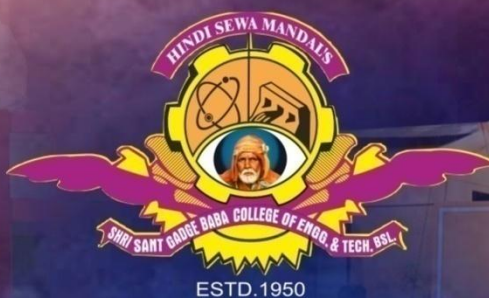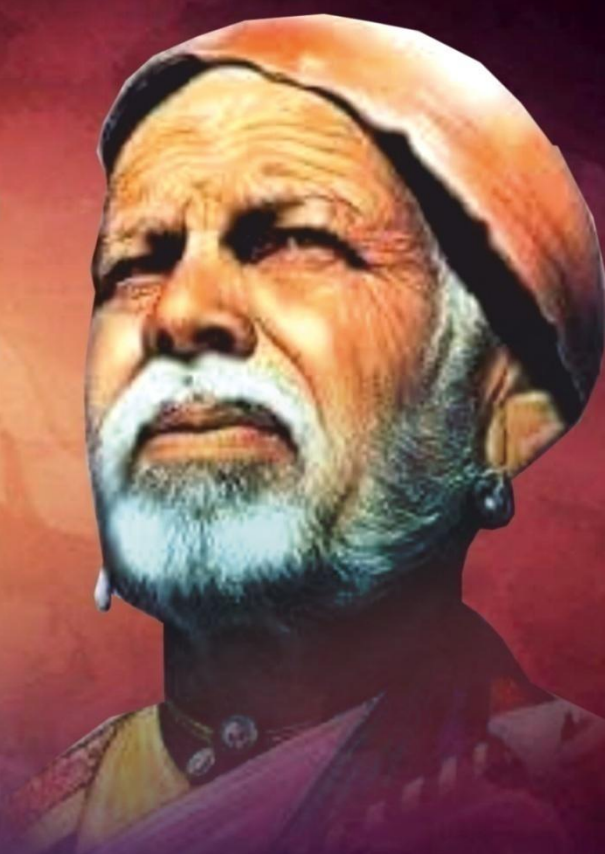"
Great saintly reformist who strived
for the material as well as
spiritual upliftment of the poor and
to eliminate superstition, illiteracy
and unsanitary conditions
"

- Shri Sant Gadgebaba

HINDI SEWA MANDAL'S

SHRI SANT GADGE BABA COLLEGE OF ENGINEERING & TECHNOLOGY, BHUSAWAL

ESTD.1950

**Curriculum
for
Post-Graduate Degree Course in
Master of Computer Application
(AN AUTONOMOUS INSTITUTE)**

# Shri Sant Gadge Baba
# College of Engineering & Technology,

**Near Z.T.C., Bhusawal. Dist. - Jalgaon (Maharashtra) Pin - 425203.**

## An Autonomous Institute with Accreditation by NAAC with A+ Grade

**(Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere.)**
**www.ssgbcoet.com**



# Master of Computer Applications (MCA)
## Program Curriculum
## With Effect from the
## Academic Year 2025-2026

**2-year, 4 Semester Full time Program**
**Choice Based Credit System (CBCS) and**
**Grading System Outcome Based Education Pattern**
**Aligned with**
**National Education Policy (NEP) 2020**

**Preamble:**

1. The name of the program shall be Master of Computer Application (M.C.A)

2. The MCA Curriculum 2025-2026 builds on the implementation of the Choice Based Credit System (CBCS). The curriculum takes the MCA program to the next level in terms of implementing National Education Policy (NEP) and Outcome Based Education (OBE) along with the CBCS and Grading System.

Program designed to equip students with a comprehensive understanding of Computer Science and Application. As aspiring professionals in the field of computing, we acknowledge the weight of responsibility that accompanies our education. Professionalism and ethical conduct is fundamental to our academic pursuits and beyond. We embrace the imperative of continuous learning and adaptability in an era marked by rapid technological advancement, pledging to proactively seek new knowledge and master emerging technologies.

The MCA program curriculum is designed to provide students with a strong foundation in computer science, programming languages, software engineering, database management systems, and computer networks. The program also includes courses on business management and soft skills to prepare students for a career in the IT industry.

Overall, an MCA program aims to provide students with a well-rounded education that prepares them for a successful career in the IT industry and for further academic pursuits.

**Our Vision:**

"To impart quality education among students by enhancing their learning aptitude and gearing them with intellectual, physical, analytical and practical capabilities."

**Our Mission:**

"To build engineers' who will inherit the future to meet the needs of commerce and industry by providing human resources with required knowledge, skills and disseminating development along with transferring technology."

**Introduction:**

**1. Definition: Outcome Based Education:**

**Outcome Based Education (OBE) Approach:** Outcomes are about performance, and this implies:

There must be a performer - the student (learner), not only the teacher. There must be something performable (thus demonstrable or assessable) to perform. The focus is on the performance, not the activity or task to be performed.

**Program Educational Objectives (PEOs):** Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. Program Educational Objectives are a set of broad future focused learner's performance outcomes that explicitly identify what learners will be able to do with what they have learned, and what they will be like after they leave institution and are living full and productive lives. Thus, PEOs are what the program is preparing graduates for in their career and professional life (to attain within a few years after graduation).

**Program Outcomes (POs):** Program Outcomes are a set of narrow statements that describes what students (learners) of the program are expected to know and be able to perform or attain by the time of graduation.

**Course Outcomes (COs):** Course Outcomes are narrower statements that describe what students are

expected to know and be able to do at the end of each course. These relate to the skills, knowledge, and behavior that students acquire in the matriculation through the course.

**Learning Outcomes:** A learning outcome is what a student can do because of a learning experience. It describes a specific task that he/she can perform at a given level of competence under a certain situation. The three broad types of learning outcomes are: a) Disciplinary knowledge and skills b) Generic skills c) Attitudes and values.

**Teaching and Learning Activities (TLAs):** The set of pedagogical tools and techniques or the teaching and learning activities that aim to help students to attain the intended learning outcomes and engage them in these learning activities through the teaching process.

**Assessment and Evaluation:** Assessment is one or more processes, carried out by the institution that identify, collect, and prepare data to evaluate the achievement of program educational objectives and program outcomes. Evaluation is done by the evaluation team, for interpreting the data and evidence accumulated through assessment practices evaluation determines the extent to which program educational objectives or program outcomes are being achieved, and results in decisions and actions to improve the program.

## 2. MCA Program Focus:

The basic objective of the Master of Computer Application (MCA) is to provide students with advanced knowledge and skills in computer applications and software development, preparing them for careers in the IT industry.

## 3. Admission Details:

**Eligibility for Admission:** The eligibility criteria for admission for the MCA course will be as decided by the All India Council of Technical Education (AICTE), New Delhi and Directorate of Technical Education (DTE), Government of Maharashtra.

**Reservation of Seat:** The percentage of seat reserved for candidates decided by the All India Council of Technical Education (AICTE), New Delhi and Directorate of Technical Education (DTE), Government of Maharashtra. It will publish on their respective websites time to time.

## 4. Lecture-Practical-Project

A course shall have either or all the three components, i.e. a course may have only lecture component, or only practical/project component or a combination of any two/three components.

**The MCA program is a combination of:**

a. Three-Credit Courses
b. Four-Credit Courses
c. Two -Credit Practical courses and Mini Project/Research paper
d. Six-Credit Courses
e. Twelve Credit Research Project
f. Three-Credit MOOCS/SWAYAM courses.

The curriculum of MCA is providing freedom to choose subjects based on their interests, regardless of their academic stream. This shift encourages disciplinary learning, enabling students to explore diverse fields and broaden their knowledge horizons. The choice based subjects start from the first semester and provides flexible options throughout the semesters.

**Lecture (L):** Classroom sessions delivered by faculty in an interactive mode. It should be conducted as per the scheme of lectures indicated in respective course.

**Practical/Project (P)**: Practical / Project Work consisting of Hands-on experience /Field Studies / Case studies that equip students to acquire the much-required skill component. Besides separate Practical/Project course, three courses in each semester include few practical assignments, and it will be evaluated under internal evaluation.

**A Mini project** is an assignment that the student needs to complete at the end of every semester in first year, in order to strengthen the understanding of fundamentals through effective application of the courses learned.

**The Field Project (FP)/On Job Training (OJT):** To be conducted in the FINAL Semester and evaluated at the end of the semester. The detail guidelines have been in the respective course structure.

## 5. Elective Courses (EC):

Institute has to offer six elective courses with 3 credits from Semester I to Semester III. The motive behind keeping an elective course is to make students aware of current/upcoming trends in Information Technology and other domains.

## 6. MOOCs Certification:

Each course (Where ever applicable) includes suggested certification which help learners to enrich themselves as per industry demands and requirements. MOOCs provide opportunities for students to delve deeper into specific topics or explore emerging areas. MOOC platforms offer a wide range of courses across various disciplines within computer applications. Students can access courses on advanced programming languages, artificial intelligence, data science, machine learning, cybersecurity, cloud computing, and many more. This diversity allows students to tailor their learning experience based on their interests and career goals.

## 7. Research Project:

Research project within an MCA course is integral components designed to impart advanced skills and knowledge essential for addressing complex challenges in computing. Research project involve rigorous investigation, experimentation and application of the or ethical concepts acquired during the program. Students are encouraged to explore diverse areas such as software engineering, data science, cybersecurity, and artificial intelligence, fostering expertise that aligns with industry demands. Engaging in research not only enhances academic understanding but also cultivates practical skills in problem-solving, critical analysis, and project management. Students are encouraged to publish their research work in reputed journals/conferences.

## 8. Evaluation and Assessment:

Concurrent Evaluation, a continuous assessment system integral to semester-based courses, spans the duration of each course and is conducted by the course faculty. The assessment aims to provide timely feedback on the teaching-learning process. As part of this system, students undergo continuous evaluation by the institute to ensure progressive student learning.

Faculty promptly shares assessment outcomes with students, guiding them toward improvement. Each institute has the autonomy to design evaluation components that offer a balanced assessment across Knowledge, Skills & Attitude (KSA) dimensions, using various assessment tools. The institute determines the type, method, and frequency of concurrent evaluation for each course, maintaining detailed records of all assessments. The curriculum spans two years and four semesters, **totaling 86 credits.**

| Semester | Credit Points | UE | IE |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **Semester I** | 22 | 340 | 310 |
| **Semester II** | 22 | 340 | 310 |
| **Semester III** | 22 | 340 | 310 |
| **Semester IV** | 20 | 150 | 200 |
| **Total** | 86 | 1170 | 1130 |
| | | **Total Marks** | **2300** |

The final total assessment of the candidate is made in terms of an internal (concurrent) evaluation and an external (university) examination for each course.

