Specific (Elective)</td>
<td>OMCA-DS-206</td>
<td>System Programming</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Specific (Elective)</td>
<td>OMCA-DS-207</td>
<td>Data Fundamentals in Azure</td>
<td>NA</td>
<td>2</td>
<td>30</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Domain Specific (Elective)</td>
<td>OMCA-DS-208</td>
<td>Artificial Intelligence using Azure</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Specific (Elective)</td>
<td>OMCA-DS-209</td>
<td>Security Fundamentals in Azure</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per maximum limit for maximum credits and for the category of Elective Courses under University Rules.
<table>
<thead>
<tr>
<th>Course Type</th>
<th>Course Code</th>
<th>Title of Course</th>
<th>Pre-requisite Course, if any</th>
<th>Periods/Week</th>
<th>Marks</th>
<th>Duration of Exam</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compulsory Courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-301</td>
<td>Advance Database Systems</td>
<td>NA</td>
<td>3</td>
<td>30</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-302</td>
<td>Programming in .NET</td>
<td>NA</td>
<td>3</td>
<td>30</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-303</td>
<td>Software Engineering &amp; Testing</td>
<td>NA</td>
<td>3</td>
<td>30</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-351</td>
<td>Advance Database Systems Lab</td>
<td>NA</td>
<td>4</td>
<td>4</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-352</td>
<td>. NET Lab</td>
<td>NA</td>
<td>4</td>
<td>4</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>Domain Specific Elective</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Specific Elective</td>
<td>OMCA-DS-304</td>
<td>Big Data Analytics</td>
<td>NA</td>
<td>3</td>
<td>30</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Domain Specific Elective</td>
<td>OMCA-DS-305</td>
<td>Cloud Computing</td>
<td>Data Communications</td>
<td>MCA-DS-201</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Specific Elective</td>
<td>OMCA-DS-354</td>
<td>Big Data Analytics Lab</td>
<td>NA</td>
<td>2</td>
<td>2</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>Domain Specific Elective</td>
<td>OMCA-DS-355</td>
<td>Cloud Computing Lab</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Specific Elective</td>
<td>OMCA-DS-306</td>
<td>Network Security and Cryptography</td>
<td>Data Communications</td>
<td>MCA-DS-201</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Specific Elective</td>
<td>OMCA-DS-307</td>
<td>Database Administration</td>
<td>Database Systems</td>
<td>MCA-DS-204</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Specific Elective</td>
<td>OMCA-DS-308</td>
<td>E-Commerce Technologies</td>
<td>NA</td>
<td>2</td>
<td>2</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>Domain Specific Elective</td>
<td>OMCA-DS-309</td>
<td>Data Visualization with Power BI</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Specific Elective</td>
<td>OMCA-DS-310</td>
<td>Advanced AI Tools</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Specific Elective</td>
<td>OMCA-DS-311</td>
<td>Security Engineering using Azure</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The
student shall be required and allowed to opt the courses out of offered courses as per maximum limit for maximum credits and for the category of Elective Courses under University Rules.
<table>
<thead>
<tr>
<th>Course Type</th>
<th>Course Code</th>
<th>Title of Course</th>
<th>Pre-requisite Course, if any</th>
<th>Periods/Week</th>
<th>Marks</th>
<th>Duration of Exam</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>OMCA-DS-401</td>
<td>Advance Java</td>
<td>Object Oriented Programming in Java</td>
<td>MCA-DS-303</td>
<td>3</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-402</td>
<td>Software Project Management</td>
<td>NA</td>
<td>NA</td>
<td>3</td>
<td>4</td>
<td>70</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-451</td>
<td>Advance Java Lab</td>
<td>Java Lab</td>
<td>MCA-DS-353</td>
<td>4</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>Core</td>
<td>OMCA-DS-457</td>
<td>Project</td>
<td>NA</td>
<td>NA</td>
<td>28</td>
<td>28</td>
<td>100</td>
</tr>
<tr>
<td>Domain Elective</td>
<td>OMCA-DS-403</td>
<td>Data Mining &amp; Warehousing</td>
<td>Database Systems</td>
<td>MCA-DS-204</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OMCA-DS-404</td>
<td>Designing &amp; implementing a Data Science solution</td>
<td>NA</td>
<td>2</td>
<td>2</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>OMCA-DS-405</td>
<td>Machine Learning Technologies</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OMCA-DS-406</td>
<td>Mitigating Security Threats</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total        |            |                                |                |              |       |      |      |       |       |
|--------------|------------|--------------------------------|-----------------|--------------|-------|------|------|-------|

* Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per maximum limit for maximum credits and for the category of Elective Courses under University Rules.

**For Successful completion of the MCA degree, the students need to earn 63 credits of compulsory courses and at least 17 of Elective Courses.
SEMESTER-I
OMCA-DS-101: LINEAR ALGEBRA AND STATISTICAL TECHNIQUES

Periods/week: L: 3 T: 1 Credits: 4
Duration of Examination: 3 Hrs

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 40

Pre-Requisite: Knowledge of basic mathematics
Course Type: Fundamentals

Course Outcomes: At the end of the course the student will be able to:
OMCA-DS-101.1. Learn the concepts and methods of Linear Algebra.
OMCA-DS-101.2. Interpret the ability to solve problems using Linear Algebra.
OMCA-DS-101.3. Relate Linear Algebra to other domain of study.
OMCA-DS-101.4. Examine the impact of Skewness and outliers on the various statistical interpretations.
OMCA-DS-101.5. Develop critical reasoning by studying statistical concepts
OMCA-DS-101.6. Apply various types of statistical tools & Linear Programming in research & real time problems.

PART-A

Unit 1: Linear Algebra
1.1 Concepts of Groups
1.2 Concepts of Ring and Fields
1.3 Vector Space
1.4 Linear Transformations
1.5 Linear Algebra
1.6 Matrix of Linear Transformation
1.7 Inverse of Matrix
1.8 Rank of Matrix

Unit 2: Linear Equations
2.1 Solution of System of Linear Equations
2.2 Homogeneous Linear Equations
2.3 Non-Homogeneous Linear Equations
2.4 Consistency theorem.

Unit 3: Eigen Values & Triangularization
3.1 Characteristic roots and Vectors
3.2 Clayey-Hamilton Theorem
3.3 Minimal Polynomial of a Matrix
3.4 Orthogonal Matrices
3.5 Normal and Unitary Matrices
3.6 Diagonalization of a Matrix.

PART-B

Unit 4: Elements of Statistics
4.1 Measures of Central Tendency
4.2 Measures of Variations Covariance
4.3 Correlation and Coefficient of Correlation
4.4 Regression
4.5 Regression lines
4.6 Probability
4.7 Binomial Distribution
4.8 Poisson Distribution
4.9 Normal Distribution
4.10 Fitting of Normal distribution to given data

Unit 5: Sampling
5.1 Concept of Sampling
5.2 Level of Significance
5.3 Critical Region
5.4 Test of Significance for large Samples
5.5 Sampling with small Samples
5.6 χ² - Distribution

Unit 6: Linear Programming & Transportation
6.1 Linear Programming
6.2 Graphical Method to solve LPP
6.3 Simplex Method
6.4 Artificial variables and degeneracy in Simplex Method
6.4 Transportation Problems and their optimal basic solutions
6.5 Unbalanced Transportation Problems.

Suggested Readings:

Note: Only latest editions of the books are recommended.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(i) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCQs</td>
<td>30%</td>
</tr>
<tr>
<td>Subjective (Short/Long)</td>
<td>40%</td>
</tr>
<tr>
<td>Discussion/Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Projects/Group Activities etc</td>
<td>15%</td>
</tr>
</tbody>
</table>
(ii) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:
Objective Type Questions: 30%
Short/Long Questions: 70%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-101.1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-101.2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-101.3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-101.4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-101.5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-101.6</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
OMCA-DS-102: DATA STRUCTURES

Periods/week Credits Max. Marks : 100
L: 3 T: 0 3 30
Duration of Examination: 3 Hrs End Semester Examination: 70

Pre-Requisite: Basic concepts of C Programming
Course Type: Core

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

OMCA-DS-102.1. Describe the concept to evaluate asymptotic performance of algorithms.
OMCA-DS-102.2. Develop skills to design and analyze simple linear and non linear data structures.
OMCA-DS-102.3. Apply for solving problem like traversing, searching, sorting, insertion and deletion of data.
OMCA-DS-102.4. Demonstrate linear and non linear data structures in real life problems.
OMCA-DS-102.5 Solve the problems related to File organization, Hashing and Collision Resolution Techniques.

PART-A

UNIT 1: Introduction to Data Structures
1.1 Concepts and definitions of basic data structure
1.2 Top Down and Bottom up Approaches
1.3 Big “O” Notations
1.4 Time and Space Complexity of algorithms
1.5 Types of data Structures
1.6 Concept of Garbage Collection and Memory Allocation
1.7 Array: Representation of one and multidimensional arrays in memory
1.8 Array Operations
1.9 Sparse matrices: representation
1.10 Searching Techniques: Linear Search; Binary search
1.11 Sorting Techniques: Internal and External Sorting Techniques.

Unit 2: Stacks and Queues
2.1 Stacks: Representation
2.2 Operations of Stack
2.3 Applications of Stack (Tower of hanoi algorithm and evaluation of arithmetic expression)
2.4 Queues: Representation
2.5 Operations of queue
2.6 Types of Queue
2.7 Applications of Queue

Unit 3: Introduction to Linked List
3.1 Linked List: Representation
3.2 Operations of Linear Linked List
3.3 Applications of Linear Linked List
3.4 Circular Linked List and its operations
3.5 Double Linked List and operations
PART-B

Unit 4: Trees
4.1 Trees Terminology
4.2 Representing a general tree
4.3 Types of Tree
4.4 Binary Tree: Memory representation
4.5 Binary tree Construction
4.6 Traversing of Binary Tree
4.7 Convert general tree into binary tree
4.8 Threaded Binary tree
4.9 Binary Search Tree: Searching and inserting in BST; Deleting in a BST; Applications of BST
4.10 B tree and its operations
4.11 B+ trees
4.12 AVL trees and its operations

Unit 5: Graph Theory
5.1 Graphs: Terms related with Graphs
5.2 Types of Graphs
5.3 Sequential and Linked Representation of Graphs
5.4 Traversing a Graph: BFS; DFS
5.5 Minimum Spanning Tree
5.6 Graph Operations
5.7 Shortest path Algorithms: Dijkstra’s and Warshall’s Algorithm

Unit 6: File Organization
6.1 Introduction to File Organization
6.2 File attributes and operations
6.3 Fixed and Variable Length Record
6.4 Hashing Techniques
6.5 Collision Resolution Techniques

Suggested Readings:

Note: Only latest editions of the books are recommended.

Software required/ Weblinks:
Turbo C
https://www.tutorialspoint.com/data_structures_algorithms/index.htm
http://toolsqa.com/data-structures-tutorial/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one
from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

**Evaluation Policy:**

The evaluation will include two types of assessments:

(iii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

(iv) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

- Objective Type Questions: 30%
- Short/Long Questions: 70%

**Assessment Tools:**

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-102.1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-102.2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-102.3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-102.4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-102.5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
OMCA-DS-103: OBJECT ORIENTED PROGRAMMING IN JAVA

Pre-Requisite: Knowledge of C++ Programming
Course Type: Core

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

OMCA-DS-103.1. Understand the Object-oriented concepts of modern programming language.
OMCA-DS-103.2. Identify classes, objects, functions and relationships among them needed for a specific problem.
OMCA-DS-103.3. Use Java in a variety of technologies and on different platforms.
OMCA-DS-103.4. Demonstrate the concepts of Polymorphism and Inheritance.
OMCA-DS-103.5. Design solutions of basic problems using Object-oriented approach.
OMCA-DS-103.6. Develop GUI based application using AWT.

PART-A

UNIT 1: Introduction and Fundamentals of Java
1.1 History of Java; Java essentials
1.2 Java Virtual Machine
1.3 Java Features
1.4 Differences between Java and C++
1.5 Java and Internet; Java Program Structure
1.6 Java Environment
1.7 Keywords; Constants and Variables
1.8 Primitive Data Types
1.9 Type Conversion and Casting; Operators
1.10 Decision Making Statements
1.11 Repetitive Statements

UNIT 2: Introducing Classes, Arrays and Inheritance
2.1 Concepts of Array
2.2 One Dimensional Array & Two dimensional Array
2.3 Class fundamentals; Method declaration; declaring objects
2.4 Constructors: Parameterized Constructors; Constructor Overloading
2.5 Static members, this keyword
2.6 Garbage Collection
2.7 Concepts of Inheritance
2.8 Types of Inheritance in Java; deriving classes using extends keyword
2.9 Overriding Methods: Super keyword, Final keyword
2.10 Abstract Classes; Shadowing vs overriding

UNIT 3: Interfaces and Packages
3.1 Interfaces: Defining, extending and implementing interfaces
3.2 Accessing interface variables
3.3 Introduction to Java API packages
3.4 Defining a Package
3.5 Package as Access Protection
3.6 Importing packages

PART B

UNIT 4: Exception Handling and Multithreaded programming
4.1 Concepts of Exception
4.2 Exception Types; checked and Unchecked Exception
4.3 Exception handling techniques: try..catch; throw, throws, finally
4.4 Multiple catch statements; creating your own exceptions
4.5 Concepts of Thread
4.6 Creating a thread
4.7 Thread Life-Cycle
4.8 Thread Priorities
4.9 Synchronizing Threads

UNIT 5: Applet Programming and Introduction to Event Handling
5.1 Two types of Applets: Applet & Application
5.2 Applet Life Cycle
5.3 How to run an applet?
5.4 Passing parameters to Applet
5.5 Introduction to Event Handling
5.6 Delegation Event Model, Sources of events, Event Listeners

UNIT 6: AWT and Introduction to JDBC
6.1 Introduction to AWT
6.2 Components and Containers
6.3 AWT Controls
6.4 Introduction to JDBC: Load the driver; establish connection; create statement; execute query; iterate resultset, transactions

Suggested Readings:
4. Bruce Eckel, 2008, Thinking in Java, Pearson Education

Note: Only latest editions of the books are recommended.

Software required/Web links:
   JDK 1.8
   https://www.tutorialspoint.com/java/index.htm
   https://www.javatpoint.com/java-tutorial

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:
The evaluation will include two types of assessments:

(v) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCQs</td>
<td>30%</td>
</tr>
<tr>
<td>Subjective (Short/Long)</td>
<td>40%</td>
</tr>
<tr>
<td>Discussion/Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Projects/Group Activities etc</td>
<td>15%</td>
</tr>
</tbody>
</table>

(vi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Type Questions</td>
<td>30%</td>
</tr>
<tr>
<td>Short/Long Questions</td>
<td>70%</td>
</tr>
</tbody>
</table>

**Assessment Tools:**
- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-103.1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-103.2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-103.3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-103.4</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-103.5</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-103.6</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-104: COMPUTER GRAPHICS

<table>
<thead>
<tr>
<th>Periods/week</th>
<th>Credits</th>
<th>Max. Marks</th>
<th>Continuous Evaluation</th>
<th>End Semester Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>L: 3</td>
<td>T: 0</td>
<td>3</td>
<td>100</td>
<td>70</td>
</tr>
<tr>
<td>Duration of Examination: 3 Hrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pre-requisite: Basic mathematics including familiarity with the theory and use of coordinate geometry and of linear algebra such as matrix multiplication.
Course Type: Domain Specific

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

OMCA-DS-104.1: Describe the basic concepts of computer graphics and its applications in day to day life.
OMCA-DS-104.2: Summarize and interpret the various categories of graphics algorithms.
OMCA-DS-104.3: Apply various scan conversion algorithms on real life problems.
OMCA-DS-104.4: Apply effective editing by using different transformations on 2D and 3D objects.
OMCA-DS-104.5: Categorize the different object shapes and their detection methods in 2D and 3D viewing.
OMCA-DS-104.6: Demonstrate practical applications on computer graphics to continue professional development.

PART-A

UNIT 1: Introduction to Computer Graphics
1.1 Basic concepts of Computer Graphics
1.2 Computer graphics hardware, Software and Standards
1.3 User Interface: Console User Interface (CUI) and Graphical User Interface (GUI)
1.4 Application of Computer Graphics
1.5 Input – Output Devices
1.6 Cathode Ray Tube
1.7 Color Monitors
1.8 Flat Panel Devices
1.9 Direct View Storage Tube
1.10 Frame Buffer
1.11 Display Processor

UNIT 2: Scan Conversion
2.1 Scan Conversion of Point, Line, and Circle
2.2 Line Drawing Algorithm: Slope Intercept, DDA and Bresenham’s
2.3 Circle Drawing Algorithm: Mid Point, Bresenham’s
2.4 Ellipse Drawing Algorithm
2.5 Antialiasing

UNIT 3: Curve drawing and Polygon filling Algorithms
3.1 Introduction to Curve Hierarchy
3.1 Bezier Curve
3.2 B-spline Curve
3.3 Area Fill Attributes: Fill style, Pattern Fill, Soft fills
3.4 Solid Modelling Techniques: Sweep Representation, Constructive Solid Geometry, Octtree, BSP Tree
3.4 Filling of Curved Boundary: Boundary fill algorithm, Flood fill algorithm.
3.5 Character Generation

PART-B
UNIT 4: Transformation & Projection
4.1 Two Dimensional and Three-Dimensional graphics concepts
4.2 Introduction to basic Matrix Operation
4.3 2-D transformation: Translation; Scaling; Rotation; Reflection, Shearing.
4.4 Composite transformations
4.5 3-D Transformation: Translation; Scaling; Rotation.
4.6 Numerical Implementation of 2D and 3D Transformation
4.7 Introduction to Projection
4.8 Types of projections: Parallel & Perspective

UNIT 5: Clipping
5.1 Introduction to Window and Viewport
5.2 Viewing pipeline
5.3 Viewing Coordinate Reference Frame
5.4 Window to Viewport mapping
5.5 Introduction to Clipping
5.6 Point Clipping Algorithm
5.7 Line Clipping Algorithms: Cohen Sutherland, Liang Barsky
5.8 Polygon Clipping Algorithm: Sutherland-Hodgeman, Weiler Antherton

UNIT 6: Visible Surface Detection Methods
6.1 Concept of Hidden Line & Surfaces
6.2 Classification of Visible Surface Detection Algorithm
6.3 Back Face Detection
6.4 Depth Buffer Method
6.5 Depth Sorting Method
6.6 Wireframe Methods
6.7 Visibility Detection Functions

Suggested Readings:

Note: Only latest editions of the books are recommended.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(vii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

<table>
<thead>
<tr>
<th>MCQs</th>
<th>Subjective (Short/Long)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>40%</td>
</tr>
</tbody>
</table>
Discussion/Presentation 15%
Projects/Group Activities etc 15%

(viii) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:
Objective Type Questions: 30%
Short/Long Questions: 70%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-104.1</td>
<td>2</td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-104.2</td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-104.3</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-104.4</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-104.5</td>
<td>2</td>
<td></td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-104.6</td>
<td>2</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-105: WEB APPLICATION DEVELOPMENT USING PHP

Periods/week Credits Max. Marks: 100
L: 3 3 100
Duration of Examination: 3 Hrs Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of Programming Languages and Database Management System
Course Type: Domain Specific

Course Outcomes: At the end of the course, students will be able to
OMCA-DS-105.1. Learn basics of Web Programming.
OMCA-DS-105.2. Understand the concepts of different frameworks for website designing.
OMCA-DS-105.3. Apply different tools and run commands for developing interactive website.
OMCA-DS-105.4. Analyze the interface and make connectivity with database.
OMCA-DS-105.5. Create and design website using PHP and MySql.