**9. Examination:** Examinations shall be conducted at the end of the semester i.e. during November/December and in April/May. However, supplementary examinations will also be held in December /January and May/June.

1. Absolute grading system based on absolute marks as indicated below will be implemented from academic year 2025-2026, starting from First Year of MCA Program.

| Percentage of Marks | Letter Grade | Grade Point |
|---|---|---|
| 91-100 | EX | 10.0 |
| 86-90 | AA | 9.0 |
| 81-85 | AB | 8.5 |
| 76-80 | BB | 8.0 |
| 71-75 | BC | 7.5 |
| 66-70 | CC | 7.0 |
| 61-65 | CD | 6.5 |
| 56-60 | DD | 6.0 |
| 51-55 | DE | 5.5 |
| 40-50 | EE | 5.0 |
| < 40 | FF | 0.0 |

2. Class is awarded based on CGPA of all eight semester of MCA Program.

| CGPA for pass class is minimum 5.0 ||
|---|---|
| CGPA up to < 5.50 | Pass Class |
| CGPA ≥ 5.50 & < 6.00 | Second Class |
| CGPA ≥ 6.00 & < 7.50 | First Class |
| CGPA ≥ 7.50 | Distinction |
| **[Percentage of Marks = CGPA*10** ||

3. A total of 100 Marks for each theory course are distributed as follows:

| 1 | Mid Semester Exam (MSE) Marks | 20 |
|---|---|---|
| 2 | Continuous Assessment Marks | 20 |
| 3 | End Semester Examination (ESE) Marks | 60 |

4. A total of 100 Marks for each practical course are distributed as follows:

| | | |
|---|---|---|
| 1. | Continuous Assessment Marks | 50 |
| 2. | End Semester Examination (ESE) Marks | 50 |

**Passing Rules and Regulations:**

1.   To obtain Passing grade in any course students must get 40% by adding together his/her marks in MSE, CA and End Semester Examination. For Practical course, students must get 40% by adding together his/her marks in CA and End Semester Examination.

2.   Grades will be allotted based on students combined performance.

3.   If student fails in any course, he/she will be allowed to reappear for the makeup/re-examination, which will be conducted immediately after the result.

4.   Provision of maximum 7 grace marks / semester is there.

5.   5 grace marks will be utilized, if student fails in only one subject.

6.   If student fails in more than one subject, maximum 3 marks / subject (out of total 7 marks) will be utilized.

5. Description of Grades:

**EX Grade:** An 'EX' grade stands for outstanding achievement.

**EE Grade:**  The 'EE' grade stands for minimum passing grade.

The students may appear for the remedial examination for the subjects he/she failed for the current semester of admission only and his/her performance will be awarded with EE grade only. If any of the students remain **absent** for the regular examination due to genuine reason and the same will be verified and tested by the Dean (Academics) or committee constituted by the University Authority.

**FF Grade:** The 'FF' grade denotes very poor performance, i.e. failure in a course due to poor performance. The students who have been awarded 'FF' grade in a course in any semester must repeat the subject in next semester.

1. Evaluation of Performance:

   Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

A) Semester Grade Point Average (SGPA) the performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPA is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

Where

$$SGPA = \frac{[\sum_{i=1}^{n} c_i g_i]}{[\sum_{i=1}^{n} c_i]}$$

'n' is the number of subjects for the semester,

'ci' is the number of credits allotted to a particular subject, and

'gi' is the grade-points awarded to the student for the subject based on his performance as per the above table.

SGPA will be rounded off to the second place of decimal and recorded as such.

B) Cumulative Grade Point Average (CGPA): An up to date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point

Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since she/he entered the Institute. CGPA is also calculated at the end of every semester (up to two decimal places). Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{[\sum_{i=1}^{m} c_i g_i]}{[\sum_{i=1}^{m} c_i]}$$

Where
'm' is the total number of subjects from the first semester onwards up to and including the semester S,
'ci' is the number of credits allotted to a particular subject, and
'gi' is the grade-points awarded to the student for the subject based on his/he performance as per the above table.
# CGPA will be rounded off to the second place of decimal and recorded as such.
Institute can decide the type, method and frequency of Concurrent Evaluation for each course and execute accordingly. Detailed record of the Concurrent Evaluation shall be maintained by the Institute. The same shall be made available to the University, on demand.

### 10. Choicebased Credit System (CBCS) and Grading:
The detail document about Choice based Credit System for PG Program is available on university website. The Grading methodology is also available on university website. University reserves rights to revise CBCS and grading system time to time.

### 11. Mediumof Instruction:
The medium of Instruction will be English.

### 12. Clarification of Syllabus:
It may be necessary to clarify certain points regarding the course. The BOS should meet to study and clarify any difficulties from the Institutes, as and when required.

### 13. Revision of Syllabus: As the computer technology is changing very fast, revision of the syllabus should be considered every 2 years.

### 14. Attendance:
The student must meet the requirement of 75% attendance per semester per course for grant of the term. The Director shall have the right to withhold the student from appearing for examination of a specific course if the above requirement is not fulfilled. Since the emphasis is on continuous learning and concurrent evaluation, it is expected that the students study all-round the semester.

### 15. Promotion Criteria: The student is promoted to second year, if student appeared to first and second semester examinations compulsory.

### 16. Maximum Duration for completion of the Program:
The candidates shall complete the MCA Program WITHIN 4 YEARS from the date of admission, by earning the requisite credits. The student will be finally declared as failed if she/he does not pass in all credits within a total period of four years. After that, such students will have to seek fresh

admission as per the admission rules prevailing at that time.

**17. Exit option:**

The students can exit the Program after one year of MCA, but he/she has to take additional 4 Credits of on-job Training. To get PG Diploma after First Year, he/she should earn total 44 + 4= 48 Credits otherwise he/she will not be eligible to get the PG Diploma and will be left as it is with previous qualification. Re-entry to complete the PG degree, after taking the exit option, will be permissible up to 05 years from the date of admission to the PG program. The institute may conduct bridge courses for the respective students at the discretion of Director/ Head of the institutions.

**18. Scaling Down of CE/INT Scores:** The marks obtained by the student for the CE/INT *shall be scaled down*, to the required extent, if percentage of the marks of CE/INT exceeds the percentage of marks scored in the End Semester University Examination by 25% for the respective course.

**19. Scheme of Assessment**

1. Appearing for Examinations:

A candidate is required to appear for all prescribed examinations during the course of study. This includes theory exams, practical exams, term-work assessments, project evaluations, and any other form of examination as specified in the syllabus.

2. Passing of Examinations.

A candidate must pass all the prescribed examinations. The passing criteria, including minimum marks required in theory, practical, term-work, and other components, will be as per the rules laid down by the university.

3. Components of Assessment

The scheme of assessment typically includes the following components:

1. Theory Examinations:

Conducted at the end of each Semester. Assess the theoretical understanding of the subjects.

2. Practical Examinations

Conducted to assess the practical skills and application of knowledge. Includes laboratory work, experiments, and practical assignments.

3. Term-Work Assessments:

Continuous assessment of assignments, tutorials, and project work throughout the Semester. Includes the evaluation of written assignments, presentations, and project reports.

4. Project Work:

Assessment of project-based learning and Second year projects. Includes continuous assessment by the faculty and final evaluation through project reports, presentations, and viva-voce.

5. Internal Continuous Assessment:

Regular assessments conducted throughout the Semester. Includes quizzes, class tests, mid-term exams, and participation in class activities.

**20.** Student may opt for the courses from NPTEL/ SWAYAM platform. (if the credits of NPTEL / SWAYAM courses do not match with the existing subject proper scaling will be done.)

**Definition of Credit\*\***

| | |
|---|---|
| 1 Hour Lecture (L) per week | 1 credit for 1 Hour |
| 1 Hour Tutorial (T) per week | 1 credit for 1 Hour |

| 2 Hours Practical (P) (Lab)/week | 1 credit for 2 Hours |
|---|---|

**The head of Tutorial and Practical (as a special case) may be merged for common credit with the permission of authority.

| Sr. No. | Type of Course | | Semester | | | | Total Credits |
|---|---|---|---|---|---|---|---|
| | | | I | II | III | IV | |
| 1 | Program Core Course (PCC) | Program Courses | 20 | 10 | 10 | -- | 40 |
| 2 | Program Elective Course (PEC) | | -- | 08 | 03 | -- | 11 |
| 3 | Experimental learning course (ELC) | Experimental Learning Courses | -- | 02 | 04 | 20 | 26 |
| 4 | Open Elective (OE) | Multidisciplinary Courses | -- | -- | 03 | -- | 03 |
| 5 | Ability Enhancement Course (AEC)/ Value Education Course (VEC) | Humanities Social Science and Management (HSSM) | -- | 02 | 02 | -- | 04 |
| 6 | Indian Knowledge System (IKS) | | 02 | -- | -- | -- | 02 |
| 7 | Research Methodology | Experimental Learning Courses | -- | -- | -- | -- | -- |
| 8 | Internship/OJT | | -- | Y | -- | -- | Y |
| 9 | Massive Open Online Courses (MOOC)/ Swayam | Massive Open Online Courses | -- | -- | -- | -- | -- |
| 10 | Audit Cousre | Audit Cousre | Y | Y | Y | -- | Y |
| | **Total** | | 22 | 22 | 22 | 20 | 86 |

**Program Educational Objectives (PEO)**

A Post Graduate in the discipline of Computer Applications is generally expected to have three kinds of knowledge. First, the post graduate should have conceptual knowledge of the core topics of Computer Science. Second, she/he should have knowledge of mathematical formalism

underlying various programming concepts. Third, post graduates will be such that he/she can apply the principles of computer science and its applications to solve real-life problems from diverse application domains. The program of Master of Computer Application essentially aims to meet these broad expectations. At the same time, the program intends to comply with the courses and syllabus available at National Program on Technology Enhanced Learning (NPTEL) and SWAYAM. The following specific educational objective aims to achieve these global and regional expectations.

| Objective Identifier | Objectives |
|---|---|
| PEO1 | Apply their computing skills to analyze, design and develop innovative software products to meet the industry needs and excel as software professionals. |
| PEO2 | Pursue lifelong learning and do research in the computing field based on solid technical foundations. |
| PEO3 | Communicate and function effectively in teams in multidisciplinary fields with in the global, societal and environmental context. |
| PEO4 | Exhibit professional integrity, ethics and an understanding of responsibility to contribute technical solutions for the sustainable development of society. |

**Program Outcomes (PO)**

After undergoing the learning process off two years, students of **Master of Computer Application** will have an ability to build information systems and provide computer based solutions to real life problems. The graduates of this program will demonstrate following abilities and skill sets.

| Outcome Identifier | Outcomes |
|---|---|
| PO1 | Engineering knowledge: Apply the knowledge of mathematics, science, applications fundamentals, and an engineering specialization to the solution of Complex engineering problems. |
| PO2 | Problem analysis: Identify, formulate, review research literature, and analyze Complex technological problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| PO3 | Design/development of solutions: Design solutions for complex computer science and technical problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| PO4 | Conduct investigations of complex problems: Use research-based knowledge and Research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions. |
| PO5 | Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern Science, engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. |
| PO6 | The engineer and society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. |
| PO7 | Environment and sustainability: Understand the impact of the professional Engineering solutions in public and environmental contexts, and demonstrate the knowledge of, and |

| | | |
|---|---|---|
| | need for sustainable development. | |
| PO8 | Ethics: Apply ethical principles and commit to professional ethics and Responsibilities and norms of the social & technological practice. | |
| PO9 | Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. | |
| PO10 | Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | |
| PO11 | Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. | |
| PO12 | Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. | |

**Program Specific Outcomes (PSOs)**

| Outcome Identifier | Outcomes |
|---|---|
| PSO1 | Able to select suitable data models, appropriate architecture, and Platform to implement a system with good performance. |
| PSO2 | Able to design and integrate various systems based components to provide user interactive solutions for various challenges. |
| PSO3 | Able to develop applications for real time environments using existing and upcoming technologies. |

**Graduate Attributes /ABET's Criteria**

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation/NAAC are as follows:

(a) Engineering knowledge: An ability to apply knowledge of mathematics, science and engineering.

(b) Problem analysis: An ability to design and conduct experiments as well as to analyze and interpret data.

(c) Design / development of solutions: An ability to design a system, a component, or process, to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacture ability, and sustainability.

(d) Individual and teamwork: An ability to function on multidisciplinary teams.

(e) Problem Solving: ability to identify, formulate and solve engineering problems.

(f) Ethics: An understanding of professional and ethical responsibility.

(g) Communication: An ability to communicate effectively.

(h) Environment and sustainability: The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and social context.

(i) Life-long learning: Recognition of the need for and an ability to engage in life-long learning.

(j) Acknowledge of technology: Acknowledge of contemporary issues, and state of art technology

(k) Modern tool usage: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

(l) Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply in multidisciplinary environments.

Mapping of Program Outcomes with Graduate Attributes/ABET's Criteria

|  | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PO1 | X |  |  |  |  |  |  |  |  | X |  |  |
| PO2 |  | X |  |  | X |  |  |  |  |  |  |  |
| PO3 |  |  | X |  | X |  |  |  |  |  |  |  |
| PO4 |  |  | X |  | X |  |  |  |  |  |  |  |
| PO5 |  |  |  |  |  |  |  |  |  |  | X |  |
| PO6 |  |  |  |  | X |  |  |  |  | X |  |  |
| PO7 |  |  |  |  |  |  |  | X |  |  |  |  |
| PO8 |  |  |  |  |  | X |  |  |  |  |  |  |
| PO9 |  |  |  | X |  |  |  |  |  |  |  |  |
| PO10 |  |  |  |  |  |  | X |  |  |  |  |  |
| PO11 |  |  |  |  |  |  |  |  |  |  |  | X |
| PO12 |  |  |  |  |  |  |  |  | X |  |  |  |

| Semester | Subject Category | Course Code | Course Title | Weakly Teaching Hrs | | | Evaluation Scheme Credit | | | | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | CA | MSE | ESE | Total | |
| **I** | PCC | MCA25PC101 | Advance Operating System | 3 | 1 | | 20 | 20 | 60 | 100 | 4 |
| | PCC | MCA25PC102 | Advance Data Base Management System | 3 | 1 | | 20 | 20 | 60 | 100 | 4 |
| | PCC | MCA25PC103 | Java Programming | 3 | 1 | | 20 | 20 | 60 | 100 | 4 |
| | PCC | MCA25PC104 | Data Structure and Algorithms | 3 | 1 | | 20 | 20 | 60 | 100 | 4 |
| | PCC | MCA25PC105L | Practical I (AOS & ADBMS Lab) | | | 4 | 50 | | 50 | 100 | 2 |
| | PCC | MCA25PC106L | Practical II (Java Programming & Data structure Lab) | | | 4 | 50 | | 50 | 100 | 2 |
| | IKS | MCA25IK107 | IKS | 2 | | | 50 | | | 50 | 2 |
| | Audit | MCA25AU108 | Yoga for Stress Management | | | 2 | | | | | Audit |
| | | | **Total** | **14** | **4** | **10** | **230** | **80** | **340** | **650** | **22** |
| **II** | PCC | MCA25PC201 | Computer Networks | 3 | 1 | | 20 | 20 | 60 | 100 | 4 |
| | PCC | MCA25PC202 | Python Programming | 3 | 1 | | 20 | 20 | 60 | 100 | 4 |
| | PEC | MCA25PE203 | Elective I | 3 | 1 | | 20 | 20 | 60 | 100 | 4 |
| | PEC | MCA25PE204 | Elective II | 3 | 1 | | 20 | 20 | 60 | 100 | 4 |
| | ELC | MCA25EL205 | Mini Project | | | 4 | 50 | | 50 | 100 | 2 |
| | PCC | MCA25PC206L | Practical III (Computer Network & Python Programming Lab) | | | 4 | 50 | | 50 | 100 | 2 |
| | OJT | MCA25OJ207 | Field Training/ Internship/ Industrial Training Evaluation | | | | | | | | Audit |
| | VEC | MCA25VE208 | Universal Human Values | 2 | | | 50 | | | 50 | 2 |
| | | | **Total** | **14** | **4** | **8** | **230** | **80** | **340** | **650** | **22** |
| | | | **Total I Year Credits** | | | | | | | | **44** |

| Course Code | Elective I |
|---|---|
| MCA25PE203 | A) Cyber Laws |
| MCA25PE203 | B) Internet of Things |
| MCA25PE203 | C) Artificial Intelligence |

| Course Code | Elective II |
|---|---|
| MCA25PE204 | A) Agumented Reality |
| MCA25PE204 | B) Artificial Neural Network |
| MCA25PE204 | C) Data Analytics and Visualization |

| Exit Program (As a PG Diploma Course) | | | |
|---|---|---|---|
| Sr. No. | Courses Code | Name of Course | Credit |
| 1. | MCA25PC101EP | Any Professional Certification Course (**Duration 4 Week**) | 4 |
| 2. | MCA25OJ207EP | Field Training/ Internship /Industrial Training | 4 |

| Semester | Subject Category | Course Code | Course Title | Weakly Teaching Hrs | | | Evaluation Scheme Credit | | | | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | CA | MSE | ESE | Total | |
| **III** | PCC | MCA25PC301 | Machine Learning | 3 | 1 | | 20 | 20 | 60 | 100 | 4 |
| | PCC | MCA25PC302 | Distributed System and Cloud Computing | 3 | 1 | | 20 | 20 | 60 | 100 | 4 |
| | PEC | MCA25PE303 | Elective III | 3 | | | 20 | 20 | 60 | 100 | 3 |
| | OE | MCA25OE304 | Open Elective-I | 3 | | | 20 | 20 | 60 | 100 | 3 |
| | PCC | MCA25PC305L | Practical III (ML & CC Lab) | | | 4 | 50 | | 50 | 100 | 2 |
| | ELC | MCA25EL306P | Project Stage-I | | | 8 | 50 | | 50 | 100 | 4 |
| | VEC | MCA25VE307 | Moral and Ethical Devlopment | 2 | | | 50 | | | 50 | 2 |
| | Audit | MCA25AU308 | Disaster Management | | | 2 | | | | | Audit |
| | | | **Total** | 14 | 2 | 14 | 230 | 80 | 340 | 650 | 22 |
| **IV** | ELC | MCA25EL401P | Project Stage-II/ Internship | | | 36 | 150 | | 200 | 350 | 20 |
| | | | **Total** | | | 36 | 150 | | 200 | 350 | 20 |
| | | **Total Second Year Credits** | | | | | | | | | 42 |

| Course Code | Elective III |
|---|---|
| MCA25PE303 | A) Big Data Analytics |
| MCA25PE303 | B) Full Stack Development |
| MCA25PE303 | C) Software Testing and Tools |

| Course Code | Open Elective-I |
|---|---|
| MCA25OE304 | A) Enterprise Resource Planning |
| MCA25OE304 | B) E-Commerce |
| MCA25OE304 | C) Innovation and Entrepreneurship Development |

1. Swayam Courses will be done using NPTEL, MOOC or as permitted by the institute authority platform. However, the student should ensure that the course content has not been already covered by the student himself in his UG or above- mentioned PG courses already completed.

2. Swayam Courses are recommended to be done in subjects that enhance their skill set and contribute to the industrial project undertaken.

3. If student not appear for Swayam course based Examination or failed to complete then he or she has to appear for institute based examination for same subject.

4. Research Paper should be published as an article in a reputed UGC Care-listed journal on Mini Project and Research project. A minimum of one paper each is expected. Guidelines for Paper writing will be provided by the concerned subject teacher.

## MCA25PC101: Advance Operating System

**[Unit 1]**

Introduction and Operating system structures: Definition, Types of Operating system, Real-Time operating system, System Components: System Services, Systems Calls, System Programs, System structure, Virtual Machines, System Design and Implementation, System Generations.

**[Unit 2]**

Processes and CPU Scheduling: Process Concept, Process Scheduling, Operation on process, Inter-process Communication, Cooperating processes, Threads, Multithreading model, Scheduling criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Scheduling Algorithms evaluation.

**[Unit 3]**

Process Synchronization: The critical-section problem, Critical regions, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of synchronization, and Monitors Deadlocks: Systems Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined approach to deadlock Handling.

**[Unit 4]**

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Continuous Memory Allocation, Fixed and variable partition, Internaland external fragmentation and compaction, Paging: Principle of operation, Page allocation Hardware support for paging, Protection and sharing, Disadvantages of paging; Segmentation. Virtual Memory: Basics of Virtual Memory– Hardware and control structures Locality of reference, Page fault, Working Set, Dirty page / Dirty bit– Demand paging, Page Replacement algorithms.

**[Unit 5]**

File Management: File Concept, Access methods, File types, File operation, Directory and disk structure, File System Structure, File System Implementation, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Mass-Storage Structure: Disk Structure, Disk attachment, Disk scheduling, Disk management, Swap Space Management.

**Text Book:**

1. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts, Wiley Publication, 8th Edition, 2008.
2. Maekawa, M. and Arthur E. Oldehoeft and Oldehoeft, R.R. Operating Systems: Advanced Concepts, Benjamin Cummings (1987).

**Reference Books:**

1. Andrew S.Tanenbaum, Modern Operating System, PHI Publication, 4th Edition, 2015.
2. D. M. Dhamdhere, Systems Programming and Operating Systems, McGraw-Hill, 2nd Edition, 1996.
3. Garry Nutt, Operating Systems Concepts, Pearson Publication, 3rd Edition, 2003.