PART – A

UNIT 1: HTML Basics
1.1 Principals involved in developing website
1.2 Five golden rules of web designing
1.3 Web Standards
1.4 Introduction to HTML
1.5 Basic Structure of HTML document
1.6 HTML Tags
1.7 Content layout and presentation
1.8 Working with images
1.9 Working with Lists
1.10 Table Handling
1.11 Frame Design
1.12 Form Design

UNIT 2: Introduction to Cascading Style Sheets and JavaScript
2.1 Introduction to Cascading Style Sheet
2.2 CSS Properties
2.3 Internal Style sheets
2.4 External Style sheets
2.5 Inline Style sheets
2.6 CSS ID and Class
2.7 Introduction to JavaScript: Document Object Model
2.8 JavaScript identifiers
2.9 JavaScript Operators
2.10 Control & Looping structure
2.11 Creating Dialog Boxes

Unit 3: Hypertext Preprocessor (PHP) Concepts
3.1 Introduction to PHP
3.2 PHP history and importance
3.3 Variables and Constants in PHP
3.4 Data types in PHP
3.5 Operators in PHP
3.6 Conditional statements
3.7 Loops
3.8 Date and Time and Image uploading in PHP
3.9 Creating and accessing string
3.10 String functions
3.11 Working with PHP forms: Get and Post methods
3.12 Form Validation
3.13 Session Handling

PART-B

UNIT 4: Working with Arrays and Files
4.1 Concept of Arrays
4.2 Types of Arrays: Index based arrays and Associative Arrays
4.3 Accessing Arrays
4.4 Single dimensional Arrays
4.5 Multidimensional array
4.6 Opening and Closing of File
4.7 Introduction to Objects
4.8 Copying, renaming and deleting of file
4.9 Working with directories
4.10 Building text editor
4.11 File uploading and downloading

UNIT 5: Object Oriented Programming in PHP
5.1 Declaring a class
5.2 The new keyword and constructor
5.3 Destructor
5.4 Access method and properties using $this variable
5.5 Public, private, protected properties and methods
5.6 Inheritance
5.7 Polymorphism
5.8 Exception Handling: Understanding Exception and error
5.9 Try, catch, and throw

UNIT 6: Connection with MySql Database and Introduction to Frameworks
6.1 Introduction to MySQL
6.2 Performing basic database operation (DML): Insert, Delete, Update, Select from PHP Scripts
6.3 Executing parameterized query
6.4 Joins: Cross joins, Inner joins, Outer Joins, Self joins
6.5 Storing and retrieving data from MySQL DB using PHP based forms
6.6 Sending Email using PHP form
6.7 Introduction to Frameworks (Word Press)

Suggested Readings:
1. Ivan Bayross, 2010, HTML, DHTML, PERL, CGI, BPB Publications.
3. Lynn Beighley, 2008, Head First PHP & MySQL, O'Reilly Media

Note: Only latest editions of the books are recommended

Software required/ Web links:
- Web Server: Apache HTTP Server 2.2
- Database Server: MySql Server 5.0
  https://www.phppoint.com/software-requirement/
  https://www.javatpoint.com/php-tutorial

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(ix) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:
- MCQs 30%
- Subjective (Short/Long) 40%
- Discussion/Presentation 15%
- Projects/Group Activities etc 15%

(x) For Summative assessment (End Semester Examination or End-Term Examination):
- Minimum: 70 percent. Categorization for the same is:
- Objective Type Questions: 30%
- Short/Long Questions: 70%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
## COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-105.1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-105.2</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-105.3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-105.4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-105.5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

MIIIRS
OMCA-DS-154: COMPUTER GRAPHICS LAB

Periods/week: 2  
Credits: 1  
Max. Marks: 100  
Continuous Evaluation: 30  
Duration of Examination: 3 Hrs  
End Semester Examination: 70

Co-Requisite: Programming in C language
Course Type: Domain Specific

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

OMCA-DS-154.1: Understand basics of computer graphics, different graphics devices and application of computer graphics.
OMCA-DS-154.2: Use various scan conversion and object filling algorithm and their comparative analysis.
OMCA-DS-154.3: Use geometric transformations on graphics objects and their application in composite form.
OMCA-DS-154.4: Extract scene with different clipping methods and its transformation to graphics display devices.
OMCA-DS-154.5: Explore projections and visible surface detection technique for display of 3D scene on 2D screen.

List of Practical:
1. Write a Program to draw a grid.
2. Write a Program to draw a clock.
3. Write a Program to draw an animation car.
4. Write a Program to draw the hut.
5. Write a Program to draw a line using DDA algorithm.
6. Write a Program to draw a nest with eggs.
7. Write a Program to draw the joker.
8. Write a Program to draw an ellipse using mid point algorithm.
9. Write a Program to draw a kite.
10. Write a Program to draw a line using Bresenham’s line drawing algorithm.
11. Write a Program to draw a circle using mid point circle algorithm.
12. Write a Program to draw a cuboid.
13. Write a Program to draw a smiley.
14. Write a Program to draw a computer system.
15. Write a Program to draw a star using line statement.
16. Write a Program to generate a tree.
17. Write a Program to generate pixel at random location with random colors.
18. Write a Program to create concentric circle.
19. Write a Program to generate concentric rectangle.
20. Write a Program to design scenery.
21. Write a Program to design a solar system.
22. Write a Program to design a chess board.
23. Write a Program to design a moving fan.
24. Write a Program to rotate a triangle A(1,1), b(5,2) and C(7,9) with an angle of 90 degree.
25. Write a Program to translate a rectangle A(1,1), b(5,1), C(1,7) and D(5,7) by 3 unit in x direction and 4 units in y direction.
26. Write a Program to rotate a unit cube with an angle of 60 degree.
27. Write a Program to translate a cuboid whose length is 4 units, breadth is 5 units and height is 3 units uniformly by 3 units.
28. Write a program to find the mirror reflection of a unit cube.

**Suggested Readings:**
1. Tay Vaughan, 2011, Multimedia making it works, TMH

**Software required:**
Turbo C compiler

**Assessment Tools:**
- Experiments in lab
- File work/Class Performance
- Viva (Question and answers in lab)
- End Term Practical Exam

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-154.1</td>
<td>3</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-154.2</td>
<td>2</td>
<td>2</td>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-154.3</td>
<td>2</td>
<td>2</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-154.4</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>MCA-DS-354.5</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-155: WEB APPLICATIONS DEVELOPMENT USING PHP LAB

<table>
<thead>
<tr>
<th>Periods/week</th>
<th>Credits</th>
<th>Max. Marks</th>
<th>Continuous Evaluation</th>
<th>End Semester Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>P: 2</td>
<td>T: 0</td>
<td>1</td>
<td>100</td>
<td>30</td>
</tr>
</tbody>
</table>

Duration of Examination: 3 Hrs

Co-Requisite: PHP Programming & MySQL Database
Course Type: Domain Specific

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

OMCA-DS-155.1. Implement interactive webpages using HTML, CSS and Javascript.
OMCA-DS-155.2. Design responsive website HTML and CSS.
OMCA-DS-155.3. Apply graphics on a web page.
OMCA-DS-155.4. Develop a dynamic website/application using server side PHP and database connectivity with MySQL

List of Practical:

HTML, CSS and JavaScript
1. Write HTML Code to demonstrate the use of Anchor Tag for the Following:
   - Creating a web link that opens in a new window.
   - Creating a web link that opens in the same window.
   - "Reference within the same html document"
   - "Reference to some image"
   - Making an image a hyperlink to display second image.

2. Create a website in which all the hyperlinks are the list items of an unordered list. The arrange the list in a frame that lies in left side of home page and after clicking the hyperlink the corresponding details should be displayed in a frame in right side of the webpage.
3. Prints 10 names with a line break between each name. The list should be alphabetized, and to do this place a subscripted number next to each name based on where it will go in the alphabetized list.
4. Display five different images. Skip two lines between each image. Each image should have a title.
5. Print a long quote and a short quote. Cite the author of each quote.
6. Create an HTML page named exer1.html with an embedded style sheet with the following properties:
   - Paragraph text is set to the color red, has a font-size of 14 pixels (px), and is of font-family arial.
   - Heading (h1) is set to the color "#660000", has a font-size of 24 points (pt), is of font-family arial, and has the property text-align set to center.
   - Display an image that has a border of size 2, a width of 200, and a height of 200.
7. Print first, the unalphabetized list with a subscript number next to each name, then the alphabetized list. Both lists should have an <h1> level heading
8. To create an html page with different types of frames such as floating frame, navigation frame & mixed frame.
9. To create an html file by applying the different styles using inline, external & internal style sheets.
10. Use user defined function to get array of values and sort them in ascending order
11. Demonstrate String and Math Object’s predefined methods
12. Write a program in JavaScript to swap images using mouse over () event
13. Write a program to generate mark sheet in JavaScript using forms and methods
14. Design a webpage of student database using alert(),confirm() and prompt() dialog boxes

**PHP & MySQL**

15. Write a PHP program to check if a given positive integer is a power of two, three and four.
16. Write a PHP program to check if an integer is the power of another integer.
17. Write a while loop in your PHP code to output the numbers 10 to 30. Then try to change the loop to output numbers 20 to 1, in reverse order
18. Write a PHP program to find a missing number(s) from an array
19. Write a PHP program to find three numbers from an array such that the sum of three consecutive numbers equal to zero.
20. Write a PHP program to find three numbers from an array such that the sum of three consecutive numbers equal to a given number
21. Write a PHP program to find the single element in an array where every element appears three times except for one
22. Write a PHP program to find majority element in an array.
23. Write a PHP program to find the length of the last word in a string
24. Write a PHP program to find the single number which occurs odd number of times and other numbers occur even number of times.
25. Create a PHP program to demonstrate the different file handling methods.
26. Create a PHP program to demonstrate the different predefined function in array, Math, Data & Regular Expression.
27. Implement a basic registration and login system using forms, sending requests, and working with a MySQL database
   The common features would be:
   a. Present the user with a login page (say, "login.php");
   b. If login is successful go to the next page (say, "welcome.php")
   c. If login fails, redirect user to login page again (better yet, with error message)
   d. If the next page ("welcome.php") is accessed directly without ever logging in, the access MUST be denied (again, with error message)
28. Write a program in PHP to create access and destroy session.
29. Write a program to add constructor to bank account class that initialize account number and an initial amount of money.
30. Mini Project by each student:
    Few of the projects are as follows:
    a. Student Tracking System
    b. Mobile Wallet
    c. Toll Collection
    d. Asset Tracking System
    e. Feedback system

**Suggested Readings:**

1. Ivan Bayross, 2010, HTML, DHTML, PERL, CGI, BPB Publications.
3. Lynn Beighley, 2008, Head First PHP & MySQL, O'Reilly Media

**Note:** Only latest editions of the books are recommended

**Software required/ Web links:**
   Web Server: Apache HTTP Server 2.2
**Assessment Tools:**
- Experiments in lab
- File work/Class Performance
  - Viva (Question and answers in lab)
  - End Term Practical Exam

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-155.1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-155.2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-155.3</td>
<td>3</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-155.4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>
OMCA-DS-152: DATA STRUCTURES LAB

Periods/week P: 2  T: 0  Credits: 1
Duration of Examination: 3 Hrs

Max. Marks : 100
Continuous Evaluation : 30
End Semester Examination : 70

Co-Requisite: Knowledge of basic C Programming
Course Type: Core

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

OMCA-DS-152.1 Analyze the asymptotic performance of various algorithms
OMCA-DS-152.2 Design and implement various algorithms with use of arrays, records, linked structures, stacks, queues, trees, and graphs
OMCA-DS-152.3 Demonstrate different methods for traversing trees.
OMCA-DS-152.4 Compare alternative implementations of data structures with respect to performance.
OMCA-DS-152.5 Design and develop non-linear data structure like Trees and Graphs.

List of Experiments:
1. Write a program in C to insert a new element in the list.
2. Write a program in C to delete a new element in the list.
3. Write a program in C to find the sum and subtraction of two matrices.
4. Write a program in C to find the product of two matrices.
5. Write a program in C to find the transpose of a matrix.
6. Write a program in C to sort the list using Bubble Sort.
7. Write a program in C to sort the list using Quick Sort.
8. Write a program in C to sort the list using Insertion Sort.
9. Write a program in C to sort the list using Merge Sort.
10. Write a program in C to sort the list using Heap Sort.
11. Write a program in C to search the element using Linear Search
12. Write a program in C to search the element using Binary Search.
13. Write a program in C to perform all operations of stack using array.
14. Write a program in C to perform all operations of queue using array.
15. Write a program in C to perform all operations of stack using Linked List.
16. Write a program in C to perform all operations of queue using Linked List.
17. Write a program in C to perform all operations of circular queue.
18. Write a program in C to perform insertion operation of linked list.
19. Write a program in C to perform deletion operation of linked list.
20. Write a program in C to perform insertion operation of circular linked list.
21. Write a program in C to perform deletion operation of circular linked list.
22. Write a program in C to perform insertion operation of double linked list.
23. Write a program in C to perform deletion operation of double linked list.
24. Write a program in C to perform traversal of the linked list.
25. Write a program in C to perform insertion operation in Binary Tree.
26. Write a program in C to perform deletion operation in Binary Tree.
27. Write a program in C to perform tree traversal methods.
28. Write a program in C to perform insertion and deletion in Binary Search Tree.

Suggested Readings:

Note: Only latest editions of the books are recommended.

Software required/Web links:
Turbo C++
https://www.tutorialspoint.com/data_structures_algorithms
https://www.includehelp.com/data-structure-tutorial

Assessment Tools:
Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-152.1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-152.2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-152.3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-152.4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-152.5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
OMCA-DS-153: OBJECT ORIENTED PROGRAMMING IN JAVA LAB

<table>
<thead>
<tr>
<th>Periods/week</th>
<th>Credits</th>
<th>Max. Marks</th>
<th>Continuous Evaluation</th>
<th>End Semester Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>P: 2</td>
<td>T: 0</td>
<td>1</td>
<td>100</td>
<td>30</td>
</tr>
</tbody>
</table>

Duration of Examination: 3 Hrs

Co-Requisite: Knowledge of Java Programming

Course Type: Core

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

OMCA-DS-153.2. Implement solutions to complex problems using Control Structures, string manipulation and functions.
OMCA-DS-153.3. Propose the use of techniques (inheritance, polymorphism) by implementing them in the Java programming language to solve the given problem.
OMCA-DS-153.4. Develop a full-fledged responsive GUI Application using Java AWT and event handling framework.

List of Practical:
1. Write a Java Program to find the Area of circle.
2. Write a program to find sum and reverse of three digit number.
3. Write a program to swap two numbers without using third variable.
4. Write a program to find simple interest.
5. Write a program to find list of prime numbers.
6. Write a program to find sequence of n numbers which are divisible by 3 and 5 both.
7. Write a program to find the roots of a Quadratic Equation.
8. Write a program to find the factorial of n Number.
9. Write a program to find the sequence of Fibonacci series up to n terms.
10. Write a program to check whether given number is palindrome or not.
11. Write a program to find HCF of two numbers.
12. Write a Java Program that will display the sum of $1+1/2+1/3.....+1/n$.
13. Write a Java Program that will print the following outputs:

```
    1 1 $
    22 2 2 $$
    333 3 3 3 $$$
    4444 4 4 4 4 $$$$$
    55555 5 5 5 5 5 $$$$$$
```

14. Write a Java Program to find product of two matrices.
15. Write a Java Program to find sum and subtraction of two matrices.
16. Write a Java Program to sort the list in ascending Order.
17. Write a Java Program to convert decimal into binary number.
18. Write a Java Program to find largest and smallest of n numbers.
19. Write a java program which shows the application of constructors.
20. Write a java program to find the electricity bill using inheritance. The details are as follow:

<table>
<thead>
<tr>
<th>Units</th>
<th>Bill Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-100</td>
<td>Rs 2 per unit</td>
</tr>
<tr>
<td>101-300</td>
<td>Rs 5 per unit</td>
</tr>
<tr>
<td>301-500</td>
<td>Rs 6 per unit</td>
</tr>
<tr>
<td>Above 500</td>
<td>Rs 8 per unit</td>
</tr>
</tbody>
</table>

21. Write a java program to find the result sheet of a student using Interfaces. The details are as follow:

<table>
<thead>
<tr>
<th>Marks</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;90</td>
<td>Excellent</td>
</tr>
<tr>
<td>&gt;60 and &lt;=90</td>
<td>Good</td>
</tr>
<tr>
<td>Below 60</td>
<td>Average</td>
</tr>
</tbody>
</table>

The format of output is as follow:
Marks of subject 1
Marks of subject 2
Marks of subject 3
Marks obtained
Total Marks
%Age

22. Write a java program which shows importing of classes from other packages.
23. Write a java program which creates threads using the thread class.
24. Write a java program which use try and catch for exception handling.
25. Write a java program which use multiple catch blocks.
26. Write a java program which shows throwing our own exception.
27. Write a program to handle Labels and Buttons using AWT Controls.
28. Write a program to handle Check Boxes using AWT Controls
29. Write a program to handle Lists and Scroll Bars using AWT Controls
30. Make a mini project based on above mentioned list of practical. Suggested mini projects are:

a) Java Application World: A Java Application World software where user can use applications developed in Java such as calculator, notepad+, puzzle game, ip finder, word count tool, source code generator, picture puzzle game, tic tac toe game and exam system.

b) Connect Globe: It provides a common platform to share the common people experiences, information's and harassments all over the world and people can discuss on any topic created by only registered user. Moreover, he/she can give the advice on any topic or report.

Suggested Readings:
4. Bruce Eckel, 2008, Thinking in Java, Pearson Education

Software required/Weblinks:
JDK 1.8
https://www.tutorialspoint.com/java/index.htm
https://www.javatpoint.com/java-tutorial
**Assessment Tools:**
- Experiments in lab
- File work/Class Performance
- Viva (Question and answers in lab)
- End Term Practical Exam

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-153.1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-153.2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-153.3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-153.4</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-156: PYTHON PROGRAMMING LAB

Periods/week                Credits    Max. Marks : 100
P: 2                     1          Continuous Evaluation : 30
Duration of Examination: 3 Hrs    End Semester Examination: 70

Co-Requisite: Knowledge of Programming concepts
Course Type: Core

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

OMCA-DS-156.1. Develop programs using basics of Python.
OMCA-DS-156.2. Implement object oriented concepts related to Python.
OMCA-DS-156.3. Use Python data structures to solve complex problems.
OMCA-DS-156.4. Solve real life problems using various python libraries and functions.
OMCA-DS-156.5. Develop applications using python programming language.

List of Practical:

Topics to be covered: Installation and Working with Python, Setting up path & Running Python Scripts, Variables & Data Types, Keywords, Input-Output, Indentation

1. Write a Python program to display the current date and time.
2. Write a Python program which accepts the radius of a circle from the user and compute the area
3. Write a Python program which accepts the user’s first and last name and print them in reverse order with a space between them.
4. Write a Python program that accepts an integer (n) and computes the value of n+n+n+n+n
5. Write a Python program to print the calendar of a given month and year.
6. Write a Python program to calculate number of days between two dates.
   Sample dates : (2014, 7, 2), (2014, 7, 11)
   Expected output : 9 days
7. Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old.
8. Ask the user for a number. Depending on whether the number is even or odd, print out an appropriate message to the user. Hint: how does an even / odd number react differently when divided by 2?

Topics to be covered: Python basic Operators, Declaring and using Numeric data types: int, float complex, Using string data type and string operations, Defining list and list slicing, Use of Tuple data type, Introduction to Dictionaries, Understanding string inbuilt methods, List manipulation using inbuilt methods, Dictionary manipulation, Programming using string, list and dictionary in build functions

9. Write a Python program which accepts a sequence of comma-separated numbers from user and generate a list and a tuple with those numbers.
10. Write a Python program to calculate the sum of three given numbers, if the values are equal then return thrice of their sum.
11. Write a Python program to test whether a passed letter is a vowel or not
12. Take a list, say for example this one:
a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89]
and write a program that prints out all the elements of the list that are less than 5.

Extras:
  a) Instead of printing the elements one by one, make a new list that has all the elements less than 5 from
     this list in it and print out this new list.
  b) Write this in one line of Python.
  c) Ask the user for a number and return a list that contains only elements from the original list a that are
     smaller than that number given by the user.

13. Create a program that asks the user for a number and then prints out a list of all the divisors of that number.
    (If you don’t know what a divisor is, it is a number that divides evenly into another number. For example, 13 is
    a divisor of 26 because 26 / 13 has no remainder.)

14. Take two lists, say for example these two:
    a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89]
    b = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13]
    and write a program that returns a list that contains only the elements that are common between the
    lists (without duplicates). Make sure your program works on two lists of different sizes.

15. Ask the user for a string and print out whether this string is a palindrome or not. (A palindrome is a string that
    reads the same forwards and backwards.)

16. Let’s say I give you a list saved in a variable: a = [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]. Write one line of Python
    that takes this list a and makes a new list that has only the even elements of this list in it.

Topics to be covered: Conditional blocks using if, else and Nested If-else, Simple For loops in python, For loop
using ranges, string, list and dictionaries, Use of while loops in python, Loop manipulation using pass, continue,
break and else, Programming using Python conditional and loops block

17. Generate a random number between 1 and 9 (including 1 and 9). Ask the user to guess the number, then tell
    them whether they guessed too low, too high, or exactly right. (Hint: remember to use the user input lessons
    from the very first exercise)

18. Ask the user for a number and determine whether the number is prime or not. (For those who have forgotten,
    a prime number is a number that has no divisors.).

19. Write a program (function!) that takes a list and returns a new list that contains all the elements of the first list
    minus all the duplicates.

20. Write a function that takes an ordered list of numbers (a list where the elements are in order from smallest to
    largest) and another number. The function decides whether or not the given number is inside the list and
    returns (then prints) an appropriate boolean.

21. Implement a function that takes as input three variables, and returns the largest of the three. Do this without
    using the Python max() function!

22. Make a mini project based on concepts above list of practical. Suggested mini projects are:
    a) Write a password generator in Python. Be creative with how you generate passwords - strong passwords
       have a mix of lowercase letters, uppercase letters, numbers, and symbols. The passwords should be
       random, generating a new password every time the user asks for a new password. Include your run-time
       code in a main method.
    b) Make a two-player Rock-Paper-Scissors game. (Hint: Ask for player plays (using input), compare them,
       print out a message of congratulations to the winner, and ask if the players want to start a new game)
       Remember the rules:
       • Rock beats scissors
       • Scissors beats paper
       • Paper beats rock

Suggested Readings:
1. Allen B. Downey, Think Python, 2016, How to Think Like a Computer Scientist, Shroff/O'Reilly Publishers

**Note: Only latest editions of the books are recommended**

**Software required/ Web links:**
- Python 3.6.4
  - https://www.tutorialspoint.com/python/index.htm
  - https://www.programiz.com/python-programming/first-program

**Assessment Tools:**
- Experiments in lab
- File work/Class Performance
  - Viva (Question and answers in lab)
  - End Term Practical Exam

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-156.1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-156.2</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-156.3</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-156.4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-156.5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-001: Fundamentals of Computer Programming

Periods/week Credits Max. Marks : 100
L: 2 T: 0P : 0 Audit Pass Continuous Evaluation : 30
Duration of Examination: 3 Hrs End Term Examination : 70

Pre-Requisite: None
Course Type: Fundamental

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

OMCA-DS-001.1 Understand the structured programming designs and the basic elements of Computer Programming
OMCA-DS-001.2 Describe and differentiate various types of Open Source Software
OMCA-DS-001.3. Construct program code using simple and nested selection/decision control structure to make decision.
OMCA-DS-001.4. Use pre& post tested loop/repetitive control structure while writing program code to process same sequence of tasks/activities.
OMCA-DS-001.5. Apply various open source tools for improving development efficiency.