**NPTEL/SWAYAM URL/ Link-** Operating System Fundamentals, Prof. Santanu Chattopadhyay, IIT Kharagpur- https://nptel.ac.in/courses/106105214

## MCA25PC102: Advance Data Base Management System

**[Unit 1]**

Database System Applications, Purpose of Database Systems, View of Data, Relational Databases, Database Design, Data Storage and Querying, ER model concepts, notation for ER diagram, Constraints, keys, E-R Diagrams, Mapping Cardinality, Concepts of Super Key, candidate key, primary key, weak entity sets, Codd's rules, Extended ER model, Generalization, Aggregation, Reduction of an ER diagrams to tables.

**[Unit 2]**

Structure of Relational Databases, Data base Schema, Keys Relational algebra: Fundamental Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations.
Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.

**[Unit 3]**

Overview of SQL, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operators, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database Intermediate SQL : Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schema, Authorization, Advanced SQL : Assessing SQL from Programming Language Functions and Procedures, Triggers.

**[Unit 4]**

Normalization: Features of good relational designs, Functional dependencies, Normal forms, First, Second, Third normal forms, BCNF, Functional Dependency Theory, Multi valued Dependencies, Fourth Normal Form, File Organization, Ordered Indices, B+tree Index files, BTree Index File.

**[Unit 5]**

Transaction Concept, A simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation, ACID Properties, Serializability Concurrency Control Techniques: Lock based Protocols, Deadlock handling, Time stamp-Based Protocols.

**Text Book:**

1. Henry Korth, Abraham Silberschatz & S.Sudarshan, Database System Concepts, McGraw-Hill Publication, 6th Edition, 2011.
2. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw- Hill Publication, 3rd Edition, 2003.

**Reference Books:**

1. Joel Murach, Murach's Oracle SQL and PL/SQL for Developers, Mike Murach& Associates, 2nd Edition, 2014.
2. Wiederhold, Database Design, McGraw-Hill Publication, 2nd Edition, 1983.
3. Navathe, Fundamentals of Database System, Addison-Wesley Publication, 6th Edition, 2012.
4. Mark L.Gillenson, Fundamentals of Database Management System, Wiley Publication, 2nd Edition, 2011.

**NPTEL/SWAYAM URL/ Link-** Data Base Management System, Prof. Partha Pratim Das, Prof. Samiran Chattopadhyay, IIT Kharagpur- https://nptel.ac.in/courses/106105175

## MCA25PC103: Java Programming

**[Unit 1]**
Introduction to object oriented programming-Features of Java – Data types, variables and arrays, Operators , Control statements , Classes and Methods , Inheritance.

**[Unit 2]**
Packages and Interfaces ,Exception Handling , Multithreaded Programming , Input/Output , Files , Utility Classes , String Handling. Generics, Generic Class, Generic methods.

**[Unit 3]**
Java applets, Life cycle of an applet , Adding images to an applet , Adding sound to an applet. Passing parameters to an applet. Event Handling. Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers and Menus.

**[Unit 4]**
JDBC Overview , JDBC implementation , Connection class , Statements , Catching Database Results, handling database Queries.. Networking, InetAddress class , URL class, TCP sockets , UDP sockets.

**[Unit 4]**
Web page Designing using HTML, Scripting basics,Client side and server side scripting. Java Script,Object, names, literals, operators and expressions, statements and features, events, windows, documents, frames, data types, built,in functions, Browser object model, Verifying forms. Servlet , life cycle of a servlet. The Servlet API, Handling HTTP Request and Response, using Cookies, Session Tracking. Introduction to JSP.

**Text Book:**
1. Java The Complete Reference , Herbert Schildt 7th Edition. Tata McGrawHill Edition
2. Java 6 by Rogers Cadenhead, Laura Lemay, Pearson education

**Reference Books:**
1. Java Programming , A Practical Approach , C Xavier, Tata McGraw,Hill Edition
2. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000
3. Javascript A Beginners Guide, 3rd Edition , John Pollock , Tata McGraw-Hill Edition

**NPTEL/SWAYAM URL/ Link-** Programming In Java, Prof. Debasis Samanta, IIT Kharagpur-
https://nptel.ac.in/courses/106105191

**MCA25PC104: Data Structures and Algorithms**
**[Unit 1]**

Data, Data types, Data structure, Abstract Data Type (ADT), representation of Information, characteristics of algorithm, program, analyzing programs. Arrays and Hash Tables Concept of sequential organization, linear and non-linear data structure, storage representation, array processing sparse matrices, transpose of sparse matrices.

**[Unit2]**

Stacks- concept, Primitive operations, Stack Abstract Data Type, Representation of Stacks Using Sequential Organization, stack operations, Applications of Stack- Expression Evaluation and Conversion, Polish notation and expression conversion, Need for prefix and postfix expressions, Postfix expression evaluation, Linked Stack and Operations. Queue: Representation of Queueusing Array, Circular Queue and its implementation

**[Unit 3]**

Concept of linked organization Representation of Linked List in Memory Singly, doubly and circular Linked List Operations on singly and Doubly Linked List such as creation, traversing, searching, insertion, deletion. Representation of Stack and Queue using Linked List.

**[Unit 4]**

Basic Terminology of Trees: Basic terminology of Trees Binary trees and its representation in memory. Algorithm Design Techniques, Performance Analysis of Algorithms, Types of Algorithm's Analysis, Order of Growth, Asymptotic Notations, Recursion, Recurrences Relation, Substitution Method, Iterative Method, Recursion Tree, Master Theorem.

**[Unit 5]**

Divide and Conquer- Strassen's Matrix Multiplication, Backtracking- Backtracking Concept, N– Queens Problem,Sum of Subsets Problem, Branch and Bound: Introduction, Travelling Salesperson Problem, Greedy Algorithms- Optimal Merge Patterns, Huffman Coding, Knapsack Problem, Dynamic Programming- matrix multiplication.

**Text Book:**

1. T.Cormen, Introduction to Algorithms, PHI Publication, 2$^{nd}$ Edition, 2002.
2. Aho, Ullman, Data Structure and Algorithms, Addison-Wesley Publication, 1$^{st}$ Edition, 1983.

**Reference Books:**

1. Michel Goodrich, Rober to Tamassia, Algorithm Design–Foundation, Analysis & Internet Examples, Wiley Publication, 2nd Edition, 2006.
2. George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Practical Guide, O'Reilly Media, 2nd Edition, 2016.
3. Ellise Horowitz, Sartaj Sahni, S.Rajasekaran, Fundamentals of Computer Algorithms, University Press (India) Private Ltd, 2nd Edition, 2008.
4. Sara Base, Computer algorithms: Introduction to Design and Analysis, Addison-Wesley Publication, 2nd Edition, 1988.

**NPTEL/SWAYAM URL/ Link-** Introduction to Data Structures and Algorithms, Prof. Naveen Garg, IIT Delhi,https://nptel.ac.in/courses/106102064

**MCA25PC105L: Practical I (AOS & ADBMS Lab)**

**A) AOS Lab**

**List of Experiments:**

1. Write a C program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF c) Round Robin (pre-emptive) d) Priority.

2. Write a C program to simulate multi-level queue scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories – system processes and user processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue.

3. Write a C program to simulate the following file allocation strategies. a) Sequential b) Indexed c) Linked.

4. Write a C program to simulate the MVT and MFT memory management techniques.

5. Write a C program to simulate the following contiguous memory allocation techniques a) Worst-fit b) Best-fit c) First-fit.

6. Write a C program to simulate paging technique of memory management.

7. Write a C program to simulate the following file organization techniques a) Single level directory b) Two level directory c) Hierarchical

8. Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.

9. Write a C program to simulate disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN.

10. Write a C program to simulate page replacement algorithms a) FIFO b) LRU c) LFU

11. Write a C program to simulate page replacement algorithms.

12. Write a C program to simulate producer-consumer problem using semaphores.

13. Write a C program to simulate the concept of Dining-Philosophers problem.


**B) ADBMS Lab**

**List of Experiments:**

1. Demonstrating the use of some DDL queries to create the database.

2. Use of various SQL DML queries to select, insert, update or delete data from database

3. To create database views and perform various operations on it.

4. To apply, modify and delete various Constraints in SQL on database.

5. Set operators and functions with of having, group by and order by clause in SQL.

6. Writing the different PL SQL Blocks.

7. Writing and using the functions in PL SQL.

8. Writing and using the Stored procedures in PL SQL.

9.  Use of Trigger in DBMS

10. Use of cursors in PL SQL


**MCA25PC106L: Practical II  (Java Programming & Data Structure Lab)**
**A) Java Programming Lab**

**List of Experiments**:

1. Demonstrate use of

A) Java Classes        B) Java Packages     C) Java Interfaces        D) Exception handling

2. Implementation of multi threading.

A) Using matrix manipulation/ sorting technique B) Creating digital clock.

3. To demonstrate concepts like

- Thread creation
- Thread communication.
- Thread prioritization.

4. AWT Implementation.

- Creation of calculator.
- Create GUS for information management & processing (e.g.personal data, admission- process etc.)

5. Applet Handling

- Implement any problem (e.g. font settings / text formatting) using applets & HTML file for parameter passing.
- Animationusingimages/sound/ videos.

6. File Handling

- Command based accepting file name, data from user, doing data updation, deletion, insertion into files.
- AWTB ased–From GUI, accepting data, displaying data, processing data.

7. JDBC & Networking

- Create a database (e.g.collage/ student/ shop) Execute DDL/ DML queries

8. Web Application

- Design a static website using HTML elements to show the use of table, links, client side image maps and form elements.
- Write external, internal and in line CSS to design the web pages
- Write Java Script functions to validate form controls using regular expressions.

## B) Data Structure Lab

**List of Experiments**:

1. Write a Programme to implement a stack using array.
2. Write a Programme to implement a stack using linked list
3. Write a Programme to implement a queue using array.
4. Write a Programme to implement a queue using linked list
5. Write a Programme to implement a circular queue using array
6. Write a Programme to implement a simple linked list
7. Write a Programme to implement a circular linked list
8. Write a Programme to implement a doubly linked list
9. Write a Programme to count a node in linked list
10. Write a Programme to implement a reversed a linked list
11. Write a Programme to implement a quick sort.
12. Write a Programme to implement a merge sort.

## MCA25IK107:   IKS

**[Unit 1]**

Indian Knowledge System – An Introduction & Vedic Corpus: What is IKS? Why do we need IKS?

Organization of IKS, Historicity of IKS, Some salient aspects of IKS, Introduction to Vedas, A synopsis of the four Vedas, Sub-classification of Vedas, Messages in Vedas, Introduction to Vedāṅgas, Prologue on Śikṣā and Vyākaraṇa, Basics of Nirukta and Chandas, Introduction to Kalpa and Jyotiṣa, Vedic Life: A Distinctive Features.

**[Unit 2]**
Number system & Mathematics: Number systems in India - Historical evidence, Salient aspects of Indian Mathematics, Bhūta- Saṃkhyā system, Kaṭapayādi system, Measurements for time, distance, and weight, Piṅgala and the Binary system. Introduction to Indian Mathematics, Unique aspects of Indian Mathematics, Indian Mathematicians and their Contributions, Algebra, Geometry, Trigonometry, Binary mathematics, and combinatorial problems in Chandaḥ Śāstra, Magic squares in India.

**[Unit 3]**
Engineering Technology: Metal & Other applications:  Wootz Steel: The rise and fall of a great Indian technology, The Indian S & T heritage, Mining and ore extraction, Metals and metalworking technology, Iron and steel in India, lost wax casting of idols and artefacts, Apparatuses used for extraction of metallic components.

**[Unit 4]**
Town Planning and Architecture: Perspective of Arthaśāstra on town planning, Vāstu-śāstra – The science of architecture eight limbs of Vāstu, town planning, temples in India: Marvelous stone architecture for eternity, temple architecture in India, Iconography.

**[Unit 5]**
Knowledge Framework and classifications: Indian scheme of knowledge, The knowledge triangle, Prameya – A vaiśeṣikan approach to physical reality, Dravyas – the constituents of the physical reality, Attributes – the properties of substances and Action – the driver of conjunction and disjunction, Sāmānya, viśeṣa, samavāya, Pramāṇa – the means of valid knowledge, Saṃśaya – ambiguities in existing knowledge, Framework for establishing valid knowledge,

**Text Book:**
1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. (2022),  Introduction to Indian Knowledge System: Concepts and Applications‖, PHI Learning Private Ltd. Delhi.

**MCA25AU108: Yoga for Stress Maganement**
**[Unit 1]**
Introduction to Yoga for Stress Management – 1, Introduction to Yoga for Stress Management – 2 Stress

according to Western perspective, Stress Eastern Perspective, Developmental process: Western and Eastern Perspective, Stress Hazards and Yoga.

**[Unit 2]**
Meeting the challenges of Stress – 1, Meeting the challenges of Stress – 2, Introduction to Stress Physiology, Stress, Appetite and Dietary management- Modern and Yogic perspective, Sleep and Stress: understanding the relationship for effective management of stress, Stress Assessment methods- a valuable tool toward stress management Role of Yoga in prevention and management of stress related disorders – a summary of research evidence.

**[Unit 3]**
Bio-Psycho-Socio-Spiritual model of stress management, Yoga practices for Stress Management, Breathing practices – 1, Hands in and out breathing, Hands stretch breathing, Ankle stretch breathing, Breathing practices – 2, Dog Breathing, Rabbit breathing, Tiger breathing, Sashankasana breathing, Breathing practices – 3, Bhujangasana breathing, Ardha Shalabhasana breathing (alternate legs), Straight leg raising, (alternate legs), Straight leg raising (both legs), Sethubandhasana lumbar stretch, Instant, Relaxation Technique (IRT), Loosening Practices – 1, Shoulder Rotation, Side bending, standing twist, Hip rotation, Thigh strengthening, Loosening practices – 2, Chakki chalan, Bhunamasana Chalana, Alternative toe touching, Loosening practices – 3, Side leg raising, Pavana muktasana kriya: Wind releasing pose movements, Quick Relaxation, Technique (QRT).

**[Unit 4]**
Asana practices – 1, Tadasana, Ardhakati Chakrasana, Ardha Chakrasana, Trikonasana, Vrikshasana Asana practices – 2, Vakarasana, Janu Sirshasana, Ushtrasana, Sashankasana, Asana practices– 3, Ardhamatseyndrasana, Paschimottanasana, Poorvottanasana, Gomukhasana Asana practices– 4, Makarasana, Bhujangasana, Salambha Shalabahasana, Dhanurasana Asana practices– 5, Setubandhasana, Sarvangasana, Mastyasana, Deep Relaxation Technique (DRT), Soorya Namaskar, Pranayama– 1, Kapalbhati kriya and Sectional Breathing, Pranayama – 2, Nadishuddhi Pranayama.

**References Books:**
1. H R Nagendra and R Nagarathna. Yoga for Promotion of Positive Health. Swami Vivekananda Yoga Prakashana. 2011.
2. Contrada, R., & Baum, A. (Eds.). The handbook of stress science: Biology, psychology, and health. Springer Publishing Company. 2010
3. Al'Absi, M. (Ed.). Stress and addiction: Biological and psychological mechanisms, Elsevier. 2011.
4. Van den Bergh, O. Principles, and practice of stress management, Guilford Publications. 2021.
5. Swami Muktibodhananda, Hatha Yoga Pradipika, Bihar Scool of Yoga, 1998
6. Swami Satyananda Saraswati, Four Chapters on Freedom, Bihar Scool of Yoga, 1975
7. Swami Tapasyananda, Srimad Bhagavat Gita, Sri Ramakrishna Math, 2012

## MCA25PC201: Computer Networks

**[Unit 1]**
Applications of computer networks, Network hardware, Network software: Protocol Hierarchy, Design

Issue, connection oriented vs. connectionless, Service Primitives, Reference models: OSI and TCP/IP, Example networks: Internet, Network standardization, Performance: Bandwidth and Latency, Delay and bandwidth product, High- Speed Network, Application Performance Needs.

**[Unit 2]**
X5, Frame relay, ATM, Ethernet (802.3), FDDI, Token Rings, Resilient Packet Rings, Wireless LANs: Wi-Fi (802.11), Cell Phone Technologies, Broadband Wireless: Wi-MAX (802.16), Bluetooth (802.15.1), RFID.

**[Unit 3]**
Introduction, functions. Design Issues: Services to Network Layer, Framing.ARQ strategies: Error detection and correction, Parity Bits, Hamming Codes (11/12-bits) and CRC. Flow Control Protocols: Unrestricted Simplex, Stop and Wait, Sliding Window Protocol. WAN Connectivity: PPP and HDLC. MAC Sub layer: Multiple Access Protocols: Pure and Slotted ALOHA, CSMA, WDMA, CSMA/CD, CSMA/CA, Binary Exponential Back-off algorithm, Introduction to Ethernet IEEE 802.3, IEEE 802.11 a/b/g/n, IEEE 802.15 and IEEE 802.16 Standards.

**[Unit 4]**
IPv4/IPv6, Routers and Routing Algorithms distance vector link state. TCP UDP and sockets, General principles, Congestion prevention policies, Load shading, Jitter control, Quality of service: Packet scheduling, Traffic shaping, integrated Services, Routing Protocols: RIP, OSPF, BGP, MPLS. Routing in MANET: AODV, DSR, Mobile IP.

**[Unit 5]**
DNS, SMTP, POP, FTP, HTTP. Network Security: Authentication, Basics of public key and private key cryptography, digital signatures and certificates, firewalls.

**Text Book:**
1. A.Tanenbaum, Computer Networks, PHI Publication,5$^{th}$ Edition,2011.

**Reference Books:**
1. B.Forouzan, Data Communications and Networking, McGraw Hill Publication, 5th Edition, 2013.
2. Larry Peterson and Bruce Davie, Computer Networks: A Systems Approach, Morgan Kufman Publication, 5th Edition, 2012.
3. S. Keshav, An Engineering Approach to Computer Networking, Addison- Wesley Professional.
4. D.Comer, Computer Networks and Internet, Pearson Education, 6$^{th}$ Edition, 2014.
5. M. Gallo, W. Hancock, Computer Communications and Networking Technologies, Brooks/Cole Publisher, 2001.
6. Natalia Olifer, Victor Olifer, Computer Networks: Principles, Technologies and Protocols for Network Design, Wiley Publication, 2005

**NPTEL/SWAYAM URL/ Link-** Advanced Computer Networks, Prof. Neminath Hubballi, Prof. Sameer Kulkarni, IIT Indore, IIT Gandhinagar- https://nptel.ac.in/courses/106106243

# MCA25PC202: Python Programming

**[Unit 1]**

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types.

**[Unit 2]**

Files: File Objects, File Built-in Function [ open() ], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, *Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, *Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules.

**[Unit 3]**

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules.

**[Unit 4]**

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs. Web Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application, Advanced CGI, Web (HTTP) Servers.

**[Unit 5]**

Database Programming: Introduction, Python Database Application Programmer's Interface (DBAPI), Object Relational Managers (ORMs), Related Modules.

**Text Book:**

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

**Reference Books**:

1. Think Python, Allen Downey, Green Tea Press.
2. Introduction to Python, Kenneth A. Lambert, Cengage.
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
4. Learning Python, Mark Lutz, O' Really..

**NPTEL/SWAYAM URL/ Link-** The Joy of Computing using Python, Prof. Sudarshan Iyengar, IIT Ropar- https://nptel.ac.in/courses/106106182

## MCA25PE203A: Cyber Laws

**[Unit 1]**

Internet, E-Commerce And E-Governance With Reference To Free Market Economy Understanding Computers, Internet and Cyber Laws, Conceptual Framework of E- commerce:E-governance, The Role of Electronic Signatures in E-commerce with Reference to Free Market Economy in India.

**[Unit 2]**

Law Relating To Electronic Records And Intellectual Property Rights In India Legal Aspects of Electronic Records/Digital Signatures, The Rules and Regulations of Certifying Authoritiesin India, Protection of Intellectual Property Rights in Cyberspace in India.

**[Unit 3]**

International Efforts Relating To Cyberspace Laws And Cyber Crimes International Efforts Related to Cyberspace Laws, Council of Europe (COE) Convention on Cyber Crimes.

**[Unit 4]**

Penalties, Compensation And Offences Under The Cyberspace And Internet In India Penalties, Compensation and Adjudication of Violations of Provisions of IT Act and Judicial Review Some Important Offences under the Cyberspace Law and the Internet in India, Other Offences under the Information Technology Act in India.

**[Unit 5]**

Miscellaneous Provisions Of It Act And Conclusions The Role of Electronic Evidence andthe Miscellaneous Provisions of the IT Act, Information Technology Act as Amended up to2008,The Information Technology (Certifying Authorities) Rules, 2000, The Information Technology (Certifying Authorities) Rules, 2000, Ministerial Order on Blocking of Websites.

**Reference Books:**

1. Harish Chander, Cyber Laws and IT Protection, PHI Publication.
2. Faiyaz Ahamad, KLSI, Cyber Law and Information Security, Dream tech Press.
3. Murray, Information Technology Law: Law and Society, 3rd Edition, Oxford University Press Oxford 2016.
4. Sunit Belapure, Nina Godbole, Cyber Security, Wiley India Pvt. Ltd.
5. Vivek Sood, Cyber Law Simplified, McGraw-Hill, Publication.

**NPTEL/SWAYAM URL/ Link -** Cyber Security and Privacy, Prof. Saji K Mathew, IIT Madras - https://nptel.ac.in/courses/106106248

## MCA25PE203B: Internet of Things

**[Unit 1]**

What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.