PART - A

UNIT 1: Introduction to Programming
1.1 History of Programming,
1.2 Difference b/w Programming Languages
1.3 System Development Life Cycle
1.4 Introduction to OOP
1.5 Introduction to Python : Installation, Python IDE
1.6 Syntax Rules and Basic Program
1.7 Numbers and Math Functions

UNIT 2: Programming Standards
2.1 Flow Chart
2.2 Pseudo Code and Hierarchy Chart
2.3 Syntax Errors
2.4 Logical Errors and Runtime Errors
2.5 Detailed Working of a Compiler
2.6 Difference Between Compiler and Interpreter.

UNIT 3: Programming Controls
3.1 Controls and Properties
3.2 Variables and Arithmetic Operations
3.3 Writing Program that Handle a Control Events
3.4 Strings
3.5 Data type conversions
3.6 Built –in functions
PART - B

UNIT 4: Introduction to Open Source
4.1. Why open source, What is Open Source, Open Source Principles
4.2. Software License provider, Free Software Vs Open Source Software
4.3. Open Source Standards, Methodologies, Philosophy
4.4. Case Studies: Apache, Linux, Mozilla Firefox

UNIT 5: Open Source Programming Languages
5.1. Various Open Source Programming Languages.
5.2. Programming Language Case Study: Python, Java, PHP
5.3. Open Source vs Closed Source Programming.
5.4. Server Side vs Client Side Programming.
5.5. Front-End and Back-End

UNIT 6: Open Source Programming Tools
6.1. Starting and Maintaining an Open Source Project
6.2. Open Source Ethics.
6.3. Open Source IDE’s and Editors (Eclipse, Atom, Sublime Text).
6.4. Source Code Management (Git)
6.5. Open Source Project Repositories (GitHub, SourceForge, Google Code etc.)

Suggested Readings:

Note: Only latest editions of the books are recommended.

Software required/ Web links:
- Turbo C
- Python 3.x

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%
(xii) For Summative assessment (End Semester Examination or End-Term Examination):
   Minimum: 70 percent. Categorization for the same is:
   Objective Type Questions: 30%
   Short/Long Questions: 70%

**Assessment Tools:**
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-001.1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-001.2</td>
<td></td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-001.3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-001.4</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-001.5</td>
<td>1</td>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-002: ELEMENTS OF MATHEMATICS

<table>
<thead>
<tr>
<th>Periods/week</th>
<th>Credits</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>L: 2</td>
<td>Audit Pass</td>
<td>100</td>
</tr>
</tbody>
</table>

Duration of Examination: 3 Hrs

Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: None
Course Type: Fundamental

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

OMCA-DS-002.1. Understand the concept of matrices and various operations performed on matrices
OMCA-DS-002.2. Learn basic concepts of probability
OMCA-DS-002.3. Use different types of functions
OMCA-DS-002.4. Develop the concept of Set, Relations and Function
OMCA-DS-002.5. Apply mathematics in real life.

PART-A

UNIT 1: Set Theory
1.1 Elements of set methods of describing a set
1.2 Types of Set
1.3 Venn diagram
1.4 Difference of a set
1.5 Union intersection and difference of set duality and applications
1.6 Partitioning of a set

UNIT 2: Relation and Function
2.1 Definition of Relation
2.2 Application of relation
2.3 Definition of function
2.4 Cartesian product
2.5 Concepts of domain, co-domain and range
2.6 Application on domain and range

UNIT 3: Matrices and Determinants
3.1 Matrices
3.2 Types of matrices
3.3 Operation on matrices
3.4 Scalar multiplication and multiplication of matrices
3.5 Determinant
3.6 Inverse of matrices
3.7 Cramer’s Rule
PART- B

UNIT 4: Binomial and Permutations, Combinations
4.1 Definition and basics of binominal theorem
4.2 Positive index
4.3 Applications of binominal theorem (Only positive index)
4.4 Basics of Permutations and Combinations

UNIT 5: Co-ordinate Geometry
5.1 Quadrant Planes
5.2 Distance Formula
5.3 Section Formula
5.4 Bisection Formula,
5.5 Slope
5.6 Equations of straight Line
5.7 Angle between two lines.

UNIT 6: Probability
6.1 Basics of Probability
6.2 Addition Theorem on Probability
6.3 Conditional Probability
6.4 Multiplication Theorem on Probability
6.5 Independent Events
6.6 Baye’s Theorem

Suggested Readings:
1. Dr. Babu Ram, 2010, Discrete Mathematics, Pearson Publication
3. Dr. Delip Kumar, 2016, Elements of Mathematics, Jeevan Sons Publications.

Note: Only latest editions of the books are recommended.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xiii) Continuous or formative assessments (in the form of end semester examination or term examination.
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

<table>
<thead>
<tr>
<th>Category</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCQs</td>
<td>30%</td>
</tr>
<tr>
<td>Subjective (Short/Long)</td>
<td>40%</td>
</tr>
<tr>
<td>Discussion/Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Projects/Group Activities etc</td>
<td>15%</td>
</tr>
</tbody>
</table>

(xiv) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

<table>
<thead>
<tr>
<th>Category</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Type Questions</td>
<td>30%</td>
</tr>
<tr>
<td>Short/Long Questions</td>
<td>70%</td>
</tr>
</tbody>
</table>
**Assessment Tools:**
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

**Instructions for paper setting:** Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-002.1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-002.2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-002.3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-002.4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-002.5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
SEMESTER II
OMCA-DS-201: DATA COMMUNICATIONS

Periods/week Credits
L: 3 3
Duration of Examination: 3 Hrs

Pre-Requisite: Knowledge of Computer Networks
Course Type: Core

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

OMCA-DS-201.1. Describe the basic concepts of data communication.
OMCA-DS-201.2. Understand various network components and standards used in data communication.
OMCA-DS-201.3. Demonstrate the framework of computer networks.
OMCA-DS-201.4. Illustrate the layered architecture and data flow.
OMCA-DS-201.5. Summarize the processes and protocols applied in data communication.

PART-A

UNIT 1: Basic Concepts of Data Communication
1.1 Introduction to data communication
1.2 Components of data communication
1.3 Advantages and applications of Networking
1.4 Network Topologies
1.5 Network Protocols
1.6 Connection –oriented and Connection-less Services
1.7 Modes of data transmission

UNIT 2: Signals and Transmission Media
2.1 Signal and data
2.2 Channel Characteristics
2.3 Encoding and Modulation Techniques
2.4 Transmission Media: Guided Media (Twisted Pair, Co-axial cable, Optical Fiber), Unguided Media (Radio, Microwave, Satellite)
2.5 Transmission Impairments
2.6 Multiplexing (Frequency Division Multiplexing, Time Division Multiplexing, Wavelength Division Multiplexing)
2.7 Switching (Circuit Switching, Packet Switching, Message Switching)

UNIT 3: System Architecture and Layered Protocol Models
3.1 Protocol hierarchies
3.2 Layered Architecture
3.3 ISO OSI Reference Model
3.4 TCP/IP Model

PART-B

UNIT 4: Data link Layer
4.1 Functions of Data Link Layer
4.1 Framing of data
4.2 Flow Control
4.3 Error control
4.4 High Level Data Link Control (HDLC)
4.5 Error detection Techniques (VRC, LRC, CRC, Checksum)
4.6 Error Correction Techniques (Single Bit Error Correction, Hamming Code and Burst Error Correction)
4.7 Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

UNIT 5: Transport Layer
5.1 Functions of Transport Layer
5.2 TCP and UDP
5.3 Routing Algorithms (Static Routing Algorithms: Shortest Path Routing, Dynamic Routing: Distance Vector Routing, Link State Routing)
5.4 Congestion control (Congestion Avoidance, Discarding and Leaky Bucket Algorithm)
5.5 Fault handling
5.6 Access control

UNIT 6: IEEE Standards, Protocols & Addressing
6.1 Logical link Control (LLC)
6.2 IEEE Standard 802.3 (Ethernet)
6.3 IEEE Standard 802.4 (Token Bus)
6.4 IEEE Standard 802.5 (Token Ring)
6.5 X.25
6.6 Frame Relay
6.7 Asynchronous Transfer Mode (ATM)
6.8 IPv4 & IPv6

Suggested Readings:

Note: Only latest editions of the books are recommended.

Weblinks:
https://www.tutorialspoint.com
www.tutorialspoint.com/listtutorials/networking/1

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xv)Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:
For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

(xvi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

- Objective Type Questions: 30%
- Short/Long Questions: 70%

Assessment Tools:
- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-201.1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-201.2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-201.3</td>
<td>3</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-201.4</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-201.5</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-202: ANALYSIS AND DESIGN OF ALGORITHM

Periods/week Credits: 3 L: 3 T: 0 3
Duration of Examination: 3 Hrs

Pre-Requisite: Knowledge of C Programming and Data Structures
Course Type: Core

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

OMCA-DS-202.1. Learn the basics of various computer algorithms.
OMCA-DS-202.2. Understand the algorithm in terms of time and space complexity.
OMCA-DS-202.3. Apply Divide & Conquer approach and Greedy method to solve critical problems.
OMCA-DS-202.4. Analyze algorithms for finding optimal solution
OMCA-DS-202.6. Design the deterministic and non-deterministic polynomial time algorithms.

PART -A

UNIT 1: Introduction to Algorithm
1.1 Algorithm analysis
1.2 Problem solving approach
1.3 Asymptotic analysis
1.4 Analysis of Non-recursive and Recursive Algorithm
1.5 Sets and disjoint sets union

UNIT 2: Divide and Conquer approach
2.1 Introduction to Divide and Conquer approach
2.2 Binary search
2.3 Merge sort
2.4 Quick sort
2.5 Selection sort
2.6 Stassen’s matrix multiplication algorithms

UNIT 3: Greedy Method
3.1 Introduction to Greedy Method
3.2 Knapsack problem
3.3 Job sequencing with dead lines
3.4 Minimum Spanning Trees: Kruskal and Prim’s method
3.5 Single source shortest paths (Diijesktra’s algorithm).

PART-B

UNIT 4: Dynamic Programming
4.1 General method
4.2 Optimal binary search trees
4.3 0/1 knapsack
4.4 Traveling salesperson problem

UNIT 5: Backtracking
5.1 General Method
5.2 8 queen’s problem
5.3 Graph colouring
5.4 Hamiltonian cycles
5.5 Introduction to Branch and Bound approach
5.6 0/1 knapsack
5.7 Traveling salesperson problem.

UNIT 6: Problem Classes
6.1 Polynomial and Non Polynomial classes
6.2 NP-hard and NP-complete
6.3 Deterministic and non-deterministic polynomial time algorithms,
6.4 Cook’s theorem
6.5 NP scheduling problems.

Suggested Readings:

Note: Only latest editions of the books are recommended.

Software required/ Web links:
Dev C/ Turbo C++
https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
https://www.youtube.com/watch?v=1PI58Q3Ne2w

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xvii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

<table>
<thead>
<tr>
<th>Category</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCQs</td>
<td>30%</td>
</tr>
<tr>
<td>Subjective (Short/Long)</td>
<td>40%</td>
</tr>
<tr>
<td>Discussion/Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Projects/Group Activities</td>
<td>15%</td>
</tr>
</tbody>
</table>

(xviii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

<table>
<thead>
<tr>
<th>Category</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Type Questions</td>
<td>30%</td>
</tr>
<tr>
<td>Short/Long Questions</td>
<td>70%</td>
</tr>
</tbody>
</table>
**Assessment Tools:**
- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

<table>
<thead>
<tr>
<th>COURSE ARTICULATION MATRIX:</th>
<th>PO1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-202.1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-202.2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-202.3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-202.4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-202.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-202.6</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
OMCA-DS-203: ARTIFICIAL INTELLIGENCE

Periods/week  Credits  
L: 3  T: 0  3  
Duration of Examination: 3 Hrs  
Max. Marks : 100  
Continuous Evaluation : 30  
End Semester Examination : 70

Pre-Requisite: Basics of Data Structure  
Course Type: Core

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

OMCA-DS-203.1. Understand the fundamental concepts of Artificial Intelligence  
OMCA-DS-203.2. Interpret the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.  
OMCA-DS-203.3. Apply knowledge representation, reasoning, and machine learning techniques to real-world problems  
OMCA-DS-203.4. Examine various AI search algorithms  
OMCA-DS-203.5. Assess critically the Artificial Intelligence techniques presented and apply them to real world problems

PART-A

Unit 1: Introduction to Artificial Intelligence
1.1 Foundations, scope, problems, characteristics, examples and approaches of AI  
1.2 Application Areas of Artificial Intelligence  
1.3 Problem solving in Artificial Intelligence: Tic-Tac-Toe, Water Jug problem  
1.4 Current trends in Intelligent Systems  
1.5 AI application to robotics  
1.6 Goal driven Learning agents  
1.7 Programming Languages of Artificial Intelligence

Unit 2: Problem Solving Concepts and AI Search Techniques
2.1 Problem Solving Concepts and Methods  
2.2 Types of Search techniques: Uninformed (Blind) and Informed (Informed) techniques  
2.2 Blind search techniques: Breadth-First search and Depth-First search methods  
2.3 Heuristic search techniques  
2.5 Best First search, Means-ends Analysis Technique  
2.6 Problem reduction, Constraint satisfaction

Unit 3: Knowledge Representation
3.1 Foundations of knowledge representation and reasoning  
3.2 Prepositional and Predicate logic  
3.3 Syntax and Semantics for first order logic  
3.4 Resolution and Unification  
3.5 Knowledge representation schemes: semantic nets, frames

PART-B

Unit 4: Reasoning and Game Playing
4.1 Reasoning about Knowledge, Default Reasoning  
4.2 Reasoning with uncertain knowledge
4.3 Probability Based Reasoning
4.4 Reasoning Using Certainty Factors; Bayes Theorem
4.5 Fuzzy Based Reasoning Systems
4.6 Games playing: Minimax algorithm, Tic-Tac-Toe

Unit 5: Expert Systems & Natural Language Processing
5.1 Expert system: Definition and applications
5.2 Characteristics of expert system
5.3 Basic components & architecture of expert systems
5.4 Introduction to Natural Language Processing (NLP)
5.5 Parsing techniques

Unit 6: Machine Learning and Neural Networks
6.1 Introduction to Machine Learning
6.2 Learning techniques
6.3 Applications of Machine Learning
6.4 Introduction to Neural Network
6.5 Artificial and Biological Neurons
6.6 Classifications of Neural Network

Suggested Readings:

Note: Only latest editions of the books are recommended.

Web links:
http://www.vssut.ac.in/lecture_notes/lecture1428643004.pdf
https://epub.uni-regensburg.de/13629/1/ubr06078_ocr.pdf
http://www.cs.toronto.edu/~fbacchus/csc384/Lectures/lectures.html
https://examupdates.in/artificial-intelligence-pdf/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xix) Continuous or formative assessments (in the form of end semester examination or term examination.
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs 30%
- Subjective (Short/Long) 40%
- Discussion/Presentation 15%
- Projects/Group Activities etc 15%

(xx) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

57
Objective Type Questions: 30%
Short/Long Questions: 70%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-203.1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-203.2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-203.3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-203.4</td>
<td>1</td>
<td>2</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-203.5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>
OMCA-DS-260: ANDROID APPLICATION DEVELOPMENT LAB

Periods/week  Credits                      Max. Marks : 100
L: 0  T: 0  P: 4  2                      Continuous Evaluation: 30
Duration of Examination: 3Hrs               End Semester Examination: 70

Co-requisite: Knowledge of Java Programming.
Course Type: Core

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

OMCA-DS-260.1. Describe the application lifecycle, intents, and activities.
OMCA-DS-260.2. Identify and understand the usage of UI-Components, layouts, event handling.
OMCA-DS-260.3. Demonstrate the usage of broadcast receivers, services, Android's APIs for data storage, retrieval, user preferences, files, and databases.
OMCA-DS-260.4. Differentiate between major UI Components and understand the selection of components based on the requirement.
OMCA-DS-260.6. Develop basic applications that act as a working example of all the topics covered in the Course.

Concepts & List of Experiments:-

Activity 1: Introduction to Android Platform.
Concept: Overview of android platform architecture.
Practical:
a) Build & Simulate the first "HelloWorld" Application.

Activity 2: User Interface (UI) Development in Android.
Concept: Overview of different Layouts:
- Linear Layouts
- Grid Layouts
Concept: Introduction about Text Controls:
- TextView
- EditText
Practical:
a) Add TextView to the LinearLayout.
b) Add TextView to the GridLayout.

Activity 3: Introduction to the range of UI Components.
Concept: Other UI components are:
• Buttons Controls
• Input Controls

Practical:

a) Design layout to show working of button and input controls.

Activity 4: Make Interactive UI using Event Handling.

Concept: Identify resources with IDs and programmatically change the IDs, onClick Attribute.

Practical:

a) Add click behavior to a button (show a toast).

b) Change text of text View on button click.

Activity 5: Introduction to various Views.

Concept:

• How to make activities scrollable?
• How to create a ListView in Android?

Practical:

a) Use a scroll view for text with minor changes in HTML formatting.

b) Create a listview and also implement its onClick attribute.

Activity 6: Activities and Intents

Concept: Creating apps with multiple activities. Starting activities with both explicit and implicit intents. Sending data between activities. Understanding activity lifecycle.

Practical:

a) Create a new activity and layout.
b) Start the new activity from an existing activity with an explicit intent.
c) Pass user-entered information from one activity to the other.
d) Pass information back to the main activity.

Activity 7: Overview of Menus

Concept:

• Options menu.
• Adding menu items.
• Handling onClick from menus.

Practical:

a) Set up an options menu.
b) Add items to the option menu.
c) Add up navigation to the app bar.
d) Implement onClick for menus.

Activity 8: Implement Broadcast Receiver.

Concept: What is a Broadcast Receiver?
Practical:
a) Create an app with a Broadcast Receiver.

**Activity 9: Introduce Notifications**

Concept: What is a Notification?

Practical:
a) Trigger a Notification.
b) Add Actions to your Notification.

**Activity 10: Database Connectivity Using SQLite.**

Concept:
- Overview of SQLite
- Querying (dev) Searching (user) databases
- Best practices for using databases in Android

Practical:
a) Create an app that stores data in an SQL database.

**Activity 11: Publishing your App**

Concept: Understanding the ways of monetizing your App.

Practical:
a) Publish your App to Google Play.

**Recommended Small Projects:**
- a) Create an accident alert app.
- b) Create a diet planner app.
- c) Create an application for budget management of your family.
- d) Create an application to stimulate calculator
- e) Create an application to simulate Notepad
- f) Create an application for Women Protection System

**Note:** Faculty can suggest more practical assignment and projects as per the need.

**Suggested Readings:**
1. Reto Meier, 2010, Professional Android 2 Application Development
3. Lauren Darcey, 2010, Sams Teach Yourself Android Application Development in 24 Hours

**Software required/ Web links:**
Android Studio 3.x
Android SDK
https://developer.android.com/guide/
https://www.javatpoint.com/android-tutorial
https://hackr.io/tutorials/learn-android-development
**Assessment Tools:**
Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

**COURSE ARTICULATION MATRIX**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-260.1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-260.2</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-260.3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-260.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-260.5</td>
<td>3</td>
<td>1</td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-260.6</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
OMCA-DS-261: R PROGRAMMING LAB

Periods/week Credits Max. Marks : 100
L: 0 T: 0 P: 4 2 Continuous Evaluation: 30
Duration of Examination: 3 Hrs End Semester Examination : 70

Co-Requisite: Programming in C language
Course Type: Core

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

OMCA-DS-261.1. Understand to setup R environment and R Console.
OMCA-DS-261.2. Demonstrate different data structures (vectors, lists, matrices, data frames) in R.
OMCA-DS-261.3. Analyze the various data sets in R programming (importing and exporting of data).
OMCA-DS-261.4. Assess the data manipulation technique using R programming.
OMCA-DS-261.5. Develop an application in R using built-in database.

List of Experiments:

Activity 1: Concept: Overview of R Console, R script, R Environment and Graphical Output.
1) Installation and Environmental setup in R studio.
2) Introduction to data types and scripts of R.

Activity 2: Introduction to Arrays & Vectors
3) Implement recursive functions using R tool.
4) Create and modify matrix using c function (c()) in R tool.
5) Create a list using List() and perform List Slicing operation in R tool.
6) Create three vectors x, y, z with integers and each vector has 3 elements. Combine the three vectors to become a 3×3 matrix A where each column represents a vector. Change the row names to a, b, c.
7) Create a vector with 12 integers. Convert the vector to a 4*3 matrix B using matrix(). Please change the column names to x, y, z and row names to a, b, c, d.
8) Create the vector of for (1,2,3,…19,20,19,18,…2,1)
9) Create a vector of values of e^cos(x) at x= 3,3.1,3.2,………,6 ;
10) Create a character vector with length of number of rows of iris dataset, such that, each element gets a character value – “greater than 5” if the corresponding ‘Sepal.Length’ > 5, else it should get “lesser than 5”. Implement it using For Loop.

Activity 3: List and Data Frames in R

11) Create a data frame in R and perform various operations.
12) Implement Linear Model Formula using 100 variables in R.
13) Write a program to expand data frame in R.
14) With the dataframes created from code below, perform the various merge operations.

```r
set.seed(100)
Df1 <- iris[sample(1:nrow(iris), 10), c(1,2,3,5)]
Df2 <- iris[sample(1:nrow(iris), 10), c(1,2,4,5)]
# induce NAs
```
Df1 <- Df1[sample(1:nrow(Df1), 3), 4]
Df2 <- Df2[sample(1:nrow(Df1), 3), 4]

**Activity 4:** Data Analysis in R (Importing and exporting of data)

15) Generate Exploratory Analysis of Big Mart Data Set.
16) Generate Exploratory Analysis of Train Data Set.
17) Show graphical representation of Big Mart Data set using Univariate Analysis and Bivariate Analysis.
18) Show graphical representation of Train Data Set using Univariate Analysis and Bivariate Analysis.