**[Unit 2]**

The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.

**[Unit 3]**

IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.

**[Unit 4]**

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT. Attacks on IoT Devices.

**[Unit 5]**

An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples. An IoT Strategy for healthcare System. An IoT Strategy for smart agriculture System.

**Text Books:**

1.David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the
2.Internet of Things, 1$^{st}$ Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 9789386873743)
3.Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017

**Reference Books:**

1.Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1$^{st}$ Edition, VPT, 2014. (ISBN: 978-8173719547)
2.Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

**NPTEL/SWAYAM URL/ Link-** Introduction to Internet of Things, Prof. Sudip Misra, IIT Kharagpur- https://nptel.ac.in/courses/106105166

## MCA25PE203C: Artificial Intelligence

**[Unit 1]**

AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

**[Unit 2]**

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction, Game Playing- Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

**[Unit 3]**

Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye's probabilistic interferences and dempster shafer theory.

**[Unit 4]**

First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decisiontrees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

**[Unit 5]**

Expert systems:- Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisitionmethod, societalimpacts reasoning in artificial intelligence, inferencewithrules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty

**Reference Books:**
1. S. Russel and P.Norvig, "Artificial Intelligence– A Modern Approach", Second Edition, Pearson Education
2. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: a logical approach", Oxford University Press.
3. G.Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
4. J.Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

**NPTEL/SWAYAM URL/ Link-** An Introduction to Artificial Intelligence, Prof. Mausam, IIT Delhi
https://nptel.ac.in/courses/106102220

## MCA25PE204A: Agumented Reality

**[Unit 1]**

Augmented Reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality. Augmented Reality Concepts- How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.

**[Unit 2]**

Hardware Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception , Requirements and Characteristics, Spatial Display Model. Processors – Role of Processors, Processor System Architecture, Processor Specifications. Tracking & Sensors - Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion.

**[Unit 3]**

Computer Vision for Augmented Reality - Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking Augmented Reality Software - Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

**[Unit 4]**

Marker-based approach- Introduction to marker-based tracking, types of markers, marker camera pose and identification, visual tracking, mathematical representation of matrix multiplication Marker types-Template markers, 2D barcode markers, imperceptible markers. Marker-less approach- Localization based augmentation, real world examples, Tracking methods- Visual tracking, feature based tracking, hybrid tracking, and initialization and recovery.

**[Unit 5]**

Projects- AR Car Customizer, AR Business Card, AR Encyclopedia, AR Filters with Spark AR Introduction to Spark AR, Interface, Face Tracking, Face Mesh, Head Occluder.

**Text Books:**

1. Schmalstieg, D., & Hollerer, T. (2016). Augmented Reality: Principles and Practice. Addison-Wesley Professional.
2. MacIntyre, B., Bolter, J. D., & Gandy, M. (2016). Introduction to Augmented Reality. CRC Press. 3. Pesce, M. (2011). Augmented Reality: Where We Will All Live. Sutro Press.

**Reference Books:**

1. Azuma, R. T. (2019). Augmented Reality: Principles and Practice (2nd ed.). Addison-Wesley
2. Billinghurst, M., & Grasset, R. (Eds.). (2016). Augmented Reality: Innovative Perspectives across Art, Industry, and Academia. Springer.
3. Pintus, R., Alletto, S., & Tistarelli, M. (2019). Augmented Reality: Principles, Technologies, and Applications. Springer.

**MCA25PE204B: Artificial Neural Network**

**[Unit 1]**
Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process.

**[Unit 2]**
Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection.

**[Unit 3]**
Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning.

**[Unit 4]**
Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification.

**[Unit 5]**
Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm Hopfield Models – Hopfield Models, Computer Experiment.

**Text Books:**
1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

**Reference Books:**
1. Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005
2. Neural Networks in Computer Inteligance, Li Min Fu MC GRAW HILL EDUCATION 2003
3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006

**NPTEL/SWAYAM URL/ Link-** Neural Networks and Applications, Prof. Somnath Sengupta, IIT Kharagpur- https://nptel.ac.in/courses/117105084

**MCA25PE204C: Data Analytics and Visualization**

**[Unit 1]**
Data Analytics Lifecycle overview: Key Roles for a Successful Analytics, Background and Overview of Data Analytics Lifecycle Project Phase 1: Discovery: Learning the Business Domain, Resources Framing the Problem, Identifying Key Stakeholders. Interviewing the Analytics Sponsor, Developing Initial Hypotheses Identifying Potential Data Sources, Phase 2: Data Preparation: Preparing the Analytic Sandbox, Performing ETLT, Learning About the Data, Data Conditioning, Survey and visualize, Common Tools for the Data Preparation Phase, Phase 3: Model Planning: Data Exploration and Variable Selection, Model Selection ,Common Tools for the Model Planning Phase, Phase 4: Model Building: Common Tools for the Model Building Phase, Phase 5: Communicate Results, Phase 6: Operationalize.

**[Unit 2]**
Overview of Time Series Analysis Box-Jenkins Methodology, ARIMA Model Auto correlation Function (ACF), Autoregressive Models ,Moving Average Models, ARMA and ARIMA Models, Building and Evaluating an ARIMA Model, Reasons to Choose and Cautions.

**[Unit 3]**
History of text mining, Roots of text mining overview of seven practices of text analytic, Application and use cases for Text mining: extracting meaning from unstructured text, Summarizing Text. Text Analysis Steps, A Text Analysis Example, Collecting Raw Text, Representing Text, Term Frequency: Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments , Gaining Insights .

**[Unit 4]**
Introduction to R: Data Import and Export, Attribute and Data type, Descriptive statistics. Exploratory Data Analysis: Visualization before analysis, Dirty Data, visualizing single variable, examining Multiple variable, Data Exploration versus presentation.

**[Unit 5]**
Essential Data Libraries for data analytics: Pandas, NumPy, SciPy. Plotting and visualization with python: Introduction to Matplotlib, Basic Plotting with Matplotlib, Create Histogram, Bar Chart, Pie chart, Box Plot, violin plot using Matplotlib. Introduction to seaborn Library, Multiple Plots, Regression plot, regplot.

**Text Books:**
1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education services Wiley Publication.

**Reference Books:**
1. Data Mining, Concepts and Techniques: 3rd edition, Jiawei Han, Micheline Kamber and Jian Pei
2. Data Analytics using R, Bharati Motwani, Wiley Publications
3. Python for Data Analysis: 3rd Edition, Wes McKinney, And Publisher: O'Reilly Media, Inc.

**NPTEL/SWAYAM URL/ Link-** Data Analytics with Python, Prof. A Ramesh, IIT Roorkee-https://nptel.ac.in/courses/106107220

### MCA25EL205: Mini Project
A mini project is an assignment that the student needs to complete at the end of every semester to strengthen

the understanding of fundamentals through effective application of the subjects learned.

**Guidelines for Mini Project:**

1. Students are expected to undertake one mini project starting from FIRST semester till SECOND semester.

2. The student may take up the mini project in first semester based on the courses learned in that semester and for next semester the mini project may be based on the courses learned in the current semester along with all the subjects learned in earlier semesters.

3. The student may take up the project individually or in group. However, if project is done in group, each student must be given a responsibility for distinct modules.

4. Selected project/module must have relevant scope as per the marks assigned and must be carried out in the Institute.

5. Internal guide should monitor and evaluate the progress of the project on individual basis through handwritten workbook (Project Diary) maintained by students containing various project milestones with learnings and remarks from internal guide for concurrent evaluation.

6. The Project Synopsis should contain an Introduction to Project clearly stating the project scope in detail justifying enough scope for 100 marks. The project work will carry 40 marks for internal assessment and 60 marks for external assessment.

7. Students are expected to show working demo of the project during final evaluation.

8. Students are expected to submit the Hard copy of mini project report as a part of final submission.

9. The project will be assessed internally as well as externally by the examiners appointed by College. College may appoint Industry Experts as an external examiner.

**MCA25PC206L: Practical III (AI and Computer Network Lab) AI Lab**

**List Experiment**

1. Study of Lisp/ PROLOG/Python/Java
2. Existing AI Application (e.g.Recommendation system, Car pooling, OTT channels etc.)
3. Solve any problem using depth first search.
4. Solve any problem using breadth first search.
5. Solve 8-puzzle problem using best first search.
6. Write a program to solve Tic-Tac-Toe using Min-Max search.
7. Solve traveling salesman problem.
8. Write a program for Alpha–Beta Pruning.
9. Write a program to solve 8 queens problem.
10. Write a program to solve map coloring problem using CSP.

## Computer Network Lab

### List Experiment

1. Implement the data link layer framing methods such as character count, character stuffing and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials CRC 12, CRC 16 and CRC CCIP
3. Implement Dijkstra's algorithm to compute the shortest path.
4. Take an example subnet graph with weights indicating delay between nodes.
5. Now obtain Routing table art each node using distance vector routing algorithm.
6. Take an example subnet of hosts. Obtain broadcast tree for it.
7. Take a 64 bit playing text and encrypt the same using DES algorithm.
8. Write a program to break the above DES coding.
9. Using RSA algorithm encrypt a text data and Decrypt the same.

**MCA25OJ207: Field Training/ Internship / Industrial Training Evaluation**

Guidelines for Field Training/ Internship/ Industrial Training:

1. To apply for a suitable Industrial Training, submit an application form to respective organization concerned one semester before the Industrial Training Program commences.

2. Student can also apply through online platforms such as Internshala for industrial training.

3. Submit one copy of the offer letter for the Industrial Training to the Head of the department or Faculty coordinator (Industrial Training).

4. To complete the Industrial Training process within the specified time based on the Industrial Training Program schedule.

5. Assessment within the Industrial Training context aims to evaluate the student's work quality and appropriateness to the field of study with reference to the learning outcomes of the Industrial Training Program.

6. Evaluation of the students' performance should be done in the next upcoming semester.

Those students who fails, they can also complete online certification courses which are available at free of cost on various MOOC platforms.

**MCA25VE208: Universal Human Values**

**[Unit 1]**

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity: Current Scenario, Method to Fulfil the Basic Human Aspirations.

**[Unit 2]**
Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Program to ensure self-regulation and Health.

**[Unit 3]**
Harmony in the Family: the Basic Unit of Human Interaction, 'Trust' the Foundational Value in Relationship, 'Respect' as the Right Evaluation, Other Feelings, Justice in Human to Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

**[Unit 4]**
Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The  Holistic Perception of Harmony in Existence.

**[Unit 5]**
Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

**Text Books:**
1. The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978- 93-87034- 47-1
2. The Teacher‟s Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G

**Reference Books:**
1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

**MCA25PC301: Machine Learning**
**[Unit 1]**

Well-posed learning problems, Designing a Learning System, Perspectives and Issues in Machine learning, Basic definitions, types of learning, Concept Learning and General-to-specific Ordering: A concept learning task, Concept learning as Search, Finding a maximally specific hypothesis, Version Spaces and Candidate elimination algorithm, Inductive Bias. Hypothesis space and inductive bias, evaluation, cross-validation.

**[Unit 2]**
Supervised Learning, Classification & Regression, Performance Metrics for Classification Problems, Performance Metrics for Regression Problems. Linear regression, Decision trees, over fitting,

**[Unit 3]**
Bayesian Learning: Bayes theorem and concept learning, Maximum likelihood and least square error hypotheses, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier,
Computational Learning Theory: Probably learning anapproximately correct hypothesis, PAC learnability, The VC dimension, the mistake bound model for learning.

**[Unit 4]**
Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM. Ensemble Learning, Bagging, Random Forest, Boosting, AdaBoost, Stacking Perceptron, multilayer network, back propagation, introduction to deep neural network.

**[Unit 5]**
Clustering k-means, adaptive hierarchical clustering, Gaussian mixture model. Association Rules Mining and Recommendation Systems. What are Association Rules, Association Rule Parameters, Calculating Association Rule Parameters, Recommendation Engines, Recommendation Engines working, Collaborative Filtering, Content Based Filtering.

**Text Books:**
1. Ethem Alpaydın, Introduction to Machine Learning, PHI, Third Edition, ISBN No.978-81-203- 5078-6
2. Christopher M.Bishop, Pattern Recognition and Machine Learning, Mcgraw-Hill, ISBN No.0- 07-115467-1

**Reference Books:**
1. Miroslav, Kubat. "An Introduction to Machine Learning", Springer Publishing.
2. Conway, Drew and White, John Myles, "Machine Learning for Hackers", O'Reilly Media, 2012.
3. Segaran, Toby. "Programming Collective Intelligence – Building Smart Web2.0 Applications", O'Reilly Media, August 2007.
4. Tom Mitchell, Machine Learning, Mcgraw-Hill, First Edition, ISBN No.0-07-115467-1.

**NPTEL/SWAYAM URL/ Link-** Introduction to Machine Learning, Prof. Sudeshna Sarkar, IIT Kharagpur - https://nptel.ac.in/courses/106105152

**MCA25PC302: Distributed System and Cloud Computing**
**[Unit 1]**

Introduction to Distributed Computing Concepts: Basic concepts of distributed systems, distributed computing models, issues in designing distributed systems Inter Process Communication Fundamental concepts related to inter process communication including message passing mechanism, Concepts of group communication, Remote Communication, Remote Procedure Call (RPC), Remote Method Invocation (RMI, Case study on Java RMI.

**[Unit 2]**
Introduction of clock synchronization, Global state, Mutual Exclusion Algorithms, Election algorithms, Synchronization in Wireless Networks. Fundamental concepts of DSM, types of DSM, various hardware DSM systems, Consistency models, issues in designing and implementing DSM systems.

**[Unit 3]**
Resource Management Scheduling Algorithms, Task Assignment, Load balancing approach, Load sharing approach Process Management Process Migration Mechanism, Thread models Distributed File System Concepts of a Distributed File System (DFS), file models, Case Study of anyone distributed system

**[Unit 4]**
Cloud Computing history and evolution, benefits of cloud computing. Cloud Computing Architecture Cloud Architecture model, Types of Clouds: Public Private & Hybrid Clouds, Cloud based services: Platform as a service (PaaS), Software as a service (SaaS), Infrastructure as a service (IaaS), Cluster computing, Grid computing, Fog computing.

**[Unit 5]**
Amazon Web Services, Microsoft Azure & Google Cloud-- Compute Services, Storage Services, Network Services, Database services, Additional Services. Google AppEngine (GAE), Aneka, Comparativestudy of various Cloud Computing Platforms. Cloud Issues and Challenges Cloud computing issues and challenges like Security, Elasticity, Resource  management and scheduling, QoS (Quality of Service) and Resource Allocation, Identity and Access Management.

**Text Books:**
1.  Distributed and Cloud Computing From Parallel Processing to the Internet of Things- Kai Hwang, Jack Dongarra, Geoffrey Fox
2.  Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011

**Reference Book:**
1. Distributed Algorithms-Nancy Lynch
2. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
3. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012

**NPTEL/SWAYAM URL/ Link-** Cloud Computing and Distributed Systems, Prof. Rajiv Misra, IIT Patna- https://nptel.ac.in/courses/106104182

## MCA25VE303A: Big Data Analytics
**[Unit 1]**
Why Big Data and Where did it come from?, Characteristics of Big, Challenges and applications of Big

Data, Enabling Technologies for Big Data, Big Data Stack, Big Data distribution packages.

**[Unit 2]**
Overview of Apache Spark, HDFS, YARN, MapReduce, MapReduce Programming Model with Spark, MapReduce Example: Word Count, Page Rank etc, CAP Theorem, Eventual Consistency, Consistency TradeO-s, ACID and BASE, Zookeeper and Paxos, Cassandra, Cassandra Internals, HBase, HBase Internals.

**[Unit 3]**
Big Data Streaming Platforms for Fast Data, Streaming Systems, Big Data Pipelines for Real- Time computing, Spark Streaming, Kafka, Streaming Ecosystem.

**[Unit 4]**
Overview of Big Data Machine Learning, Mahout, Big Data Machine learning Algorithms in Mahout k means, Naïve Bayes etc. Machine learning with Spark, Machine Learning Algorithms in Spark, Spark MLlib, Deep Learning for Big Data, Graph Processing: Pregel, Giraph, Spark GraphX.

**[Unit 5]**
Introduction to mongoDB key features, Coreserver tools, MongoDB through the JavaScript' s shell, Creating and querying through Indexes, Document-oriented, principles of schema design, Constructing queries on databases, collections and documents, MongoDB query language.

**Text Book:**
1. Bart Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley and SAS Business Series.
2. Kyle Banker, Peter Bakkum and ShaunVerch, MongoDB in Action, 2nd Edition Dreamtech Press, ISBN: 978-9351199359.

**Reference Books:**
1. Rajkumar Buyya, Rodrigo N.Calheiros, Amir M Vahid Dastjerdi, Morgan Kaufmann, Big Data Principals and Paradiagram, Elsevier, ISBN: 978-0-12-805394-2
2. Anand Rajaraman, Jeffrey D.Ullman, Mining of Massive Datasets, 3$^{rd}$ edition, Cambridge University Press
3. Sima Acharya, Subhashini Chhellappan, BIG Data and Analytics, Willey publication, ISBN: 978-8126554782.

**NPTEL/SWAYAM URL/ Link-** Big Data Computing, Prof. Rajiv Misra, IIT Patna-
https://nptel.ac.in/courses/106104189

### MCA25VE303B: Full Stack Development
**[Unit 1]**
End Frameworks (e.g.,React,Angular,Vue.js), Responsive Web Design and CSS Preprocessors (e.g., Sass,

Less) Introduction to Back-End Development, Server-Side Programming (e.g., Node.js, Python, Java), Web APIs and RESTful Services Databases and SQL (e.g., MySQL, PostgreSQL),NoSQL Databases (e.g.MongoDB),Serverless Computing (e.g., AWS Lambda, Azure Functions)

**[Unit 2]**
Git and GitHub/GitLab, Code Reviews and Collaboration Workflows, Issue Tracking and Project Management (e.g., Jira, Trello)

**[Unit 3]**
Introduction to DevOps and  CI/CD, Continuous Integration (CI) and Automated Testing, Continuous Delivery (CD) and Deployment Infrastructure as Code (IaC) with Tools like Terraform or Cloud Formation, Containerization and Docker, Orchestration with Kubernetes.

**[Unit 4]**
Introduction to Cloud Computing (e.g., AWS, Azure, Google Cloud), Cloud Deployment and Scaling Strategies Cloud Services (e.g.,AWSEC2, S3, Lambda, Azure App Service), Monitoring and Logging inthe     CloudEnvironment, Web Application Security Fundamentals, Authentication and Authorization, Secure Coding Practices, Network Security and Encryption, DevSecOps and Security in CI/CD Pipelines.

**[Unit 5]**
Front-End Performance Optimization, Back-End Performance Optimization, Caching Strategies, Load Balancing and Scalability.

**Text Books:**
1. ColinIhrig, Full Stack Java Script Development with MEAN: MongoDB, Express, Angular JS, and Node.JS, Site Point; 1st Edition.

**Reference Books:**
1. https://www.w3schools.com/whatis/whatis_fullstack.asp**.**
2. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites, O'Reilly Media; 3rd edition,
3. Callum Macrae, Learning from jQuery, O'Reilly Media.

**MCA25VE303C: Software Testing and Tools**
**[Unit 1]**
Human and errors, Testing and Debugging, Software Quality, Requirement Behavior and Correctness,

Fundamentals of Test Process, Psychology of Testing, General Principles of Testing, Test Metrics.

**[Unit 2]**
Review of software development models (Waterfall Models, Spiral Model, W Model, V Model) Agile Methodology and Its Impact on testing, Test Levels (Unit, Component, Module, Integration, System, Acceptance, Generic)Static Testing Structured Group Examinations Static Analysis Control flow & Data flow, Determining Metrics.

**[Unit 3]**
Dynamic Testing Black Box Testing Equivalence Class Partitioning, Boundary Value Analysis, State Transition Test, Cause Effect Graphing and Decision Table Technique and Used Case Testing and Advanced black box techniques White Box Testing Statement Coverage, Branch Coverage, Test ofConditions, PathCoverage, Advanced WhiteBox Techniques, Instrumentation and Tool Support Gray Box Testing, Intuitive and Experience Based Testing.

**[Unit 4]**
Test Organization Test teams, tasks and Qualifications Test Planning Quality Assurance Plan, Test Plan, Prioritization Plan, Test Exit Criteria Cost and economy Aspects Test Strategies Preventive versus Reactive Approach, Analytical versus heuristic Approach Test Activity Management, Incident Management, Configuration Management Test Progress Monitoring and Control Specialized Testing: Performance, Load, Stress & Security Testing.

**[Unit 5]**
Automation of Test Execution, Requirement tracker, High Level Review Types of test Tools Tools for test management and Control, Test Specification, Static Testing, Dynamic Testing, Non functional testing Selection and Introduction of Test Tools Tool Selection and Introduction, Cost Effectiveness of Tool . Introduction to OO testing concepts, Differences in OO testing.