**Activity 5:** Data Manipulation in R.

19) Calculate the count of Outlet Identifiers, Item Identifiers and Outlet years of Big mart Data Set.
20) Calculate the count of Outlet Identifiers, Item Identifiers and Outlet years of Big mart Data Set.

**Note:** Faculty can suggest more practical assignment and projects as per the need.

**Suggested Readings:**

**Note:** Only latest editions of the books are recommended.

**Software required:**
R Studio

**Assessment Tools:**
Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-261.1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-261.2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-261.3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-261.4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-261.5</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
OMCA-DS-262: VOCATIONAL TRAINING/CAPSTONE PROJECT

Periods/week Credits: 4 Weeks 2
Max. Marks: 100
Continuous Evaluation: 100
End Semester Examination: ---
Duration of Examination: 2 Hrs

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

1. Describe the Systems Development Life Cycle (SDLC).
2. Construct and evaluate data flow diagrams.
3. Design and evaluate system outputs.
5. Determine the various test cases and analyze the results.
6. Develop soft-skills including writing formal reports and delivering oral presentations.

Internship experience provides the student with an opportunity to enhance the knowledge in their respective subject areas. This training provides insight to understand the actual behaviour of the industry able to develop a greater understanding about the career option. Each of the students is required to develop a mini project during his/her one month internship. Evaluation will be done by the respective mentors. Internal assessment will be done on the basis of following criteria:

1. Presentation - 30 marks
2. Viva - 50 marks
3. Thesis/Project report - 20 marks.
OMCA-DS-204: CYBER SECURITY

Pre-Requisite: Knowledge of computer hardware, software and computer networks
Course Type: Domain Elective

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

OMCA-DS-204.1. Understand of basic concept and issues related to Cyber Security.
OMCA-DS-204.2. Distinguish various tools used in Cyber Security.
OMCA-DS-204.3. Identify various mechanisms to protect themselves from various security threats on the internet.
OMCA-DS-204.4. Use security tools to enhance system security.
OMCA-DS-204.5. Apply precautionary measures such as firewalls, digital certificates, to stay safe online.

PART - A

UNIT 1: Introduction to cyber security
1.1 Cyber Crimes
1.2 Types of Cybercrime
1.3 Cyberspace and Criminal Behavior
1.4 Digital Forensics
1.5 Contemporary Crimes
1.6 Indian IT ACT 2000

UNIT 2: Web Application Tools
2.1 Scanning for web vulnerability
2.2 Hyper Text Transfer Protocol utility
2.3 Application Inspection Tools
2.4 Password Cracking
2.5 Brute Force Tools – John the ripper and Hydra

UNIT 3: Network Defense Tools
3.1 Working of Firewall
3.2 Packet characteristics to filter
3.3 Network address translation
3.4 Virtual Private Network
3.5 Linux Firewall
3.6 Windows Firewall

PART-B

UNIT 4: Cryptography
4.1 Ciphers and Secret Message
4.2 Security Attacks and Services
4.3 Mathematical Tools for Cryptography
4.4 Theory of Block Cipher Design
4.5 Cipher Network Structures

UNIT 5: Digital Signatures, Certificates, and Standards
5.1 Digital Signature Standard and Authentication (DSS and DSA)
5.2 Public Key Infrastructure
5.3 Digital Certificates
5.4 Basics of Public Key Cryptography Standards (PKCS)
5.5 Internet Protocol and Web Security Protocols

UNIT 6: Introduction to Cyber Crime Investigation
6.1 Password Cracking
6.2 Keyloggers and Spyware
6.3 Trojan and backdoors
6.4 SQL Injection
6.5 Buffer Overflow
6.6 Attack on wireless Networks
6.7 Website Attacks

Suggested Readings:

Note: Only latest editions of the books are recommended.

Software required/ Web links:

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xxi) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

<table>
<thead>
<tr>
<th>Category</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCQs</td>
<td>30%</td>
</tr>
<tr>
<td>Subjective (Short/Long)</td>
<td>40%</td>
</tr>
<tr>
<td>Discussion/Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Projects/Group Activities etc</td>
<td>15%</td>
</tr>
</tbody>
</table>

(xxii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

<table>
<thead>
<tr>
<th>Category</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Type Questions</td>
<td>30%</td>
</tr>
</tbody>
</table>
Short/Long Questions: 70%

**Assessment Tools:**
- Assignment / Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-204.1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-204.2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-204.3</td>
<td>2</td>
<td></td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-204.4</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-204.5</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-205: MOBILE COMPUTING

Periods/week Credits Max. Marks: 100
L: 2 T: 0 2 Continuous Evaluation: 30
Duration of Examination: 3 Hrs End Semester Examination: 70

Pre-Requisite: Knowledge of Computer Networks
Course Type: Domain Elective

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

OMCA-DS-205.1 Define the concept of wireless communication & design of various cellular systems.
OMCA-DS-205.2 Describe working principle of wireless LAN and its standards.
OMCA-DS-205.3 Explain various techniques of multiple user access to scarce radio spectrum resources.
OMCA-DS-205MCA-DS-406.4 Compare different protocols for mobile adhoc networks
OMCA-DS-205-DS-406.5 Analyze the working of the GPS system and the concept of location based routing.
OMCA-DS-205.6 Design applications based on emerging technologies like Bluetooth, RFID, WI-MAX and Mobile IP.

PART -A

Unit 1: Introduction to Mobile Computing
1.1 Mobile computing features & characteristics
1.2 Issues in mobile computing
1.3 Novel applications
1.4 Limitations and architecture
1.5 Cellular concept
1.6 Air-interface
1.7 Channel structure
1.8 Channel allocation in cellular systems
1.9 GSM Architecture, GSM entities, call routing in GSM, CDMA
1.10 GPRS network architecture, network operations, data services, limitations, applications

Unit 2: Wireless LAN
2.1 IEEE 802.11 standards
2.2 Wireless LAN advantages and applications
2.3 Wireless LAN Architecture
2.4 Mobility in Wireless LAN
2.5 Security in Wireless LAN
2.6 WIFI versus 3G

Unit-3: Wireless Application Protocol (WAP)
3.1 Wireless Application Architecture
3.2 Wireless Application protocol Stack
3.3 Wireless Application environment
3.4 Wireless Application push architecture
3.5 Wireless Application push framework
3.6 Wireless session protocol
3.7 Wireless transmission protocol
3.8 WAP gateways and Applications
PART -B

Unit 4: Mobile Adhoc Network
4.1 Introduction to Adhoc networks
4.2 Definition to Adhoc networks
4.3 Characteristics to Adhoc networks
4.4 Applications to Adhoc networks
4.5 Adhoc mobility model: indoor & outdoor models
4.6 Security issues in Adhoc networks

Unit 5: Routing Protocols in Reference to Mobile Computing
5.1 Routing Protocols
5.2 Design issues
5.3 Goals & classification
5.4 Proactive versus reactive routing
5.5 Problems with Message Routing in Wireless Ad-hoc Mobile Networks
5.6 Routing scheme based on signal strength
5.7 Dynamic State Routing (DSR)
5.8 Route Maintenance and Routing error
5.9 Fisheye Routing (FSR)
5.10 Ad-hoc on Demand Distance Vector (ADDV)

Unit 6: Emerging Technologies & Mobile IP
6.1 Bluetooth protocol stack
6.2 Bluetooth security
6.3 Bluetooth application model
6.4 RFID, RFID tags, Application areas
6.5 WIMAX Architecture and applications
6.6 Mobile IP Goals
6.7 Assumptions & requirement agent discovery
6.8 Registration
6.9 Tunneling
6.10 Optimizations
6.11 Reverse tunneling

Suggested Readings:
2. Jochen Schiller, 2004, Mobile Communications, Pearson Education

Note: Only latest editions of the books are recommended.

Web links:
https://www.tutorialspoint.com/mobile_computing/mobile_computing_evolution.htm
https://sgar91.files.wordpress.com/2011/10/mobile_communications_schiller_2e.pdf
http://freeofread.com/download/mobile-computing-talukdar/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one
from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

**Evaluation Policy:**

The evaluation will include two types of assessments:

(xxiii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

(xxiv) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

- Objective Type Questions: 30%
- Short/Long Questions: 70%

**Assessment Tools:**

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-205.1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-205.2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-205.3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-205.4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-205.5</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-205.6</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
OMCA-DS-206: SYSTEM PROGRAMMING

Periods/week Credits Max. Marks: 100
L: 2 T: 0 2 Continuous Evaluation: 30
Duration of Examination: 3 Hrs
End Semester Examination: 70

Pre-Requisite: Knowledge of Computer Hardware
Course Type: Domain Elective

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

OMCA-DS-206.1. Understand the programming environment, software tools and different translators used in programming environment
OMCA-DS-206.2. Define the basics of system programs like editors, compiler, assembler, linker, loader interpreter, macros and debugger.
OMCA-DS-206.3. Apply the knowledge and techniques learnt to develop solutions to real world problems;
OMCA-DS-206.4. Design and implement system level programs.
OMCA-DS-206.5. Write system software with the aid of sophisticated OS services, programming languages and utility tools.

PART - A

Unit 1: Introduction to System Programming
1.1 Concepts of Compilers
1.2 Concepts of Assembler
1.3 Concepts of Loader
1.4 Concepts of Linker
1.5 Concepts of Interpreter
1.6 Concepts of Macro Preprocessor
1.7 Concepts of Operating System Structure
1.8 Concepts of Interrupt Handling and Device Drivers

Unit 2: Directories and File Systems
2.1 File and Manuals
2.2 File Organization
2.3 Access Method
2.4 Directories & its organization
2.5 File Properties and File Systems
2.6 Process and Programs
2.7 Allocation Schemes
2.8 I/O redirection and pipes

Unit 3: Compilers: An overview
3.1 Functions and features of Compilers
3.2 Phases of compilation
3.3 Applications of Linked List
3.4 Comparison of compilers and interpreters
3.5 Code optimization
3.6 Compilation of Expression
3.7 Compilation of Control Structure
3.8 Code generation algorithm and DAG representation

PART-B

Unit 4: Macro Preprocessor and Its Function
4.1 Introduction to macro function
4.2 Macro Definition and Call
4.3 Features of macros
4.4 Nested Macro Calls
4.5 Design of a Macro Assembler
4.6 Functions of a Macro Processor
4.7 Basic Tasks of a Macro Processor
4.8 Design of two pass Macro Processor
4.9 Macro expansion
4.10 Nested macro calls

Unit 5: Loaders and Linkers
5.1 Features and functions of loaders
5.2 Overview of loading Schemes
5.3 Go & compile loader
5.4 Relocation loading scheme
5.5 Design of Absolute loader
5.4 Design of Direct linking loader
5.5 Program linking
5.6 Static and Dynamic Linking
5.7 Relocation of linking concepts

Unit 6: Introduction to Software Tools and Assembly Language
6.1 Introduction to software tools for program development
6.2 Introduction to editors with their types
6.3 Function of debug monitor
6.4 Features and functions of assembly language
6.5 Design of one-pass and Two-pass Assemblers
6.6 Function of Load and Go Assembler.

Suggested Readings:
3. Beck and Manjula, 2016, System software, Pearson Education

Note: Only latest editions of the books are recommended.

Web links:
https://sites.google.com/a/venusict.org/system-programming/nptel-vide

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.
Evaluation Policy:

The evaluation will include two types of assessments:

**(xxv)** Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

**(xxvi)** For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

- Objective Type Questions: 30%
- Short/Long Questions: 70%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PS01</th>
<th>PS02</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-206.1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-206.2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-206.3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-206.4</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-206.5</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
OMCA-DS-207: DATA FUNDAMENTALS IN AZURE

Periods/week Credits
L:2 T: 0 2
Duration of Examination: 3 Hrs
Max. Marks : 100
Continuous Evaluation :30
End Semester Examination: 70

Pre-Requisite: NA
Course Type: Domain Elective

Learning Outcomes: At the end of the course, the learner will be able to:

OMCA-DS-207.1 To learn core data concepts.
OMCA-DS-207.2. Build fundamental knowledge of cloud data services within Microsoft Azure
OMCA-DS-207.3. Explore relational data concepts and relational database services in Azure
OMCA-DS-207.4. Understand Azure storage for non-relational data
OMCA-DS-207.5. Understand fundamentals of Azure Cosmos DB
OMCA-DS-207.6. Explore modern data warehousing, real-time analytics and data visualization

PART-A

UNIT 1: Fundamentals of core data concepts
1.1 Core data concepts: relational, non-relational and big-data
1.2 Defining and storing data
1.3 Characteristics of relational and non-relational data
1.4 Describe and differentiate data workloads
1.5 Difference between batch and streaming data

UNIT 2: Fundamentals of relational data in Azure
2.1 Data roles and services
2.2 Cloud services used by data professionals
2.3 Azure services for relational data

UNIT 3: Azure relational database services
3.1 Normalization in relational database
3.2 Identify types of SQL statement
3.3 Relational database objects
3.4 Azure SQL services
3.5 Open-source database in Azure
3.6 Database services on Azure

PART-B

UNIT 4: Non-relational data in Azure
4.1 Fundamentals of Azure storage
4.2 Features and capabilities of Azure blob storage
4.3 Features and capabilities of Azure Data Lake Gen2
4.4 Features and capabilities of Azure file and table storage
4.5 Concept of Azure storage account

UNIT 5: Azure Cosmos DB
5.1 Fundamentals of Azure Cosmos DB
5.2 Key features of Azure Cosmos DB
5.3 Identification of APIs supported in Azure Cosmos DB
5.4 Using Azure Cosmos DB instance

UNIT 6: Data Analytics
6.1 Modern data warehousing
6.2 Elements of a modern data warehousing
6.3 Streaming and real-time analytics
6.4 Types of analytical data store and related Azure services
6.5 Data visualization
6.6 Azure Synapse Analytics and use
6.7 Batch and stream processing
6.8 Elements of streaming data solutions

Evaluation Policy:

The evaluation will include two types of assessments:

( xxvii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

( xxviii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

- Objective Type Questions: 30%
- Short/Long Questions: 70%

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
OMCA-DS-208: ARTIFICIAL INTELLIGENCE USING AZURE

Learning Outcomes: At the end of the course, the learner will be able to:

OMCA-DS-208.1 Understand the key foundational concepts of AI
OMCA-DS-208.2 Build AI solutions using Microsoft Azure.
OMCA-DS-208.3 Learn secure, monitor, and deploy cognitive services resources and use them to build intelligent solutions
OMCA-DS-208.4 Create apps that extract semantic meaning from text and translate it between languages
OMCA-DS-208.5 Develop speech-enabled applications by using the Speech service.
OMCA-DS-208.6 Enable to train a language model to extract semantic meaning from natural language.

PART-A

UNIT 1: Developing AI Solutions on Azure
1.1 Introduction to the Core concepts of Artificial Intelligence
1.2 Defining considerations for AI Engineers
1.3 Characteristics of responsible Artificial Intelligence
1.4 Capabilities of Azure Machine Learning
1.5 Capabilities of Azure Cognitive Services
1.6 Capabilities of Azure Bot Services
1.7 Capabilities of Azure Cognitive Search

UNIT 2: Manage Azure Cognitive Services
1.1 Azure Cognitive services
1.2 Use cognitive services to build intelligent solutions
1.3 Use Azure portal
1.4 Create and consume cognitive services
1.5 Secure cognitive services
1.6 Monitor Cognitive services
1.7 Deploy cognitive services in containers

UNIT 3: Process and Translate text with Azure Cognitive Services
3.1 Extract insights from text with the language services
3.2 Create intelligent applications
3.3 Analyze sentiment
3.4 Extract entities and linked-entities
3.5 Understand language detection, translation and transliteration
3.6 Translate text with Translator service

PART-B

UNIT 4: Process Speech with Azure Cognitive Speech Services
4.1 Develop speech-enabled applications by using the Speech service
4.2 Use Speech-to-text API
4.3 Use text-to-speech API
4.4 Use speech synthesis Markup language
4.5 Concept of Azure storage account

UNIT 5: Translate Speech with Azure Cognitive Speech Services
5.1 Azure as a resource for speech translation
5.2 Translate speech to text
5.3 Synthesize translations

UNIT 6: Create Language Translation Solution
6.1 Azure resources for language understanding
6.2 Use patterns to differentiate similar utterances
6.3 Use pre-built models
6.4 Train test publish and review a language Understanding App

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:
The evaluation will include two types of assessments:

(xxiv) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCQs</td>
<td>30%</td>
</tr>
<tr>
<td>Subjective (Short/Long)</td>
<td>40%</td>
</tr>
<tr>
<td>Discussion/Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Projects/Group Activities etc</td>
<td>15%</td>
</tr>
</tbody>
</table>

(xxx) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Type Questions</td>
<td>30%</td>
</tr>
<tr>
<td>Short/Long Questions</td>
<td>70%</td>
</tr>
</tbody>
</table>

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
OMCA-DS-209: SECURITY FUNDAMENTALS IN AZURE

Periods/week Credits Max. Marks: 100
L: 2 T: 2 Continuous Evaluation: 30
Duration of Examination: 3 Hrs End Term Examination: 70

Pre-Requisite: Knowledge of fundamentals of computer networks
Course Type: Domain Elective

Course Outcomes: At the end of the course, the student will be able to:
OMCA-DS-209.1 Describe security, compliance concepts and methodologies.
OMCA-DS-209.2 Explain Azure AD services and identity principals, secure authentication, access management capabilities, as well as identity protection and governance.
OMCA-DS-209.3 Describe security capabilities in Microsoft.
OMCA-DS-209.4 Explain compliance solutions in Microsoft.

PART -A

UNIT 1: Fundamentals of Security
1.1 Security Concepts
1.2 Security Methodologies
1.3 Security Compliance Concepts & Methodologies
1.4 Security Identity Concepts
1.5 Identity Solutions (Zero Trust, Shared Responsibility)
1.6 Role of Identity Providers

UNIT 2: Microsoft Azure Identity
2.1 Azure AD Services
2.2 Identity Types of Azure AD
2.3 Identity Principals
2.4 Identity Protection and Governance
2.5 Identity Protection and Governance Capabilities of Azure AD
2.6 Privileged Identity Management

UNIT 3: Access Management Solutions
3.1 Azure Access Management Capabilities
3.2 Secure Authentication
3.3 Authentication Capabilities of Azure AD
3.4 Access Management in Azure AD with Conditional Access
3.5 Azure AD Authentication with Self-service Password Reset

PART -B

UNIT 4: Security Capabilities
4.1 Basic Security Capabilities In Azure
4.2 Network and Platform Capabilities of Azure
4.3 Azure Security Management
4.4 Security Capabilities of Microsoft Sentinel
4.5 Threat Protection Capabilities of Microsoft 365
4.6 Security Management Capabilities

UNIT 5: Security Solutions
5.1 Explore Azure Network Security Groups (NSGs)
5.2 Microsoft Defender for Cloud
5.3 Microsoft Sentinel
5.4 Microsoft Defender for Cloud Apps
5.5 Microsoft Endpoint Protection with Intune

UNIT 6: Compliance Solutions
6.1 Compliance Management Capabilities
6.2 Information Protection and Governance Capabilities
6.3 Insider Risk Capabilities
6.4 ediscovery and Audit Capabilities
6.5 Resource Governance Capabilities in Azure
6.6 Service Trust Portal

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xxxi) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

(xxxii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

- Objective Type Questions: 30%
- Short/Long Questions: 70%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination
SEMESTER III
OMCA-DS-301: ADVANCE DATABASE SYSTEMS

Periods/week Credits: Max. Marks : 100
L: 3  Continuous Evaluation : 30
Duration of Examination: 3 Hrs  End Semester Examination : 70

Pre-Requisite: Knowledge of Database Management System
Course Type: Core

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

OMCA-DS-301.1 Understand the concept of Advance Database Base Management System.
OMCA-DS-301.2 Explore the relational databases and its different models.
OMCA-DS-301.3 Apply advance SQL queries and PL/SQL programs.
OMCA-DS-301.4 Analyze the different database security issues.
OMCA-DS-301.5 Create and implement the ER and EER diagrams.

PART -A
UNIT 1: Relational Database Design and Implementation
1.1 Introduction to Relational Database Management System
1.2 Features of Good Relational Database Management System
1.3 Enhanced ER tools
1.4 Converting EER diagram to tables
1.5 Different Table Constraints and Characterization
1.6 Normalization : UNF, 1NF, 2NF, 3NF, EKNF, BCNF, 4NF, ETNF, 5NF, DKNF, 6NF
1.7 Inclusion Dependencies and Template Dependency

UNIT 2: Emerging Database Technologies, Applications and Environments
2.1 Database Concepts and its Architecture
   2.1.1 Object Oriented Database
   2.1.2 Object Relational Database
   2.1.3 Active Database
   2.1.4 Temporal Database
   2.1.5 Spatial Database
   2.1.6 Deductive Database
   2.1.7 Mobile Database
2.2 Query Processing
2.3 Geographic Information System
2.4 Data Warehousing and Data Mining

UNIT 3: Advance SQL and PL/SQL
6.6 SQL Query Statements
6.7 Advance SQL Queries
6.8 SQL Operations : Selection, Join, Sorting, Grouping
6.9 Transformation of Relational and Logical Operations
6.10 SQL Functions
6.11 Storage and Query Optimization
6.12 Views and Query Processing
6.13 Cursors : Implicit and Explicit
6.14 Database Triggers

82
6.15 Exception Handling
6.16 Sub Programs: Procedures and Functions

PART-B

UNIT 4: Distributed Databases
4.1 Centralized versus non centralized Databases
4.2 Homogeneous and Heterogeneous DDBMS and their comparison
4.3 Functions and Architecture
4.4 Distributed database design, query processing in DDBMS
4.5 Distributed concurrency management, deadlock management
4.6 Concepts of replication servers

UNIT 5: Database Security and Authorization
6.1 Introduction to Database Security
6.2 Problems in Database Security and Conclusions
6.3 Levels of Database Security
6.4 Access Control
6.5 Multilevel Security
6.6 Statistical Database Security
6.7 Examples of E-Security

UNIT 6: Transaction Management and Recovery Process
6.1 Advanced feature of Transactions
6.2 Enhanced Lock Based and timestamp based Protocols
6.3 Deadlock Handling
6.4 Weak Levels of Consistency
6.6 Recovery and Atomicity
6.7 Recovery with Concurrent Transaction
6.8 Advanced Recovery Techniques
6.9 Remote Backup Systems

Suggested Readings:
5. C. J. Date & Longman, 2003, Introduction to Database Systems, Pearson Education

Note: Only latest editions of the books are recommended.

Software required/ Web links:
Oracle 9i or above versions (10g, 11i, 12c)
https://www.geeksforgeeks.org/dbms-concurrency-control-protocols-lock-based-protocol/
https://www.tutorialspoint.com/dbms/dbms_data_recovery.htm
https://www.w3schools.com/html/index.htm
https://www.w3schools.com/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one
from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

**Evaluation Policy:**

The evaluation will include two types of assessments:

(xxxii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCQs</td>
<td>30%</td>
</tr>
<tr>
<td>Subjective (Short/Long)</td>
<td>40%</td>
</tr>
<tr>
<td>Discussion/Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Projects/Group Activities etc</td>
<td>15%</td>
</tr>
</tbody>
</table>

(xxxiv) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Type Questions</td>
<td>30%</td>
</tr>
<tr>
<td>Short/Long Questions</td>
<td>70%</td>
</tr>
</tbody>
</table>

**Assessment Tools:**

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PS01</th>
<th>PS02</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-301.1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-301.2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-301.3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-301.4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-301.5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-302: PROGRAMMING IN .NET

Periods/week Credits
L: 3   T: 0   3
Duration of Examination: 3Hrs
Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Prerequisite: Knowledge of Object Oriented Programming Approach
Course Type: Core
Course Outcomes: At the end of the course, students will be able to

OMCA-DS-302.1. Define the concepts of windows application programming concepts.
OMCA-DS-302.3. Demonstrate the usage of different tools and controls used in C# programming.
OMCA-DS-302.4. Analyze the various types of database connectivity with visual studio .net.
OMCA-DS-302.5. Assess various ASP.NET components and justify their usage in various programming situations.

PART -A

UNIT 1: Introduction to .Net Architecture
1.1 Introduction to Visual Studio and .Net Architecture
1.2 Visual Studio IDE, Development Environment Setup
1.3 .NET Overview, CLR, Assemblies (monolithic vs. component-based applications)
1.4 Execution Model, Client-Side vs. Server-Side Programming.
1.5 Debugging using Visual Studio.
1.6 Creating Different types of Projects in Visual Studio(Web, Desktop, Library)

UNIT 2: C# Basics
2.1 Variables, Constants
2.2 Strings, Data Types
2.3 Arrays Different Types of Arrays and Operations on Arrays
2.4 Decision statements
2.5 Loop statements
2.6 Exception Handling using try – catch –finally
2.7 Name Space
2.8 Class and Objects, Creating and using Objects
Unit 3: Inheritance and Interface
3.1 Concept of Inheritance
3.2 Sealed class
3.3 Operator Overloading
3.4 Method Overloading
3.5 Indexer Overloading
3.6 Creating an Interface
3.7 Implementing an Inheritance
3.8 Inheriting an Interface

PART-B

Unit 4: Desktop Applications and Event Handling
4.1 Windows Forms
4.2 MsgBox, DialogBox
4.3 Handling Mouse and Keyboard Events
4.4 Basic Control Programming for following controls
4.5 Button, Label, Textbox, Rich Textbox
4.6 Radio Button, Checkbox, List Box
4.7 Checked List Box
4.8 Tree View
4.9 Picture Box, Tab Control

UNIT 5: Database Programming
5.1 Architecture of ADO.NET
5.2 Data Providers in ADO.NET
5.3 Connection and Command Class
5.4 DataReader
5.5 DataAdapter
5.6 DataSet and DataTable
5.7 DataReader
5.8 DataGridview Control
5.9 Binding Controls with DataSets
5.10 Reading and Writing into XML Data Files.
5.11 Executing Stored Procedures from ADO

UNIT 6: Web Applications using ASP.NET
6.1 Web Development and ASP.NET
6.2 Session Tracking
6.3 ASP.NET Components: Web forms
6.4 Basic Components (Textbox, Dropdown, Button)
6.5 GridView and DataList Controls
6.6 State Management
6.7 Deploying Application in IIS Server
6.8 Web.Config and Global.asax
6.9 Creating Web Services
6.10 Consuming RESTfulWeb Service in C#
Suggested Readings:
2. Jack Purdum, 2007, Beginning C# 3.0 An introduction to object oriented programming, Wrox Publication
5. Imar Spaanjaars, 2010, Beginning ASP.NET 4.5 in C# and VB, Wrox Publications

Note: Only latest editions of the books are recommended.

Software required/ Web links:
Visual Studio 2010
Database Server: SQL Server 2008
https://docs.microsoft.com/en-us/dotnet/csharp/quick-starts/
https://www.tutorialspoint.com/csharp/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:
The evaluation will include two types of assessments:

(335) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs 30%
Subjective (Short/Long) 40%
Discussion/Presentation 15%
Projects/Group Activities etc 15%

(336) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

Objective Type Questions: 30%
Short/Long Questions: 70%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
## COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-302.1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-302.2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-302.3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-302.4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-302.5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-302.6</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
OMCA-DS-303: SOFTWARE ENGINEERING AND TESTING

Periods/week        Credits                      Max. Marks : 100
L: 3       T: 0       3                         Continuous Evaluation : 30
Duration of Examination: 3 Hrs                           End Semester Examination: 70

Pre-Requisite: Knowledge of fundamentals of computers
Course Type: Core
Course Outcomes: At the end of the course, students will be able to

OMCA-DS-303.1. Analyze a software development problem and compare various software development life-cycle approaches with risks and benefits of each approach.
OMCA-DS-303.2. Understand the requirements for software development and learn the specifications within realistic constraints
OMCA-DS-303.3. Understand various software planning and Management techniques for Project scheduling and development.
OMCA-DS-303.4. Learn various software design models, design technologies involved in software development.
OMCA-DS-303.5. Distinguish between various forms of testing and apply various software testing techniques at the system and organizational level.
OMCA-DS-303.6. Understand the issues related to the maintenance and upgradation of the software system.

PART –A

Unit 1: Introduction to Software Engineering
1.1 The software problem
1.2 Software crisis
1.3 Evolution of software engineering
1.4 Principles of software engineering
1.5 Software development vs. software engineering
1.6 Component based software engineering
1.7 Requirements gathering
1.8 Requirements analysis and specification
1.9 Software process

Unit 2: Software Process Models, Project Metrics & Project Management
2.1 Selection of appropriate process model
2.2 Software process models: Waterfall, Spiral, Prototyping, RAD, Agile methodology
2.3 Software project management concepts
2.4 Project planning and control
2.5 Cost estimation using COCOMO model
2.6 Project scheduling using PERT charts, GANTT charts and WBS
2.7 Software metrics: FP, LOC, FP vs. LOC, Token count
2.8 Object-Oriented metrics

Unit 3: Basic Design Issues
3.1 Introduction to software design
3.2 Design objectives
3.3 Design principles
PART B

Unit 4: Introduction to Testing & Static Testing Techniques
4.1 Some terms: error, mistakes, bug, fault, failure, defects
4.2 Software testing: introduction and definition
4.3 Testing objectives
4.4 Testing process
4.5 Testing lifecycle
4.6 Testing principles
4.7 Software testing team
4.8 Models for software testing
4.9 Test cases designing and writing of test cases: concept & introduction
4.10 Verification & Validation
4.11 Review techniques

Unit 5: Dynamic Testing Techniques & Various Testing Strategies
5.1 Introduction dynamic testing techniques
5.2 Need & advantages
5.3 Functional testing techniques: Equivalence partitioning, BVA, Cause- Effect graphing, Decision table testing
5.4 Structural testing techniques: Coverage testing, Path coverage, Mutation testing
5.5 Unit testing, Integration testing, System testing
5.6 Acceptance testing: Alpha testing & Beta testing
5.7 Usability testing

Unit 6: Types of Testing and Software Quality Assurance
6.1 Regression testing
6.2 Performance testing: load testing & stress testing
6.3 Security testing
6.4 Testing web based Applications
6.5 Definition of quality and factors
6.6 Software quality control
6.7 Software quality assurance Software quality control VS Software quality assurance
6.8 The SEI process Capability Maturity Model (CMM)

Suggested Readings:

Note: Only latest editions of the books are recommended.

Weblinks:
https://www.tutorialspoint.com
https://www.nptel.ac.in
**Instructions for paper setting:** Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

**Evaluation Policy:**

The evaluation will include two types of assessments:

(***xxvii**) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

(***xxviii**) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

- Objective Type Questions: 30%
- Short/Long Questions: 70%

**Assessment Tools:**

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-303.1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-303.2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-303.3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-303.4</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-303.5</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-303.6</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>
OMCA-DS-304: BIG DATA ANALYTICS

Periods/week  Credits  Max. Marks  L: 3  T: 0  3  Continuous Evaluation: 30
Duration of Examination: 3 Hrs  End Semester Examination: 70

Pre-requisite: Knowledge of Database Management System, Data Warehousing, Java or Python

Course Type: Domain

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

OMCA-DS-304.1. Understand the key concepts of Big data management and its associated applications.
OMCA-DS-304.2. Explore the need of Big Data to make better business decisions.
OMCA-DS-304.3. Manage big data using NoSQL databases.
OMCA-DS-304.4. Apply Map-Reduce programming using Hadoop and related tools.
OMCA-DS-304.5. Implement the parallel processing framework using Apache Spark.

PART-A

Unit 1: Introduction Data Mining
1.1 Data Mining Functionalities
1.2 Steps in Data Mining Process
1.3 Architecture of A Typical Data Mining Systems
1.4 Classification of Data Mining Systems
1.5 Overview of Data Mining Techniques

Unit 2: Overview of Big Data
2.1 Basics of Big data
2.2 Reasons for using Big data
2.3 Characteristics of Big Data
2.4 Big Data Architecture: Storing, Selecting and Processing of Big Data
2.5 Applications of Big Data
2.6 Cloud and Big Data

Unit 3: Managing Data with NoSQL
3.1 Introduction of NoSQL Database concepts- ACID Vs. BASE, Advantages, Application
3.2 Schema of NoSQL database
3.3 CAP Theorem: Consistency, Availability and Partition Tolerance
3.4 Sharding and Share Nothing Architecture- Feature Based, Key Based and Lookup Table Based
3.5 Distributed and Decentralised NoSQL databases
3.6 High Availability and Fault Tolerance in NoSQL databases
3.7 Comparison of few NoSQL Databases (Cassandra, Mongo, Cloudera, CouchDB, HBase)

PART-B

Unit 4: Introduction to Hadoop Ecosystem
4.1 Problems with traditional large-scale systems
4.2 Hadoop v/s RDBMS
4.3 Hadoop Distributed File System Design and Architecture
4.4 Building Blocks of Hadoop: NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker
4.5 Map Reduce Framework
4.6 Map Reduce Input and Output Formats
4.7 Introduction to write a MapReduce Program

**Unit 5: Querying Big Data with Hive**
5.1 Hive Architecture
5.2 Comparison with Traditional Database
5.3 Hive-Data types
5.4 Hive built-in operators and built-in functions
5.5 Hive-Views and Indexes
5.6 Hive QL

**Unit 6: Basics of Apache Spark**
6.1 Features of Apache Spark
6.2 Hadoop v/s Apache Spark
6.3 Resilient Distributed Dataset (RDD): Introduction of Resilient Distributed Dataset
6.4 Spark RDD operations: RDD Transformation
6.5 Parallel Processing in Spark

**Suggested Readings:**
1. Tom Plunkett, Brian Macdonald, 2013, Oracle Big Data Handbook, Bruce Nelson, Fujitsu
5. Mike Frampton, 2015, Mastering Apache Spark

**Note:** Only latest editions of the books are recommended.

**Software required/Weblinks:**
http://hadooptutorials.co.in/
https://www.ibm.com/analytics/hadoop/mapreduce
https://www.datacamp.com/community/tutorials/apache-spark-tutorial-machine-learning
http://hadooptutorial.info/category/hive/

**Instructions for paper setting:** Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

**Evaluation Policy:**

The evaluation will include two types of assessments:

(***xix*) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:
MCQs: 30%
Subjective (Short/Long): 40%
Discussion/Presentation: 15%
Projects/Group Activities etc: 15%

(xl) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:
Objective Type Questions: 30%
Short/Long Questions: 70%

Assessment Tools:
- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-304.1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-304.2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-304.3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-304.4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-304.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-305: CLOUD COMPUTING

Periods/week Credits Max. Marks: 100
L: 3 T: 0 Continuous Evaluation: 30
Duration of Examination: 3 Hrs End Semester Examination: 70

Pre-Requisite: Knowledge of Data Communication & Networking
Course Type: Domain

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

OMCA-DS-305.1 Define cloud computing and memorize the different cloud services and deployment models.
OMCA-DS-305.2 Describe importance of virtualization along with their respective technology.
OMCA-DS-305.3 Use and examine different cloud computing services.
OMCA-DS-305.4 Analyze and compare various different cloud computing platforms such as AWS, Microsoft Azure.
OMCA-DS-305.5 Design different cloud computing business applications with appropriate security mechanism.

PART-A

UNIT 1: Introduction to Cloud Computing
1.1 Definition of Cloud Computing
1.2 Origin and Influences
1.3 Basic Concepts of Clouds: Virtualization and Abstraction
1.4 Cloud Characteristics
1.5 Challenges and Risks
1.6 Applications of Cloud Computing

UNIT 2: Cloud Computing Architecture
1.1 Cloud Models: Deployment models, Service Models
1.2 Cloud reference model (Architecture, Infrastructure, Platform, and Software)
1.3 Cloud types (Public, Private, Hybrid & Community clouds) with examples
1.4 Exploring cloud computing status; Connecting to cloud
1.5 Cloud Computing Technologies: Elasticity, Load Balancing
1.6 Open Challenges

UNIT 3: Cloud Delivery Models
3.1 IaaS (IaaS workloads, Pods, Aggregation & Silos);
3.2 PaaS (Application development, Using PaaS application framework)
3.3 SaaS (Characteristics, Open SaaS & SOA)
3.4 IDaaS
3.5 Comparing Cloud Delivery Models
3.6 Combining Cloud Delivery Models

PART-B

UNIT 4: Cloud Security and Trust Management
4.1 An Introduction to the Idea of Data Security
4.2 Cloud Security Threats
4.3 The Current State of Data Security in the Cloud CryptDb
4.4 Onion Encryption layers and Homomorphic Encryption
4.5 Trust, Reputation and Security Management

UNIT 5: Cloud Platforms in Industry
5.1 Amazon Web Services
5.2 Google AppEngine
5.3 Microsoft Azure
5.4 Manjra Soft Aneka
5.5 Hadoop

Unit 6: Cloud Applications
6.1 Scientific Applications
6.2 Business Applications
6.3 Consumer Applications
6.4 Third Party Cloud Services
6.5 Case Study related to cloud environment

Suggested Readings:

Note: Only latest editions of the books are recommended.

Web links:
https://www.tutorialspoint.com/cloud_computing/cloud_computing_evolution.htm
http://www.buyya.com/MasteringClouds/ToC-Preface-TMH.pdf

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:
The evaluation will include two types of assessments:
(xli) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:
For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:
MCQs 30%
Subjective (Short/Long) 40%
Discussion/Presentation 15%
Projects/Group Activities etc 15%
(xlii) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:
Objective Type Questions: 30%
Short/Long Questions: 70%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-305.1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-305.2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-305.3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-305.4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-305.5</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
OMCA-DS-306: NETWORK SECURITY AND CRYPTOGRAPHY

Periods/week Credits Max. Marks : 100
L: 2 T: 0 2 Continuous Evaluation : 30
Duration of Examination: 3 Hrs End Semester Examination : 70

Pre-Requisite: Knowledge of Networking
Course Type: Domain Elective

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

OMCA-DS-306.1 Analyze the basic concepts of network security.
OMCA-DS-306.2 Recognize various security threats, their harm, strategies and tactics to protect the networks
OMCA-DS-306.3 Explore various aspects of network security and access control mechanism
OMCA-DS-306.4 Appraise the concept of encryption and decryption keys and to explain the various types of cipher.
OMCA-DS-306.5 Relate existing symmetric key algorithm like Data Encryption Standard.
OMCA-DS-306.6 Elaborate the concepts of authentication, digital signature & cryptography

PART- A

Unit 1: Security Fundamentals
1.1 Overview of Security
1.2 Protection versus Security
1.3 Goals and Aspects of Security
1.4 Data Integrity
1.5 Data Availability and Privacy
1.6 Security Problems
1.7 User Authentication

Unit 2: Security Threats
2.1 Program Threats
2.2 Worms, Viruses, Trojan Horse, Trap Door
2.3 Stack and Buffer Overflow
2.4 System Threats- intruders
2.5 Communication Threats- Tapping and Piracy
2.6 Firewalls
2.7 Security Methodology-The Three D’s of Security
2.8 Strategy and Tactics
2.9 Website Attacks: SQILA, XSS, LDAP, Injection Attack

Unit 3: Network Security and Access Control
3.1 Risk Analysis and Defense Models
3.2 Network Segmentation
3.3 Access Control
3.4 Physical Security
3.5 Security Assets (Locks, Entry Controls)
3.6 Physical Intrusion Detection
3.7 Authentication and Authorization Controls
PART B

Unit 4: Encryption Techniques
4.1 Substitution Ciphers
4.2 Transposition Ciphers
4.3 Stream and Block Ciphers
4.4 Symmetric-key Algorithms, Asymmetric-key Algorithms
4.5 Data Encryption Standard
4.6 Advanced Encryption Standards
4.7 Public Key Encryption – RSA
4.8 Message Integrity and Authentication- MAC, Hash functions

Unit 5: Digital Signatures
5.1 Introduction to Digital Signatures
5.2 Symmetric Key Signatures
5.3 Public Key Signatures
5.4 Message Digests
5.5 Public Key Infrastructures.

Unit 6: Mathematics of Cryptography
6.1 Integer Arithmetic (Extended Euclidean Algorithm, Linear Diophantine Equation)
6.2 Modular Arithmetic (Additive & Multiplicative Inverse)
6.4 Linear Congruence.
6.5 Algebraic Structures ((Groups; Rings; Fields)
6.6 GF (2n) Fields
6.7 Chinese Remainder Theorem
6.8 Quadratic Congruence
6.9 Exponention and Logarithm

Suggested Readings:

Note: Only latest editions of the books are recommended.

Software required/ Web links:
https://www.tutorialspoint.com/network_security/
http://learnthat.com/introduction-to-network-security/6/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.
Evaluation Policy:

The evaluation will include two types of assessments:

(xliii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

(xliv) For Summative assessment (End Semester Examination or End-Term Examination):

- Minimum: 70 percent. Categorization for the same is:
  - Objective Type Questions: 30%
  - Short/Long Questions: 70%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-306.1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-306.2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-306.3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-306.4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-306.5</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-306.6</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
MCA-DS-307: DATABASE ADMINISTRATION

Periods/week Credits: Max. Marks : 100
L: 2  T: 0  2
Duration of Examination: 3 Hrs  Continuous Evaluation: 30
End Semester Examination : 70

Pre-Requisite: Knowledge of Database Management System
Course Type: Domain Elective

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

OMCA-DS-307.1 Identify the importance of Database Administration and role of its administrator.
OMCA-DS-307.2 Acquire knowledge on cloud databases and its applications.
OMCA-DS-307.3 Transform an information model into a relational database schema with Oracle.
OMCA-DS-307.4 Analyze strategies for managing data security, privacy, fraud detection, backup and recovery.
OMCA-DS-307.5 Implement techniques for controlling the consequences of concurrent data access.

PART - A

UNIT 1: Database Administration and its Interface
1.1 Database Management System and its Architecture
1.2 Database Models – Implementation of Object Oriented Database Model
1.3 Database Administration and its scope
1.4 Roles and Responsibilities of Database Administrator
1.5 Working knowledge of Database Administrative tasks
1.6 Data Dictionary Reports
1.7 Database Schemas
1.7.1 Internal Schema
1.7.2 External Schema
1.7.3 Storage Schema
1.8 Enterprise Manager Tour

UNIT 2: Oracle : Installation and Architecture
2.1 Oracle Installation
2.2 General Oracle Database Architecture
2.3 Optimal Flexible Architecture (OFA)
2.4 Managing Oracle Memory
2.5 Memory Structure of Oracle
2.6 Instance Memory
2.7 System Global Area
2.8 Program Global Area
2.9 Instance Background Processes
2.10 SQL Execution Processes

UNIT 3: Database Storage Structures
3.1 Tablespaces : Introduction and Architecture
3.2 Tablespaces Management in Database
3.3 Types of Tablespaces : Temporary and Permanent
3.4 Tablespaces Manipulation : Create, Alter, Drop
3.5 Managing Data Files
3.6 Managing Temp Files
3.7 UNDO_MANAGEMENT
3.8 UNDO_TABLESPACE
3.9 UNDO_RETENTION

PART-B

UNIT 4: Virtual and Cloud Based Oracle Server and Services
4.1 Oracle in Cloud
4.2 Managing online and Offline Database
4.3 Database Architecture on Cloud
4.4 Logical and Physical Database Layout on Cloud
4.5 Types of Oracle Services
4.6 Different types of Servers used in Oracle
4.7 Oracle Cloud : Enterprise Cloud Computing SaaS, IaaS, PaaS
4.8 Difference between Public, Private and Hybrid Cloud

UNIT 5: Database Security
5.1 Introduction to Database Security
5.2 Problems in Database Security and Conclusions
5.3 Security Models
5.4 Security Mechanism
5.5 Security Software Design
5.6 Database Object Privileges
5.7 Administrative Auditing of Database Activity
5.8 Enhanced Default Security Settings
5.9 Backup and Recovery Procedures
5.10 Rollback Segments
5.11 Roll Based Security

UNIT 6: Managing Concurrency and Locks
6.1 Concurrency Control Protocols
6.2 Lock Based Protocols and its Types
6.3 Timestamp based Protocols
6.4 ACID Properties of Database
6.5 Deadlock and Deadlock Prevention
6.6 Catastrophic Failure and Avoidance
6.7 Data Recovery
6.8 Recovery Classifications
6.9 Recovery and Atomicity

Suggested Readings:

Note: Only latest editions of the books are recommended.
Software required/ Web links:
Oracle 9i or above versions (10g, 11i,12c)
https://www.geeksforgeeks.org/dbms-concurrency-control-protocols-lock-based-protocol/
https://www.tutorialspoint.com/dbms/dbms_data_recovery.htm
https://www.w3schools.com/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xlv) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCQs</td>
<td>30%</td>
</tr>
<tr>
<td>Subjective (Short/Long)</td>
<td>40%</td>
</tr>
<tr>
<td>Discussion/Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Projects/Group Activities</td>
<td>15%</td>
</tr>
</tbody>
</table>

(xlvi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Type Questions</td>
<td>30%</td>
</tr>
<tr>
<td>Short/Long Questions</td>
<td>70%</td>
</tr>
</tbody>
</table>

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
### COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-307.1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-307.2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-307.3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-307.4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-307.5</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
OMCA-DS-308: E-COMMERCE TECHNOLOGIES

Pre-Requisite: Knowledge of Internet
Course Type: Domain Elective

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

OMCA-DS-308.1: Understand the fundamentals and importance of E-Commerce.
OMCA-DS-308.2: Classify trading relationships including Business to Consumer, Business-to-Business, Inter-organization.
OMCA-DS-308.3: Interpret the key features of Internet, Intranets and Extranets by demonstrating their relation with each other.
OMCA-DS-308.4: Analyze the major security challenges in using and making On-line transactions.
OMCA-DS-308.5: Examine the legal issues and Privacy in E-Commerce.
OMCA-DS-308.6: Design an embedded system by exploring marketing strategies and using IOT based applications.

PART-A

Unit 1: Introduction to E-Commerce
1.1 Introduction to E-Commerce
1.2 Main activities of E-Commerce
1.3 Goals of E-Commerce
1.4 Technical Components of E-Commerce
1.5 Advantages and disadvantages of E-Commerce
1.6 Scope of E-Commerce
1.7 Electronic Commerce Applications
1.8 Electronic Commerce and Electronic Business

Unit 2: Evolution of Internet
2.1 Domain Names and Internet Organization
2.2 Types of Network
2.3 Internet Service Provider
2.4 World Wide Web
2.5 Benefits of creating a Website
2.6 Registering a Domain Name
2.7 Web promotion
2.8 Shopping Bots

Unit 3: Internet Security
3.1 Secure Transaction
3.2 Computer Monitoring
3.3 Privacy on Internet
3.4 Corporate Email privacy
3.5 Computer Crime (Laws, Types of Crimes)
3.6 Threats and Attacks on Computer System
3.7 Software Packages for privacy
3.8 Hacking
3.9 Computer Virus
3.10 Encryption and Decryption
3.11 Public Key Encryption
3.12 Authorization and Authentication
3.13 Firewall
3.14 Digital Signature

PART-B

Unit 4: Internet, Extranet and Electronic Data Exchange
4.1 Definition of Internet
4.2 Advantages and Disadvantages of the Internet
4.3 Component of Internet Information technology structure
4.4 Development of Intranet
4.5 Extranet and Intranet Difference
4.6 Role of Internet in B2B Application
4.7 Concepts of EDI and its Limitation
4.8 EDI model
4.9 Applications of EDI

Unit 5: Planning for E-Commerce and EPS
5.1 Introduction
5.2 Types of Electronic Payment System
5.3 Payment Types
5.4 Electronic Cash
5.5 Linking objectives to business strategies
5.6 Strategies for developing electronic commerce web sites
5.7: Case study on Flip Kart, Amazon and Wall Mart

Unit 6: Internet Marketing and E –Governance for India
6.1 Concept of online shopping
6.2 Internet business
6.3 Internet marketing techniques
6.4 The E-cycle of Internet marketing
6.5 Personalization e-commerce
6.6 Indian customer
6.7 Service center
6.8 Imports
6.9 Exports

Suggested Readings:

Note: Only latest editions of the books are recommended.

Web Links:
https://www.tutorialspoint.com/e_commerce
https://www.bestcourse4u.com › What is e-commerce
https://ecommerceguide.com/guides

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xlvii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:
For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:
Objective Type Questions: 30%
Short/Long Questions: 70%

Assessment Tools:
- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-308.1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-308.2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-308.3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-308.4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-308.5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-308.6</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-309: DATA VISUALIZATION WITH POWER BI

Periods/week Credits
L:2 T: 0 2
Max. Marks : 100
Duration of Examination: 3 Hrs
Continuous Evaluation: 30
End Semester Examination : 70

Pre-Requisite: NA
Course Type: Domain Elective

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

OMCA-DS-309.1 Identify when to use each Microsoft Power Platform component application to create business solution
OMCA-DS-309.2 Learn the value of using Microsoft Power Platform to create business solutions
OMCA-DS-309.3 Learn the components and features of Microsoft Power Platform

Part-A

UNIT 1: Introduction to Microsoft Power Platform
1.1 Microsoft Data verse Overview
1.2 Module Summary

UNIT 2: Introduction to Microsoft Data verse
2.1 Microsoft Power Platform Overview
2.2 Module Summary

UNIT 3: Get Started with Power Apps
3.1 Introduction to Power Apps
3.2 How to build a canvas app
3.3 How to build a model-driven app
3.4 Introduction to Power Apps portals

Part-B

UNIT 4: Get Started with Power Automate
4.1 Power Automate Overview
4.2 How to Build an Automated Solution

Unit 5: Get Started with Power BI
5.1 Power BI Overview
5.2 How to Build a Simple Dashboard

Unit 6: Introduction to Power Virtual Agents
6.1 Power Virtual Agents overview
6.2 How to build a Chabot
**Instructions for paper setting:** Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

**Evaluation Policy:**

The evaluation will include two types of assessments:

(xlix) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

- For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:
  - MCQs: 30%
  - Subjective (Short/Long): 40%
  - Discussion/Presentation: 15%
  - Projects/Group Activities etc: 15%

(I) For Summative assessment (End Semester Examination or End-Term Examination):

- Minimum: 70 percent. Categorization for the same is:
  - Objective Type Questions: 30%
  - Short/Long Questions: 70%

**Assessment Tools:**

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination
OMCA-DS-310: ADVANCED AI TOOLS

Periods/week: 4
Cred: 3
Max. Marks: 100

Duration of Examination: 3 Hrs

Pre-Requisite: NA
Course Type: Domain Elective

Learning Outcomes: At the end of the course, the learner will be able to:

OMCA-DS-310.1 Describe considerations for creating AI-enabled applications
OMCA-DS-310.2. Use the Text Analytics cognitive service to analyze text
OMCA-DS-310.3. Publishing and Using a Language Understanding App
OMCA-DS-310.4. Implementing a conversational Bot

PART-A

UNIT 1: Artificial Intelligence on Azure and Azure Cognitive services
1.1 Artificial Intelligence in Azure
1.2 Creation of AI-enabled applications
1.3 Azure services for AI application development
1.4 Azure Cognitive services
1.5 Monitor Cognitive Services
1.6 Cognitive Services Container

UNIT 2: Building Speech-Enabled applications using Natural Language Processing (NLP)
2.1 Basics of Natural Language Processing
2.2 Analyzing Text: using Text analytics cognitive service
2.3 Translating text: using Translator cognitive service to translate text
2.4 Recognize and synthesize speech: using Speech cognitive service
2.5 Translate speech: using Speech cognitive service

UNIT 3: Create Language Understanding Solutions
3.1 Create a language understanding application
3.2 Publishing and using a language understanding application
3.3 Use Language understanding with speech
3.4 Create OnA maker to create a knowledge base
3.5 Publish and use OnA knowledge base in an application

PART-B

UNIT 4: Conversational AI & Computer Vision
4.1 Basics of Bot Designing
4.2 Microsoft Bot Framework
4.3 Azure Bot Service
4.4 Designing conversational Bots
4.5 Computer Vision Service to Analyze Images
4.6 Video Analyzer to Analyze Videos

UNIT 5: Detecting, Analyzing, and Recognizing Faces
5.1 Custom Vision Service
5.2 Custom Image Classification
5.3 Object Detection Models
5.4 Detecting Faces with the Computer Vision Service
5.5 Face Service

UNIT 6: Knowledge Mining Solution
6.1 Reading text with the Computer Vision Service
6.2 Form Recognizer service
6.3 Intelligent Search Solution
6.4 Custom Skills for an Enrichment Pipeline
6.5 Knowledge Store

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(ii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

(iii) For Summative assessment (End Semester Examination or End-Term Examination):

- Minimum: 70 percent. Categorization for the same is:
  - Objective Type Questions: 30%
  - Short/Long Questions: 70%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination
MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

OMCA-DS-311: SECURITY ENGINEERING USING AZURE

Periods/week  Credits  Max. Marks: 100
L: 2     T: 2  Continuous Evaluation: 30
Duration of Examination: 3 Hrs  End Term Examination: 70

Pre-Requisite: Knowledge of basics of security
Course Type: Domain Elective

Course Outcomes: At the end of the course, the student will be able to:
OMCA-DS-311.2 Explain perimeter, network, host, and container security.
OMCA-DS-311.3 Describe Azure Key Vault, application security, storage security, and SQL database security.

PART-A

UNIT 1: Identity Management
1.1 Azure Active Directory
1.2 Azure Identity Protection (Risk Policies, Conditional Access and Access Reviews)
1.3 Azure AD Privileged Identity Management
1.4 Hybrid Identity
1.5 Role of Identity Providers

UNIT 2: Enterprise Governance Strategies
2.1 Role-Based Access Control
2.2 Azure Policy
2.3 Resource Locks
2.4 MFA, Conditional Access
2.5 Directory Synchronization
2.6 Azure AD infrastructure (Users, Groups, and Multi-Factor Authentication)
2.7 Azure AD Connect

UNIT 3: Platform Protection
3.1 Perimeter Security (Azure Firewall)
3.2 Network Security (Network Security Groups, Application Security Groups)
3.3 Host Security (endpoint protection, remote access management, update management, disk encryption)
3.4 Container Security (Azure Container Instances, Azure Container Registry, and Azure Kubernetes)
3.5 Host Security Strategies

PART-B

UNIT 4: Secure Data and Applications
4.1 Azure Key Vault
4.2 Managing Certificates, Keys & Secretes
4.3 Application Security
4.4 App Registration
UNIT 5: Securing Azure SQL Database
5.1 Shared Access Signatures
5.2 Blob Retention Policies
5.3 Azure Files Authentication
5.4 Data Authentication
5.5 Data Classification
5.6 Dynamic Data Masking
5.7 Always Encrypted Strategy

UNIT 6: Manage Security Operations
6.1 Azure Monitor including connected sources, log analytics, and alerts.
6.2 Azure Security Center including policies, recommendations, and just in time virtual machine access.
6.3 Implement Azure Sentinel including workbooks, incidents, and playbooks.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(iii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCQs</td>
<td>30%</td>
</tr>
<tr>
<td>Subjective (Short/Long)</td>
<td>40%</td>
</tr>
<tr>
<td>Discussion/Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Projects/Group Activities etc</td>
<td>15%</td>
</tr>
</tbody>
</table>

(liv) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Type Questions:</td>
<td>30%</td>
</tr>
<tr>
<td>Short/Long Questions:</td>
<td>70%</td>
</tr>
</tbody>
</table>

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
OMCA-DS-351: ADVANCE DATABASE SYSTEMS LAB

Periods/week Credits: P: 4 T:0 2
Max. Marks: 100
Duration of Examination: 3 Hrs
Continuous Evaluation: 30
End Semester Examination: 70

Co-Requisite: Knowledge of Database Management System
Course Type: Core

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

OMCA-DS-351.1 Implement advanced SQL Commands.
OMCA-DS-351.2 Apply clauses and different joins on multiple tables to develop the relationships.
OMCA-DS-351.3 Demonstrate the PL/SQL architecture, program structure, conditional, loop statements, procedures, functions and packages.
OMCA-DS-351.4 Experiment the concepts of triggers, cursor management and exception handling in PL/SQL
OMCA-DS-351.5 Develop a project for real time applications.

List of Experiments:
Every student is required to maintain Practical File and write the following steps in each practical:
1. Problem statement
2. Formula(s) used
3. Syntax
4. Queries
5. Program listing (print-out)
6. Input & Output.

Q1. Create tables Employee and Department

<table>
<thead>
<tr>
<th>Column_name</th>
<th>Data type</th>
<th>Size</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>EmpNo</td>
<td>Number</td>
<td>4</td>
<td>Primary Key</td>
</tr>
<tr>
<td>Empname</td>
<td>Varchar2</td>
<td>20</td>
<td>Not null</td>
</tr>
<tr>
<td>Address1</td>
<td>Varchar2</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Job</td>
<td>Varchar2</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Hiredate</td>
<td>Date</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salary</td>
<td>Number</td>
<td>9,2</td>
<td>Check &gt; 15000</td>
</tr>
<tr>
<td>Comm</td>
<td>Number</td>
<td>7,2</td>
<td></td>
</tr>
<tr>
<td>DeptNo</td>
<td>Number</td>
<td>2</td>
<td>Not null</td>
</tr>
</tbody>
</table>
Department:

<table>
<thead>
<tr>
<th>Column_name</th>
<th>Data type</th>
<th>Size</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>DeptNo</td>
<td>Number</td>
<td>2</td>
<td>Primary Key</td>
</tr>
<tr>
<td>Dname</td>
<td>Varchar2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Varchar2</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

2. Insert five records for each table.
3. List all information about all employees from employee table.
4. List all employee numbers along with their salary.
5. List department names and locations from the department table.
6. List the employees belonging to department 20.
7. List the names of analysts and salesman.
8. List the employee names not belonging to the department 10, 40.
9. List the employee names who are not eligible for commission.
10. List the employees whose names start with "S" not s.
11. List the names, salary and PF amount of all the employees (PF is calculated as 10% of salary).
12. List the employee names having "k" as the second character.
13. List the employee details in ascending order of salary.
14. List the maximum and minimum salary from the employee and rename with "Max_Sal" and "Min_Sal".
15. List the department number and the total salary payable in each department.
16. List the jobs and the number of employees in each job. The result should in descending order of the number of employees.
17. Write a PL/SQL block to calculate total salary of employee having employee number 100.
18. Write a PL/SQL code to find the greatest of three numbers.
19. Write a PL/SQL code to print the numbers from 1 to n.
20. Write a PL/SQL code to reverse a string using for loop.
21. Write a PL/SQL code to find the sum of n numbers.
22. Write a PL/SQL block to show the use of Elsif ladder.
23. Consider a PL/SQL code to display the empno, ename, job of employees of department number 10 (using cursor).
24. Consider a PL/SQL code to display the employee number & name of top five highest paid employees.
25. Consider a PL/SQL code to calculate the total salary of first n records of employee table. The value of n is passed to cursor as parameter using for loop.
26. Consider a PL/SQL procedure that accepts 2 numbers & return addition, subtraction, multiplication & division of two numbers using stored procedure and local Procedure.
27. Consider a PL/SQL code that accepts 2 numbers & return addition, subtraction, multiplication & division of two numbers using stored functions.
28. Consider a PL/SQL code that accepts 2 numbers & return addition, subtraction, multiplication & division of two numbers using local functions.

29. Make a mini project based on above mentioned list of practical. Suggested mini projects are:

a) Online Grievance Redressal System
Online Grievance Redressal System is a project which is created to bring transparency and flexibility in the administration system. This system is an online platform where people can share ideas, invoke discussion, issue complaints and create suggestion/petitions for the improvement of the city administration. This application is an automated process which is a user-friendly online interface for the citizens. All data related to the application would be saved in Oracle Database and can be viewed online.

b) Internet Content Filtering Tool
The Internet Content Filtering project will be developed using Oracle and any front end tool. The application has the same working principles of a proxy server. The project will have the aim to promote safer use of the Internet and new online technologies, particularly for children, and to fight against illegal content and content unwanted by the end-user.

c) Intelligent Business Process System
This project is a client server based administrative software utility to manager and automates various processes taking place in a business processing and outsourcing company mainly focused on data conversion. It consists of three software components, Server Manager, Client Assistant, QC Assistant. Each component can operate independently and can communicate with each other using TCP/IP Protocol. The three components of the IBPM operate accordingly to coordinate the various process-taking places in a BPO firm.

Suggested Readings:
5. C. J. Date & Longman, 2003, Introduction to Database Systems, Pearson Education

Note: Only latest editions of the books are recommended.

Software required/ Web links:
Oracle 9i or above versions (10g, 11i, 12c)
https://www.geeksforgeeks.org/dbms-concurrency-control-protocols-lock-based-protocol/
https://www.tutorialspoint.com/dbms/dbms_data_recovery.htm
https://www.w3schools.com/

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-351.1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-351.2</td>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-351.3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
<td></td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-351.4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-351.5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-352: .NET LAB

<table>
<thead>
<tr>
<th>Periods/week</th>
<th>Credits</th>
<th>Max. Marks</th>
<th>Continuous Evaluation</th>
<th>End Semester Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>P: 4 T: 0</td>
<td>2</td>
<td>100</td>
<td>30</td>
<td>70</td>
</tr>
</tbody>
</table>

Duration of Examination: 3 Hrs

Co-requisite: Knowledge of Object oriented programming approach

Course Type: Core

Course Outcomes: After completing this course, the student will be able to

OMCA-DS-352.1 Understand and explain the windows application programming concepts.
OMCA-DS-352.2 Identify the different tools and controls used in the programming.
OMCA-DS-352.3 Explore the concept of Objects and classes to be used in C#.
OMCA-DS-352.4 Learn advanced concepts like file handling and event handling in C#.
OMCA-DS-352.5 Demonstrate the basic concepts of database connectivity with visual studio .net.
OMCA-DS-352.6 Implement the object oriented concepts in C#.

1. Revision of Basic programming techniques using C#.

2. Implement the Concept to C# that inputs a positive integer n and then prints a triangle of asterix n times high and 2n-1 column wide. For example If input is 5 then the output would pyramid.

3. Implement the concept of bubble sort in C#.

4. Create two classes DF & DM distance in Cm & m. Implement the Concept to read the dimensions in one of these metrics & convert them to other & display the same.

5. Implement the concept of a class to represent a Bank Account comprising the given specifications & concept of member functions.

6. Implement the concept of file handling to read XML file and display all the values in a read only Form.

7. Concept of three variables: temp, pressure and water level for a chemical industry boiler from the keyboard. Throw an event called alert, if these variables level shoot above a certain level. [Event Handling]

8. Concept to illustrate overloading an indexer.

9. Implement the concept in C# consisting of a delegate called student that refers to a method called student record (), your program should get the details of student record and display. [Delegate]

10. Develop the Concept to create a class that does metric conversion from meters, centimeter to feet, inches respectively. Create a class called meters.txt and read the data from the user by prompting. Convert this data into feet and inches and save it in another file called feet.txt. [File Handling]

11. Prepare a login form, which will accept unique username, password of alphanumeric type, re-type password, date of birth, and text to remember password. And put all necessary validation. If user does not fill the complete
form it should show valid error message. Also if user is new then there should be option for creating new Login and a checkbox to remember on computer. [Windows application].

12. Prepare & develop the concept of with Menu Bar, Context Bar and Tool Bar.

13. Prepare a ASP.NET page to fill student details. Use any of the components available as deemed fit for the requirements. on the press of save button user should be able to save the form data in a mysql table .

14. Develop an ASP page to display the data of students entered in the previous form in tabular format using any of the grids .use Dataset to populate the grid.

15. Create a ASP.NET page to fill student details. Use any of the components available as deemed fit for the requirements. on the press of save button user should be able to save the form data in a mysql table .

16. Create an ASP page to display the data of students entered in the previous form in tabular format using any of the grids. Use Dataset to populate the grid.

17. Make a mini project based on above mentioned list of practical. Suggested mini projects are:
   a. Student Tracking System
   b. Mobile Wallet
   c. Toll Collection
   d. Asset Tracking System
   e. Feedback system

Suggested Reading:

2. Jack Purdum, 2007, Beginning C# 3.0 An introduction to object oriented programming, Wrox Publication
5. Imar Spaanjaars, 2010, Beginning ASP.NET 4.5 in C# and VB, Wrox Publications

Note: Only latest editions of the books are recommended.

Software required/ Web links:
Visual Studio 2010
Database Server: SQL Server 2008
https://docs.microsoft.com/en-us/dotnet/csharp/quick-starts/
https://www.tutorialspoint.com/csharp/

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-352.1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-352.2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-352.3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-352.4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-352.5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-352.6</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-354: BIG DATA ANALYTICS LAB

Periods/week Credits Max. Marks : 100
P: 2 1 Continuous Evaluation: 30
Duration of Examination: 3 Hrs End Semester Examination: 70

Co-requisite:
Course Type: Domain Specific Elective
Course Outcomes:
At the end of the course the student will be able:

OMCA-DS-354.1. To acquire fundamental enabling techniques and scalable algorithms such as NO SQL.
OMCA-DS-354.2. To analyze and integrate machine learning libraries, mathematical and statistical tools with modern technologies like mapreduce.
OMCA-DS-354.3. To solve problems associated with big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issue.
OMCA-DS-354.4. To implement machine learning techniques and computing environment that are suitable for the real time applications such as recommender system.

List of Practicals

1. Installation of VMWare to setup the Hadoop environment and its ecosystems.
2. Perform setting up and Installing Hadoop in its three operating modes. i. Standalone. ii. Pseudo distributed. iii. Fully distributed.
3. Prototype Designing
4. Simulation based implementation
5. Use web based tools to monitor your Hadoop setup.
6. Implementing the basic commands of LINUX Operating System – File/Directory creation, deletion, update operations.
7. Implement the following file management tasks in Hadoop:
   i. Adding files and directories
   ii. Retrieving files
   iii. Deleting files
   iv. Creating and destroying files
8. Write a Word Count Map Reduce program to understand Map Reduce Paradigm.
9. Optimization of Codes
10. Write a Map Reduce Program to analyse time-temperature statistics and generate report with max/min temperature.
11. Implement Matrix Multiplication with Hadoop Map Reduce
12. Download MongoDB and analyse its client and server working.
13. Create a database in MongoDB and apply CRUD operations.
15. Use Hive to create, alter, and drop databases, tables, views, functions, and indexes .
16. Download Apache Spark, python libraries, open source libraries and implement python programs in spark.
17. How MongoDB associated with other coding languages

**Suggested Readings:**

5. Mike Frampton, 2015, Mastering Apache Spark, PACKT Publishers

**Software required/weblinks:**

http://hadooptutorials.co.in/
https://www.ibm.com/analytics/hadoop/mapreduce
https://www.datacamp.com/community/tutorials/apache-spark-tutorial-machine-learning
http://hadooptutorial.info/category/hive/

**Assessment Tools:**

- Experiments in lab
- File work/Class Performance
- Viva (Question and answers in lab)
- End Term Practical Exam

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-354.1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-354.2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-354.3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>OMCA-DS-354.4</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
OMCA-DS-355: CLOUD COMPUTING LAB

Periods/week Credits Max. Marks: 100
P: 2 1 Continuous Evaluation: 30
Duration of Examination: 3 Hrs End Semester Examination: 70

Co-Requisite: Cloud Computing
Course Type: Domain Specific

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

OMCA-DS-355.1. Define Git and Docker cloud computing tools.
OMCA-DS-355.2. Understand cloud oriented AmazonEC2 services.
OMCA-DS-355.3. Extend the Microsoft azure services for mobile and desktop.
OMCA-DS-355.4. Determine the services of Hadoop and understand its features.
OMCA-DS-355.5. Apply the open source cloud using google app engine.

List of Experiments:
1. Create account on github.com and install gitbash on machine.
2. Install docker from docker-hub on the machine.
3. Create and configure virtual machines using VMware.
4. Create a virtual machine in Microsoft windows using AWS.
5. Connect EC2 Linux Instance Using PuTTY and run basic linux commands on it.
7. Create docker-image for simple program.
8. Manage virtual machines with Red Hat Network.
9. Create the containers and manage blobs in cloud environment using Microsoft Azure.
10. Create a spreadsheet using google drive.
11. Install Google App Engine. Create hello world app and other simple web applications using python/java.
12. Create and deploy an application using google app engine.
13. Create encryption and decryption script using Microsoft Azure Key Valut
14. Create backup script with Azure VMs.
15. Create recovery scripts using Azure VMs.
16. Deploy OpenStack Single Node with OpenStackCompute (Nova), OpenStak Identity (Keystone) and OpenStack Dashboard (Horizon).
17. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
18. Show the virtual machine migration based on the certain condition from one node to the other.
19. Find procedure to set up the one node Hadoop cluster.
20. Mount the one node Hadoop cluster using FUSE.
21. Write a program to use the API’s of Hadoop to interact with it.
22. Write a word count program to demonstrate the use of Map and Reduce task

**Case Studies:**

1. As Amazon.com grows larger, the sizes of their Oracle databases continue to grow, and so does the sheer number of databases they maintain. This has caused growing pains related to backing up legacy Oracle databases to tape and led to the consideration of alternate strategies including the use of Cloud services of Amazon Web Services (AWS), a subsidiary of Amazon.com, so maintain reliable backups and being fast and efficient when retrieving data. DBAs have to evaluate whether Amazon S3 backups would be viable for their database backups.

2. In Microsoft Azure, a server takes lot of time to upload a file, so create some function or macro to reduce the file uploading time on Azure.

3. Devevelop a Hadoop-based cloud computing application that pro-cesses sequences of microscope images of live cell.

4. Organize a case in Aneka / Eucalyptus for simulation entities in run-time using a its toolkit support and manage virtual cloud.

**Suggested Readings:**


**Note:** Only latest editions of the books are recommended.

**Web links:**

https://aws.amazon.com/what-is-cloud-computing/
http://www.manjrasoft.com/aneka_architecture.html/
http://uir.ulster.ac.uk/20675/3/ijacivol3no1.pdf/
https://www.techopedia.com/definition/25939/silo/
https://github.com/
https://hub.docker.com

**Assessment Tools:**

Assignments
Sessional tests
Surprise questions during labs/Lab Performance
End Semester examination

**COURSE ARTICULATION MATRIX:**
<table>
<thead>
<tr>
<th>Course Code</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PS01</th>
<th>PS02</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-355.1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-355.2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-355.3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-355.4</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-355.5</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>OMCA-DS-355.6</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**SEMESTER IV**
OMCA-DS-401: ADVANCE JAVA

Pre-Requisite: Knowledge of Core java
Course Type: Core

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

OMCA-DS-401.1. Define sophisticated and interactive user interfaces using the Java Swing class.
OMCA-DS-401.2. Understand about Java server Pages (JSP) technology.
OMCA-DS-401.3. Implement the server side programming using advanced java tools.
OMCA-DS-401.4. Evaluate the mapping of Java classes and objects associations to the relational database tables.

PART-A

UNIT 1: Java Database Connectivity (JDBC)
1.1 Overview of RDBMS
1.2 Introduction to Call Level Interface (CLI)
1.3 Introduction to JDBC
1.4 JDBC Architecture
1.5 Types of JDBC Drivers
1.6 Establishing a JDBC Connection
1.7 Managing Transactions in JDBC

UNIT 2: Extensible Markup Language (XML)
2.1 Extensible Markup Language (XML)
2.2 Document Object Model (DOM)
2.3 Understanding DOM
2.4 Using DOM in Java
2.5 StAX in Java
2.6 Understanding StAX
2.7 Programming with StAX

UNIT 3: Java Servlets
3.1 Introduction to CGI and Servlets
3.3 Lifecycle of a Servlets
3.4 JSDK servlet API
3.5 javax.servlet package
3.6 Reading servlet and initialization parameters
3.7 javax.servlet HTTP package,
3.9 Handling HttpRequest & Responses
3.10 Cookies-Session Tracking, Security Issues

PART-B

UNIT 4: Java Server Pages (JSP)
4.1 Introduction to JSP
4.2 Problem with Servlet
4.3 Anatomy of a JSP Page
4.5 JSP Processing.
4.6 JSP Application Design with MVC Setting Up
   JSP Environment: Installing the Java Software Development Kit
4.7 Tomcat Server & Testing Tomcat

UNIT 5: Enterprise Java Beans
5.1 Introduction to Enterprise Java Beans
5.2 EJB – Environment Setup.
5.3 EJB – Create Application
5.4 EJB – Stateless Bean
5.5 EJB – Stateful Bean
5.6 EJB – Persistence
5.7 EJB – Message Driven Beans
5.8 EJB – Exception Handling.
5.9 EJB – Web Services

UNIT 6: JSP Expression Language (EL)
6.1 Syntax
6.2 Implicit objects
6.3 Operators
6.4 Control Structures
6.5 Functions

Suggested Readings:
2. Uttam Roy, 2015, Advanced Java Programming, Oxford University Press
3. Murach, 2005, Murach's beginning JAVA JDK 5, SPD
5. Pekowsky, 2004, Java Server Pages, Pearson publication

Note: Only latest editions of the books are recommended.

Web links:
   https://www.tutorialspoint.com/jdbc
   https://www.javatpoint.com/java-jdbc
   https://www.w3schools.com/xml/
   https://www.javatpoint.com/servlet-tutorial
   https://www.tutorialspoint.com/jsp/jsp_expression_language.htm

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.
**Evaluation Policy:**

The evaluation will include two types of assessments:

(IV) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCQs</td>
<td>30%</td>
</tr>
<tr>
<td>Subjective (Short/Long)</td>
<td>40%</td>
</tr>
<tr>
<td>Discussion/Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Projects/Group Activities etc</td>
<td>15%</td>
</tr>
</tbody>
</table>

(IVi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Type Questions</td>
<td>30%</td>
</tr>
<tr>
<td>Short/Long Questions</td>
<td>70%</td>
</tr>
</tbody>
</table>

**Assessment Tools:**

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-401.1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-401.2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-401.3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-401.4</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-401.5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-402: SOFTWARE PROJECT MANAGEMENT

Periods/week Credits Max. Marks : 100
L: 3 T: 0 3 Continuous Evaluation : 30
Duration of Examination: 3 Hrs End Semester Examination : 70

Pre-Requisite: Knowledge of computer hardware, software and computer networks

Course Type: Core

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

OMCA-DS-402.1. Monitor & control software project development.
OMCA-DS-402.2. Perform quality audits of software projects.
OMCA-DS-402.3. Examine quality control and quality assurance aspect of software project.
OMCA-DS-402.4. Analyze the process to outsource the project and ensuring quality.
OMCA-DS-402.5. Create Gantt Chart and PERT chart.
OMCA-DS-402.6. Develop project plan and cost estimation.

PART- A

UNIT 1: Introduction to Software Project Management
1.1 Introduction to project management
1.2 Software projects versus other engineering projects
1.3 Software projects activities
1.4 Software projects management control
1.5 Software projects requirement specification
1.6 Software projects issues
1.7 Capability Maturity Model (CMM)

UNIT 2: Software Project Planning
2.1 Overview of software project planning
2.2 Software project selection
2.3 Identify software project scope and project infrastructure,
2.4 Analyze software project characteristics and efforts required
2.5 Software project activity risks

UNIT 3: Software Project Management
3.1 Software project management activities: proposal writing
3.2 Software project planning and scheduling
3.3 Software project costing, monitoring and reviews etc.
3.4 Software project management: project plan, milestones and deliverables
3.5 Software Project scheduling: Program Evaluation and Review Technique, GANTT chart
3.6 Risk management: Risk Identification and Risk Management

PART-B

UNIT 4: Selection of Appropriate Project Approach
4.1 Criteria of choice for process models
4.2 Waterfall, V-process, Spiral model, Prototyping, Incremental
4.3 Software effort estimation: Basis for estimates
4.4 Albrecht function point analysis
4.5 COCOMO cost estimation model
4.6 Procedural code-oriented approach

UNIT 5: Software Project Evaluation
5.1 Software project strategic assessment
5.2 Software project technical assessment
5.3 Software Quality Audits
5.4 Software Quality Assurance
5.5 Software project cost benefit analysis
5.6 Software project evaluation techniques

UNIT 6: Software Projects Future Trends
6.1 Future of software project management
6.2 Project profile of current software
6.3 Next generation software economics
6.4 Modern process transitions
6.5 Issues in Android Software Development

Suggested Readings:

Note: Only latest editions of the books are recommended.

Web links:
http://www.opensourcetesting.org/
http://www.onestoptesting.com/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(lvii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

(lviii) For Summative assessment (End Semester Examination or End-Term Examination): Minimum: 70 percent. Categorization for the same is:
Objective Type Questions: 30%
Short/Long Questions: 70%

**Assessment Tools:**
- Assignment / Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

**COURSE ARTICULATION MATRIX:**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-402.1</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-402.2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-402.3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-402.4</td>
<td>1</td>
<td></td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-402.5</td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-402.6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-451: ADVANCE JAVA LAB

Periods/week Credits
P: 4  T: 0  2
Max. Marks : 100
Duration of Examination: 3 Hrs
Continuous Evaluation : 30
End Semester Examination: 70

Co-Requisite: Basic of Core java
Course Type: Core

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

OMCA-DS-451.1 Create basic data-driven programs using Java database connectivity.
OMCA-DS-451.2 Create functional web pages using Servlets / JSP
OMCA-DS-451.3 Apply JSP Customs tags and use them in JSP pages
OMCA-DS-451.4 Create Multi-Tier web application using EJB Architecture.
OMCA-DS-451.5 Develop a fully functional Web Application to solve a particular business problem.

List of Experiments:

2. Write the code to insert three records into student table using PreparedStatement (assume student table with user id and user name).
3. Write a JAVA servlet program to implement a dynamic HTML using Servlet (user name and password should be accepted using HTML and displayed using a servlet).
4. Write a JAVA Servlet program to implement and demonstrate get() and post() methods (using HTTP Servlet class)
5. Write a JAVA servlet program using cookies to remember user preferences.
6. Write a program to perform state management using HttpSession using servlet.
7. Write a program to set the cookie information using servlet.
8. Write a program to maintain session for user using jsp.
9. Write a program for hotel booking using jsp.
10. Write a program to use different java operator using expression language function in jsp.
11. Write a hibernate example to insert a record of students into database.
12. Develop a small web program using Servlets, JSPs with Database connectivity.
13. An EJB application that demonstrates Session Bean
15. An EJB application that demonstrates MDB.
16. Create Web Service client which consume above service and display student data by entering student id.
17. Implement Authentication filter using filter API
18. Create Servlet file and study web descriptor file
19. Study and implement Hibernate
20. Write RMI application where client supplies two numbers and server response by summing it. Provide your custom security policy for this application
21. Implement any one sorting algorithm using TCP/UDP on Server application and Give Input On Client side and client should sorted output from server and display sorted on input side.
22. Implement TCP Server for transferring files using Socket and Server Socket
23. Make a mini project based on above mentioned list of practical. Suggested mini projects are:

   a) New Patient Registry Management System
   b) Port Scanner Project in Java
   c) Distance Calculator using Google API
   d) IP address Changer Projects in Java
   e) Medical Store Billing Management System

Suggested Readings:
2. Hans Bergstan, 2003, Java Server Pages
3. Murach, 2005, Murach’s beginning JAVA JDK 5, SPD

Note: Only latest editions of the books are recommended.

Software required/Web links:
Java SDK or JRE 1.6 or higher
Java Servlet Container (Free Servlet Container available)

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-451.1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-451.2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-451.3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-451.4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-451.5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OMCA-DS-403: DATA MINING AND WAREHOUSING

Periods/week Credits Max. Marks: 100
L: 2 T: 0 2 Continuous Evaluation: 30
Duration of Examination: 3 Hrs End Semester Examination: 70

Pre-requisite: Knowledge of Data Base Management System
Course Type: Core
Course Objectives: At the end of the course, the student will be able to:

OMCA-DS-403.1. Define the fundamental concepts of Data Warehouse.
OMCA-DS-403.2. Describe the difference between data base management system, data mining and data warehouse.
OMCA-DS-403.3. Demonstrate the architecture of a Data Warehouse
OMCA-DS-403.4. Apply data mining techniques on different kinds of data.
OMCA-DS-403.5. Compare various data mining techniques and their applications.

PART-A

Unit 1: Introduction to Data Warehousing
1.1 Evolution of data warehousing
1.2 Difference between data warehousing and data warehouse
1.3 Data Warehousing characteristics
1.4 Benefits of data warehousing
1.5 Comparison of OLTP and OLAP
1.6 Problems of data warehousing

Unit 2: Data Model
2.1 Data Mart
2.2 Data Cube
2.3 Multidimensional Data Model
2.4 Characteristics of OLAP System
2.5 OLAP operations on MDDM
2.5 Schemas for data model: Star, Snowflake and Fact constellation
2.6 Conversion of schemas using DMQL

Unit 3: Data Warehousing Architecture
3.1 Data Warehouse components
3.2 Three-Tier Data Warehouse architecture
3.3 Types of OLAP Servers
3.4 ROLAP versus MOLAP versus HOLAP
3.5 Distributed and Virtual data warehouse

PART-B

Unit 4: Introduction to Data Mining
4.1 Basic concepts of data mining
4.2 Data mining steps, data mining functionalities
4.3 Architectures of data mining
4.4 Knowledge Discovery in Data mining versus data mining
4.5 Applications of data mining
4.6 Classification of Data Mining Systems
4.7 Data Mining primitives
4.8 Data preprocessing
4.9 Integration of Data Mining System with a Data Warehouse

Unit 5: Data Mining Techniques
5.1 Support and confidence
5.2 Frequent Item set Mining methods
5.3 Multi-Level Association Rules
5.4 Multi-Dimensional Association Rules: Apriori algorithm
5.5 Correlation analysis

Unit 6: Classification and Cluster Analysis
6.1 Difference between Classification and Prediction
6.2 Decision Tree Induction
6.3 Bayesian Classification
6.4 Prediction techniques
6.5 Cluster Analysis
6.6 Categorization of Clustering Methods
6.7 Partitioning Methods
6.8 Hierarchical Methods
6.9 Data Mining Applications

Suggested Readings:
1. Jawei Han & Micheline Kamber, 2006, Data Mining- Concepts & Techniques, Morgan Kaufmann
3. Pudi Vikram, 2009, Data Mining, Oxford University Press
4. Thareja Reema, 2009, Data Warehousing, Oxford University Press

Note: Only latest editions of the books are recommended.

Softwares required:

- Weka
- Tanagra

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:
Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

- Objective Type Questions: 30%
- Short/Long Questions: 70%

Assessment Tools:
- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-403.1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-403.2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-403.3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-403.4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>OMCA-DS-403.5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
OMCA-DS-404: DESIGNING & IMPLEMENTING A DATA SCIENCE SOLUTION

<table>
<thead>
<tr>
<th>Periods/week</th>
<th>Credits</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>L: 2</td>
<td>T: 2</td>
<td>100</td>
</tr>
<tr>
<td>Duration of Examination: 3 Hrs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous Evaluation: 30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End Semester Examination: 70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Course Type: Domain Elective**

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

OMCA-DS-404.1. Use tools and code to work with Azure Machine Learning
OMCA-DS-404.2. Train and register machine learning models
OMCA-DS-404.3. Create and use data stores
OMCA-DS-404.4. Publish and run pipeline services.
OMCA-DS-404.5. Optimize hyper parameters for model training
OMCA-DS-404.6. Apply differential privacy to data analysis

**PART-A**

**Unit 1: Azure Machine Learning workspace**
1.1 Create an Azure Machine Learning workspace
1.2 Configure workspace settings
1.3 Manage a workspace by using Azure Machine Learning studio
1.4 Select Azure storage resources
1.5 Register and maintain datastores
1.6 Create and manage datasets

**Unit 2: Manage compute for experiments in Azure Machine Learning**
2.1 Determine the appropriate compute specifications for a training workload
2.2 Create compute targets for experiments and training
2.3 Configure Attached Compute resources including Azure Databricks
2.4 Monitor compute utilization
2.5 Determine access requirements and map requirements to built-in roles
2.6 Create custom roles
2.7 Manage role membership
2.8 Manage credentials by using Azure Key Vault
2.9 Create compute instances
2.10 Share compute instances
2.11 Access Azure Machine Learning workspaces from other development environments
2.12 Create an Azure Databricks workspace and cluster
2.13 Create and run notebooks in Azure Databricks
2.14 Link and Azure Databricks workspace to an Azure Machine Learning workspace

**Unit 3: Create models by using the Azure Machine Learning designer**
3.1 Create a training pipeline by using Azure Machine Learning designer
3.2 Ingest data in a designer pipeline
3.3 Use designer modules to define a pipeline data flow
3.4 Use custom code modules in designer
3.5 Create and run an experiment by using the Azure Machine Learning SDK
3.6 Configure run settings for a script
3.7 Consume data from a dataset in an experiment by using the Azure Machine Learning SDK
3.8 Run a training script on Azure Databricks compute
3.9 Log metrics from an experiment run
3.10 Retrieve and view experiment outputs
3.11 Logs to troubleshoot experiment run errors
3.12 MLflow to track experiments
3.13 Track experiments running in Azure Databricks
3.14 Use Automated Machine Learning to create optimal models
3.15 Tune hyperparameters with Azure Machine Learning

PART-B

Unit 4: Deploy machine learning solutions
4.1 Select compute for model deployment
4.2 Deploy a model as a service
4.3 Manage models in Azure Machine Learning
4.4 Create an Azure Machine Learning pipeline for batch inferencing
4.5 Publish an Azure Machine Learning designer pipeline as a web service

Unit 5: Operationalize machine learning solutions
5.1 Implement pipelines by using the Azure Machine Learning SDK
5.2 Apply ML Ops practices
5.3 Trigger an Azure Machine Learning pipeline from Azure DevOps
5.4 Automate model retraining based on new data additions or data changes
5.5 Refactor notebooks into scripts
5.6 Implement source control for scripts

Unit 6: Implement responsible machine learning
6.1 Use model explainers to interpret models
6.2 Describe fairness considerations for models
6.3 Describe privacy considerations for data

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(i) Continuous or formative assessments (in the form of end semester examination or term examination.

   Weightage of assessments are as follows:
For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs: 30%
- Subjective (Short/Long): 40%
- Discussion/Presentation: 15%
- Projects/Group Activities etc: 15%

For Summative assessment (End Semester Examination or End-Term Examination):

- Minimum: 70 percent. Categorization for the same is:
  - Objective Type Questions: 30%
  - Short/Long Questions: 70%

**Assessment Tools:**
- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination
OMCA-DS-405: MACHINE LEARNING TECHNOLOGIES

Periods/week  Credits  Max. Marks : 100
L: 2        T: 2          Continuous Evaluation : 30
Duration of Examination: 3 Hrs  End Semester Examination: 70

Course Type: Domain Elective

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

OMCA-DS-405.1. Use tools and code to work with Azure Machine Learning
OMCA-DS-405.2. Train and register machine learning models
OMCA-DS-405.3. Create and use data stores
OMCA-DS-405.4. Publish and run pipeline services.
OMCA-DS-405.5. Optimize hyper parameters for model training
OMCA-DS-405.6. Apply differential privacy to data analysis

PART-A

Unit 1: Azure Machine Learning and Visual tools
1.1 Introduction to Azure Machine Learning
1.2 Working with Azure Machine Learning
1.3 Automated Machine Learning
1.4 Azure Machine Learning Designer

Unit 2: Running Experiments, Training Models & working with Data
2.1 Introduction to Experiments
2.2 Training and Registering Models
2.3 Working with Data stores
2.4 Working with Datasets

Unit 3: Working with Compute and Pipelines
3.1 Working with Environments
3.2 Working with Compute Targets
3.3 Introduction to Pipelines
3.4 Publishing and Running Pipelines

PART-B

Unit 4: Deploying and Consuming Models
4.1 Real-time Inferencing
4.2 Batch Inferencing
4.3 Continuous Integration and Delivery

Unit 5: Training Optimal Models and responsible Machine Learning
5.1 Hyper parameter Tuning
5.2 Automated Machine Learning
5.3 Differential Privacy
5.4 Model Interpretability
5.5 Fairness

**Unit 6: Monitoring Models**
6.1 Monitoring Models with Application Insights
6.2 Monitoring Data Drift

**Instructions for paper setting:** Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

**Evaluation Policy:**

The evaluation will include two types of assessments:

(lxiii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

- For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:
  - MCQs: 30%
  - Subjective (Short/Long): 40%
  - Discussion/Presentation: 15%
  - Projects/Group Activities etc: 15%

(lxiv) For Summative assessment (End Semester Examination or End-Term Examination):
  - Objective Type Questions: 30%
  - Short/Long Questions: 70%

**Assessment Tools:**

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination
OMCA-DS-406: MITIGATING SECURITY THREATS

Pre-Requisite: NA
Course Type: Domain Elective

Course Outcomes: At the end of the course, students will be able to
OMCA-DS-406.1 Describe the investigation and remediation features of Azure Active Directory Identity Protection
OMCA-DS-406.2 Describe Threat and Vulnerability Management in Microsoft Defender for Endpoint
OMCA-DS-406.3 Explain how Microsoft Defender for Cloud protections function
OMCA-DS-406.4 Utilize threat intelligence in Microsoft Sentinel
OMCA-DS-406.5 Visualize security data
OMCA-DS-406.6 Explore API libraries for advanced threat hunting

PART A

UNIT 1: Mitigate threats using Defender
1.1 Introduction to threat protection
1.2 Mitigate incidents using Defender
1.3 Remediate risks with Defender
1.4 Defender for Identity
1.5 Protect your identities with Azure AD Identity Protection
1.6 Defender for Cloud Apps
1.7 Respond to data loss prevention alerts
1.8 Manage insider risk

UNIT 2: Mitigate threats using Defender for Endpoint
2.1 Protect against threats with Defender for Endpoint
2.2 Deploy the Defender for Endpoint environment
2.3 Implement Windows security enhancements
2.4 Perform device investigations
2.5 Perform actions on a device
2.6 Perform evidence and entities investigations
2.7 Configure and manage automation
2.8 Configure for alerts and detections
2.9 Utilize Threat and Vulnerability Management

UNIT 3: Mitigate threats using Defender for Cloud
3.1 Plan for cloud workload protections using Microsoft Defender for Cloud
3.2 Workload protections in Microsoft Defender for Cloud
3.3 Connect Azure assets to Microsoft Defender for Cloud
3.4 Connect non-Azure resources to Microsoft Defender for Cloud
3.5 Remediate security alerts using Microsoft Defender for Cloud

PART B
UNIT 4: Create queries for Microsoft Sentinel using Kusto Query Language (KQL) & Configure your Microsoft Sentinel environment
4.1 Construct KQL statements for Sentinel
4.2 Analyze query results using KQL
4.3 Build multi-table statements using KQL
4.4 Work with string data using KQL statements
4.5 Introduction to Sentinel
4.6 Create and manage Sentinel workspaces
4.7 Query logs in Sentinel
4.8 Use watchlists in Microsoft Sentinel
4.9 Utilize threat intelligence in Microsoft Sentinel

UNIT 5: Connect logs to Sentinel & Create detections and perform investigations using Sentinel
5.1 Connect data to Sentinel using data connectors
5.2 Connect Microsoft services to Microsoft Sentinel
5.3 Connect Microsoft 365 Defender to Microsoft Sentinel
5.4 Connect Windows hosts to Microsoft Sentinel
5.5 Connect Common Event Format logs to Sentinel
5.6 Connect syslog data sources to Sentinel
5.7 Connect threat indicators to Sentinel
5.8 Threat detection with Sentinel analytics
5.9 Security incident management in Sentinel
5.10 Threat response with Microsoft Sentinel playbooks
5.11 User and entity behavior analytics in Sentinel
5.12 Query, visualize, and monitor data in Sentinel

UNIT 6: Perform threat hunting in Sentinel
6.1 Threat hunting concepts in Sentinel
6.2 Threat hunting with Sentinel
6.3 Hunt for threats using notebooks in Sentinel

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Evaluation Policy:
The evaluation will include two types of assessments:

(lxvi) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs 30%
Subjective (Short/Long) 40%
Discussion/Presentation 15%
Projects/Group Activities etc 15%

(lxvi) For Summative assessment (End Semester Examination or End-Term Examination):


Minimum: 70 percent. Categorization for the same is:

Objective Type Questions: 30%
Short/Long Questions: 70%
Course Outcomes: At the end of the course, students will be able to

1. Describe the Systems Development Life Cycle (SDLC).
2. Construct and evaluate data flow diagrams.
3. Design and evaluate system outputs
4. Construct and evaluate entity-relationship (ER) diagrams for real projects
5. Determine the various test cases and analyze the results.
6. Develop soft-skills including writing formal reports and delivering oral presentations.

Note: Project guidelines are enclosed in Annexure-A

The evaluation of the industrial training shall be made as per following:

Continuous Evaluation during training:

1. Project Report : 40 marks
2. Seminar cum Presentation : 40 marks
3. Viva : 20 marks

Total Internal marks : 100
Annexure-A:

1. Guidelines for submission of Project

All the candidates of MCA Final year are required to submit a project report based on the work done by him/her during the project period based on any programming language. Presentation / viva will be based on the project work carried during the semester. The Project topics should be based on syllabus or beyond.

The project is evaluated on the basis of following heads:

1. Presentation
2. Viva
3. Project report
4. Software Coding
5. Documentation
6. Testing

2. Project Report Preparation Guidelines

Project report should consist the following:

I. Cover page as per the format (Annexure 1)
II. Declaration by the Student (Annexure 2)
III. Certificate from Department (Annexure 3)
IV. Acknowledgement
V. Index (Table of Contents in tabular form)
VI. Introduction
   (a) About Organization
   (b) Aims & Objectives
   (c) Manpower

VII. System Study

   a) Existing System along with limitations
   b) Proposed System along with advantages
VIII. Feasibility Study
   a) Technical
   b) Behavioural
   c) Economic

IX. Project Monitoring System
   a) Gantt Chart

X. System Analysis
   a) Requirement Specification
   b) System Flowcharts
   c) DFDs /ERDs (up to Level 2)

XI. System Design
   a) File/ Data Design

XII. Input / Output Form Design
   a) Screen Design (Screenshots of all screens In Color)
   b) Report Design

XIII. System Testing
   a) Preparation of Test Data
   b) Testing With Live Data
   c) Test Cases with results

XIV. System Implementation
   a) System Requirements (Hardware/Software)

XV. Documentation

XVI. Scope of the Project

XVII. Bibliography

3. Project Report Submission Guidelines
a) Make 2 copies of the project.

b) Submit one original hard and one original soft copy of the project report to concerned guide.

c) A photocopy of the complete Project should be retained by the student for future reference.

d) Cover page should be properly formatted. (See Annexure 1)

e) The project report must be about 80-100 pages.

f) Source code or pseudo code should not be included in the project report.

g) Student will be giving a presentation of about 5-10 minutes, highlighting the project objective, summary
and report and findings of the project at the time of viva.

h) Project completed in all aspects with necessary enclosures should be submitted to the concerned Guide in
specified time period.

i) The dimension of the project report should be in A4 size.

j) The project report should be bound using flexible cover of the thick plastic paper (Spiral Binding).

k) Report should use Font Arial/ Times New Roman; Font Size: 14 (For Headings Bold) and 12 (For
Paragraphs). Document can have maximum of 1.5 lines spacing.

l) Project completed in all aspects with necessary enclosures should be submitted to the concerned Guide.

m) Violation of the project guidelines will lead to the rejection of the project at any stage.

n) A photocopy of the project report is not acceptable for submission.

**COURSE ARTICULATION MATRIX**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCA-DS-653.1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCA-DS-653.2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCA-DS-653.3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCA-DS-653.4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCA-DS-653.5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCA-DS-653.6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Project guidelines are enclosed in Annexure I**
MASTER OF COMPUTER APPLICATIONS
(MCA)

PROJECT GUIDELINES
w.e.f
(2018)

Centre for Distance and Online Education
MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

Sector 43, Faridabad

Guidelines for submission of MCA Major Project
All the candidates of MCA final project are required to submit a project report based on the work done by him/her during the project period.

**Project Time**
The MCA Major Projects would be approximately 20-22 weeks and carries a total of 900 marks (300 Internals & 600 Externals). The Project topics should be based on syllabus or beyond.

**Note:**
If the company/organization in which the student has done his project is not allowing the student to submit the code to the University then the company/organization has to send a confidential report, clearly indicating the percentage of marks obtained by the student for his software project. To proceed with the project work, it is important to select a right topic and right organization, where you will get required information for the successful completion of the project work.

If on the basis of viva if the examiner feels that the project work has not actually being done by the student then he/she can allot zero marks for software coding.

1. **Synopsis Preparation Guidelines:**
Synopsis should be submitted within a week’s time, after finalization of the topic. Synopsis, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up must adhere to the guidelines and should include the following (not necessarily in order as given below).

   a) Name / Title of the Project Statement about the Problem
   b) Why is the particular topic chosen?
   c) Objective and scope of the project
   d) Methodology (including a summary of the project)
   e) Hardware & Software to be used
   f) Testing Technologies used.
   g) What contribution would the project make?
   h) Details of both internal and external guides.

I. **Topic of the Project**
This should be explicitly mentioned at the beginning of the Synopsis. Since the topic itself gives a peep into the project to be taken up, candidate is advised to be prudent on naming the project. This being the overall impression on the future work, the topic should corroborate the work.

II. **Objective and Scope**
This should give a clear picture of the project. Objective should be clearly specified. What the project ends up to and in what way this is going to help the end user has been mentioned.

III. **Process Description**

The process of the whole software system proposed, to be developed, should be mentioned in brief. This may be supported by DFD’s / Flowcharts to explain the flow of the information.

IV. **Resources and Limitations**

The requirement of the resources for designing and developing the proposed system must be given. The resources might be in form of the hardware / software or the data from the industry. The limitations of the proposed system in respect of a larger and comprehensive system must be given.

V. **Conclusion**

The write-up must end with the concluding remarks-briefly describing innovations in the approach for implementing the project, main achievements and also any other important feature that makes the system stands out from the rest.

**Communication of Approval of Synopsis**

After allocation of the project from the organization and go-ahead from the internal guide students should send the synopsis and 1-2 page write up of the organization to the Internal Guide or TPO in soft/hard copy. Incomplete Synopsis in any respect will be straightway rejected. An E-Mail regarding the approval / non approval of the project synopsis will be sent to the candidate within weeks of the receipt of the synopsis. In case of non-approval, the suggestions for reformulating the project will be communicated. Revised Project Synopsis Performa should be resubmitted along with a copy of the earlier synopsis and comments of the guide.

**Page Specification:**

- Left Margin: 3.0 cms
- Right Margin: 3.0 cms
- Top Margin: 2.7 cms
- Bottom Margin: 2.7 cms

Page numbers - All text pages as well as program source code listing should be numbered at the bottom centre of the pages.

**Fonts:**

- **Headings**: Times New Roman 14 Bold
- **Sub Headings**: Times New Roman 12 Bold
**Document Format:**

The document should be sent in doc format.

**2. Schedule:**

- Submission of Proof of Training -- TBA
- Submission of complete synopsis -- TBA
- Review of Design Document (High Level) -- TBA
- Review of Design Document (Low Level) -- TBA
- Review of Project Report (Soft Copy) -- TBA
- Project Report submission (Soft Binding) -- TBA
- Final Project Assessment & Viva (Internal) -- TBA
- Final Report Submission & Viva (External) -- TBA

**3. Project Report Preparation Guidelines:**

Project report should consist the following:

I. Cover page as per the format
II. Declaration by the Student (Annexure 3)
III. Certificate from Department (Annexure 2)
   - Extreme Left (Candidate’s Sign.)
   - Extreme Right (Project Supervisor)
   - Right Bottom: Head of Department.
IV. Certificate from Organization (Annexure 2)
V. Acknowledgement
   - Properly signed (right side)
   - Date on Left
VI. Index (Table of Contents in tabular form)
VII. Introduction
   - About Organization
   - Aims & Objectives
   - Manpower
VIII. System Study
   - Existing System along with limitations/ deficiencies
• Proposed System along with intended objectives

IX. Feasibility Study
• Technical
• Economic, etc.

X. Project Monitoring System
• Gantt Chart

XI. System Analysis
• Requirement Specification
• System Flowcharts
• DFDs/HIPOs/ERDs (up to Level 2)

XII. System Design
• File/ Data Design

XIII. Data Dictionary
This should give a catalogue of the data elements used in the system / sub system developed. The following are the details required. Write NA if NOT applicable:
  a. Data Name
  b. Aliases if any
  c. Length ( size )
  d. Type, Numeric, Alpha, Binary etc.
  e. Program Specifications

XIV. Input / Output Form Design
• Screen Design (Screenshots of all screens In Color)
• Report Design

XV. System Testing
• Preparation of Test Data
• Testing With Live Data
• Test Cases with results (Minimum 100 test cases of different modules)

XVI. System Implementation
• Installation Instructions
• System Requirements (Hardware/Software)

XVII. Documentation
• User Manual
• Miscellaneous

XVIII. Scope of the Project
• Deficiencies
• Further Scope
Project Report Submission Guidelines:

1. Make 2 copies of the project.
2. Submit two original hard and original soft copy of the project report before exam.
3. Bring one original hard and original soft copy of the project for the exam, on exam date for viva and presentation.
4. Cover page should be properly formatted. (See Annexure 1)
5. You can make a third copy for your own record.
6. The full content of the report must be hard bound together so that the pages cannot be removed or replaced.
7. The project report must be about 100-150 pages
8. One of the copies should contain all the original certificates related to the training.
9. Other copy should have colored copies of the certificates.
10. Rest of the contents should be same.
11. Screenshots of all the forms should be printed in color.
12. Project report should contain at least 100 test cases of different modules.
13. Source code or pseudo code should not be included in the project report
14. The diagrams attached (DFD’s and Flow charts) should be neat clean and clearly visible.
15. Student will be giving a presentation of about 5 Mins, highlighting the project objective, summary and report and findings of the project.
16. Text pages should be printed on one side of the paper, preferably with 1.5 spacing, and page numbers at the bottom of the each page. Margins should be 2” on the left and 1” on the right.
17. The project work must be undertaken in a company and it should be original in nature.
18. The project work should be designed in such a way that, it would be useful to the organization.
19. Do submit your project in specified time period.
20. Fonts:

<table>
<thead>
<tr>
<th>Type</th>
<th>Font Style</th>
<th>Size</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headings</td>
<td>Times New Roman</td>
<td>14</td>
<td>Bold</td>
</tr>
<tr>
<td>Sub Headings</td>
<td>Times New Roman</td>
<td>12</td>
<td>Bold</td>
</tr>
<tr>
<td>Paragraph Text</td>
<td>Times New Roman</td>
<td>12</td>
<td>Normal</td>
</tr>
</tbody>
</table>

Annexure 1

Title of the Project
(Organization: For Whom Developed)

Submitted to:
Certificate from the Guide

This is to certify that the project report entitled “______________________________” submitted in partial fulfillment of the degree of MASTER OF COMPUTER APPLICATIONS (MCA) to MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES, Faridabad is an
authentic and original work carried out by Mr. / Ms.______________________________

with Roll no. _______________________ under my guidance.

The matter embodied in this project is genuine work done by the student and has not been submitted whether to this University or to any other University / Institute for the fulfillment of the requirements of any course of study.

Signature of the Student:  
Date:  
Name and Address of the student

Signature of the Guide  
Date:  
Name, Designation and Address of the Guide:

(Director)
Annexure 3

Declaration

I do hereby declare that this project work entitled “______________________________” submitted by me for the partial fulfillment of the requirement for the award of MASTER OF COMPUTER APPLICATIONS (MCA) is a record of my own work. The report embodies the finding based on my study and observation and has not been submitted earlier for the award of any degree or diploma to any Institute or University.

Date:       Name:
   Roll No:
Appendix-A

List of courses having relevance to the Local/Regional, National and Global Development needs.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Regional</th>
<th>National</th>
<th>Global</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMCA-DS-101</td>
<td>Linear Algebra and Statistical Techniques</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-102</td>
<td>Data Structures</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-104</td>
<td>Object Oriented Programming in Java</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-152</td>
<td>Data Structures Lab</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-153</td>
<td>Object Oriented Programming in Java Lab</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-156</td>
<td>Python Programming Lab</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-104</td>
<td>Computer Graphics</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-105</td>
<td>Web Applications Development using PHP</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-154</td>
<td>Computer Graphics Lab</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-155</td>
<td>Web Applications Development using PHP Lab</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-201</td>
<td>Data Communications</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-202</td>
<td>Analysis &amp; Design of Algorithm</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-203</td>
<td>Artificial Intelligence</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-260</td>
<td>Android Application Development Lab</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-261</td>
<td>R Programming Lab</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-262</td>
<td>Vocational Training/Capstone Project</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-204</td>
<td>Cyber Security</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-205</td>
<td>Mobile Computing</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-206</td>
<td>System Programming</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-207</td>
<td>Data Fundamentals in Azure</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-208</td>
<td>Artificial Intelligence using Azure</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>OMCA-DS-209</td>
<td>Security Fundamentals in Azure</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Offered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>---------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-301</td>
<td>Advance Database Systems</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-302</td>
<td>Programming in .NET</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-303</td>
<td>Software Engineering &amp; Testing</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-351</td>
<td>Advance Database Systems Lab</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-352</td>
<td>.NET Lab</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-304</td>
<td>Big Data Analytics</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-305</td>
<td>Cloud Computing</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-354</td>
<td>Big Data Analytics Lab</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-355</td>
<td>Cloud Computing Lab</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-306</td>
<td>Network Security and Cryptography</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-307</td>
<td>Database Administration</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-308</td>
<td>E-Commerce Technologies</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-309</td>
<td>Data Visualization with Power BI</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-310</td>
<td>Advanced AI Tools</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-311</td>
<td>Security Engineering using Azure</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-401</td>
<td>Advance Java</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-402</td>
<td>Software Project Management</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-403</td>
<td>Data Mining &amp; Warehousing</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-404</td>
<td>Designing and Implementing a Data Science Solution</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-405</td>
<td>Machine Learning Technologies</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-406</td>
<td>Mitigating Security Threats</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMCA-DS-457</td>
<td>Project</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Name</td>
<td>Employability</td>
<td>Entrepreneurship</td>
<td>Skill development</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------------------</td>
<td>---------------</td>
<td>------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>MCA-DS-352</td>
<td>Data Structures Lab</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>MCA-DS-353</td>
<td>Object oriented programming in Java Lab</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>MCA-DS-357</td>
<td>Python Programming Lab</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>MCA-DS-355</td>
<td>Web Applications Development using PHP Lab</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>MCA-DS-451</td>
<td>Android Application Development Lab</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>MCA-DS-452</td>
<td>R Programming Lab</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>MCA-ID-001</td>
<td>Employability Skills Enhancement</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCA-DS-553</td>
<td>.NET Lab</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>MCA-DS-651</td>
<td>Advance Java Lab</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>MCA-DS-653</td>
<td>Major Project</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>MCA-DS-652</td>
<td>Project</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>
### Appendix C: List of courses and proposed activities relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability

<table>
<thead>
<tr>
<th>Activity on Gender Sensitization</th>
<th>Environment and Sustainability</th>
<th>Professional Ethics</th>
<th>Human Values</th>
<th>Gender Equality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop on Ethical Hacking</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>