**Text Book:**
1. Software Engineering–A practitioner's approach by Roger S. Pressman, 5th Edition, McGraw Hill.

**Reference Books:**
1. Software Testing Foundations, Andreas Spillner, Tilo Linz, Hans Schaefer, Shroff Publishers and Distributors.
2. Software Testing: Principles and Practices by Srinivasan D and Gopal swamy R, Pearson Ed, 2006.
3. Foundations of Software Testing by Aditya P.Mathur–Pearson Education custom edition 2000.
4. Testing Object Oriented Systems: models, patterns and tools, Robert V Binder, Addison Wesley, 1996

**NPTEL/SWAYAM URL/ Link-** Software Testing, Prof. Meenakshi D'souza, IIIT Bangalore-
https://nptel.ac.in/courses/106101163

### MCA25OE304A: Enterprise Resource Planning

**[Unit 1]**
Information System and Its Components, Value Chain Framework, Organizational Functional Units,

Evolution of ERP Systems, Role of ERP in Organization, Three-Tier Architecture of ERP system.

**[Unit 2]**

Project Preparation, Initial Costing, Requirement Engineering, ERP Solution Selection, Technical Planning, Change Management and Training Plan, Implementation and Deployment Planning, Configuration, Custom Coding, Final Preparation, Go-live.

**[Unit 3]**

Business Processing Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management (SCM), Customer Relationship Management (CRM), Electronic Data Interchange (EDI).

**[Unit 4]**

MRP - Material Requirement Planning, BOM - Bill of Material, MRP - Manufacturing Resource Planning, DRP - Distributed Requirement Planning, PDM - Product Data Management, ERP Modules Finance, Plant Maintenance, Quality Management, Materials Management,

**[Unit 5]**

Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality, Costs, Improved Information Accuracy and Design-making Capability Introduction to ERP tools Open ERP JD Edwards- Enterprise One Microsoft Dynamics- CRM Module SAP.

**Text Book:**

1. Enterprise Resource Planning, A Managerial Perspective by Veena Bansal, PEARSON.
2. Enterprise Resource Planning: Concepts and Practices by Vinod Kumar Garg, N. K. Venkitakrishnan

**Reference Books:**

1. Enterprise Resource Planning - Alexis Leon, Tata McGraw Hill.
2. Guide to Planning ERP Application, Annetta Clewwto and Dane Franklin, McGRaw-Hill, 1997.
3. The SAP R/3 Handbook, Jose Antonio, McGraw – Hill.
4. E-Business Network Resource planning using SAP R/3 Baan and Peoplesoft: A Practical Roadmap for Success by Dr. Ravi Kalakota.

**MCA25OE304B: E-Commerce**

**[Unit 1]**

Introduction to Electronic Commerce: Motivation, brief history of e-commerce, Advantages and

Disadvantages, Benefits to Organization, Benefits to society, Forces behind E commerce industry framework, Architectural framework. Traditional Commerce v/s E- Commerce: Traditional business commerce, Rules for traditional commerce, Main difference between e-commerce and traditional commerce, Technical & non-technical limitations, Enterprise Data Interchange.

**[Unit 2]**
E- Commerce Models: Business - to - Business (B2B), Business - to - Consumer (B2C), Consumer - to - Consumer (C2C), Consumer - to - Business (C2B), Business - to - Government (B2G), Government - to - Business (G2B), Government - to - Citizen (G2C), Intra organizational ecommerce and Inter organization ecommerce. Network infrastructure for ecommerce: Infrastructure for ecommerce, Meaning of I-Way, Market forces behind I-way, Market Drivers of I-Way, Component of I-way access equipment, The I-way Infrastructure and Strategic Alliances.

**[Unit 3]**
Security in E-Commerce: Client-Server network, Emerging client server security threats, Threats to Servers, Protecting the Environment, Trust-Based Security, Security through Obscurity (STO), Password Schemes, Biometric Systems. Threats and Security: Software Agents and Malicious code, Introduction to Cryptography. Security tool in E-Commerce: Introduction to web security, Firewalls & its types, Configuration and Limitations of Firewall, Risks in E-commerce, Data & Gateway Security, Fraud schemes in E-commerce, Handling Transactions, Online Transactions Processing - From start to finish,

**[Unit 4]**
Electronic Data Interchange: EDI Definition, Benefits of EDI, Shortened Ordering Time, EDI Example, Legal Requirement in E-Commerce, Limitations of EDI. Electronic Payment System: Overview of Electronics Payments, Types of Electronic Payment Systems, Digital Token-Based Electronic Payment Systems, Smarts Cards, Credit Card, Debit Card Emerging financial Instruments, Home Banking, Online Banking, Wallet. Intranet and Extranet: Development of Intranet, Extranet and Intranet Difference, Role of Intranet in B2B Application.

**[Unit 5]**
Legal Issues related to E-commerce in India: E- Governance of India, Cyber Law in India, Computer Crime, Types of Crimes, Introduction to Ethics, Cyber laws, Types of Cyber Crimes, Characterstics of Cyber crimes, Purpose of Cyber law, Legal Framework in India, IT Acts in India, Amendments.

**Text Book:**
1. E-Business & Commerce: Brahm Cazner, Wiley dreamtech.

**Reference Books:**
1. Ravi Kalakota & A. B. Whinston - "Frontiers of Electronic Commerce", Pearson Education, India, 1999.
2. Daniel Minoli, Emma Minoli: "Web Commerce Technology Handbook", Tata McGraw Hill
3. Bajaj and Nag. "E-Commerce the cutting edge of Business". TMH.
 NPTEL/SWAYAM URL/ Link- E-Commerce, Prof. Subodh Kesharwani, Indira Gandhi National Open
 University, New Delhi- https://onlinecourses.swayam2.ac.in/nou25_cm16/preview

### MCA25OE304C: Innovation and Entrepreneurship Development

**[Unit 1]**
Entrepreneurship Fundamentals & Context Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. Gamified role

play based exploration aligned to one's short term career aspiration and ambition. An understanding of how to build entrepreneurial mindset, skillsets, attributes and networks while on campus.

**[Unit 2]**

Problem & Customer Identification: Understanding and analysing the macro Problem and Industry perspective, technological, socio-economic and urbanization trends and their implication on new opportunities. Identifying passion, identifying and defining problem using Design thinking principles. Analysing problem and validating with the potential customer. Iterating problem-customer fit. Understanding customer segmentation, creating and validating customer personas.

**[Unit 3]**

Solution design & Prototyping: Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition. Developing Problem-solution fit in an iterative manner. Developing a feasibility prototype with differentiating value, features and benefits. Initial testing for proof-ofconcept and iterate on the prototype. Core Teaching Tool: Venture Activity, nocode Innovation tools, Class activity.

**[Unit 4]**

Opportunity Assessment and Sizing: Assess relative market position via competition analysis, sizing the market and assess scope and potential scale of the opportunity. Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach Business planning: components of Business plan- Sales plan, People plan and financial plan, Financial Planning, understanding basics of Unit economics and analysing financial performance.

**[Unit 5]**

Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt & Equity, Map the Start-up Lifecycle to Funding Options.

**Text Book:**
1. , Dr. Shubhendu Shekher Shukla, Innovation and Entrepreneurship, S.K Kataria & Sons, 2025
**Reference Books:**
1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
2. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business.
3. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons.

**NPTEL/SWAYAM URL/ Link-** Innovation, Business Models and Entrepreneurship, Prof. Rajat Agrawal, Prof. Vinay Sharma, IIT Roorkee- https://nptel.ac.in/courses/110107094

## MCA25PC305L: Practical III (ML & CC Lab)
### A) ML Lab

**List of Experiment:**

1. Write a program to Perform Exploratory Data Analysis and Data Visualization in Python.

2. Write a program to Perform Data Preprocessing through various feature-engineering algorithms by python.

3. Write a program to implement the Implement Simple Linear Regression and Multiple Linear Regression for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test datasets and Visualize model with Python.

4. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample and Visualize model with Python.

5. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Compute the accuracy of the classifier, considering fewtest datasets and Visualize model with Python.

6. Write a program to implement the Naïve Bayes algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets with Python.

7. Write a program to implement the Kernel Logistic Regression Algorithm for a sample training data set stored as a.CSV file. Compute the accuracy of the classifier, considering few test data sets and Visualize model with Python.

8. Write a program to implement the Kernel SVM Algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets and Visualize model with Python.


### B) CC Lab

**List of Experiment:**

1. Write a client and server program to calculate the value of PI, in which server calls the remote procedure of the client side (C programming)

2. Create an word document of your class time table and store locally and also on cloud and share it (use www.zoho.com, docs.google.com)

3. Create your resume in an eat format using google and zoho cloud Programs on PaaS.

4. Discuss processor virtualization, memory virtualization, I/O virtualization in VMWare.

5. Setup Azure DevOps, Import Code and Create the Azure DevOps Build Pipeline.

<h1 style="text-align:center">MCA25EL306P: Project Stage-I</h1>

**Guidelines for the project phase–I:**
The project should enable the students to combine the theoretical and practical concepts studied in his / her academics. The project work should enable the students to exhibit the ability to work in a team, develop planning and execute skills and perform analyzing and trouble shooting of their respective problem chosen for the project. The students should be able to write technical report, understand the importance of teamwork and group task. The students will get knowledge about literature survey, problem definition, its solution, and method of calculation, trouble shooting, costing, application and scope for future development.

**Project work:**
The project work is an implementation of learned technology. The knowledge gained by studying various subjects separately supposed to utilize as a single task. A singal student will have to work on assigned work. The topic could be a product design, specific equipment, live industrial problem etc. The project work involve sexperimental/ theoretical/ computational work. It is expected to do necessary literature survey by referring current journals belonging to Information Technology reference books and internet. After finalization of project, requisites like equipment's, data, tools etc. should be arranged.

**Project Activity:**
The project groups should interact with guide, who in turn advises the group to carry various activities regarding project work on individual and group basis. The group should discuss the progress every week in the project hours and follow further advice of the guide to continue progress. Guides should closely monitor the work and help the student from time to time. The guide should also maintain a record of continuous assessment of project work progress on weekly basis.

**Phase-I:**
1. Submission of project/ problem abstract containing problem in brief, requirements, broad area, applications, approximate expenditure if required etc.
2. Problem definition in detail.
3. Literature survey.
4. Requirement analysis.
5. System analysis (Draw DFD upto level 2, at least).
6. System design, Coding/ Implementation (30 to 50%).

<h1 style="text-align:center">MCA25VE307: Moral and Ethical Development</h1>

**[Unit 1]**

Morals, Values and Ethics, Integrity, Work Ethics, Service Learning, Civic Virtue, Respect for Others, Living Peacefully, Caring, Sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character.

**[Unit 2]**

Introduction to Professional Ethics, Morals, Values and Ethics, Personal and Professional, Sensé of Engineering Ethics, Code of Ethics by NSPE , Making decisions with ethical dimensions , definition, roadmap to ethical decision making, common standards, internal obstacles, bias, empathy.

**[Unit 3]**

Philosophical approaches to Business Ethics, ethical reasoning, ethical issues in business, Social Responsibility of Business conflict of interest, cultural relativism, Ethical leadership, Resisting, un-ethical authority and domination, Global Business Ethics.

**[Unit 4]**

Ethics in changing domains of Research, academic integrity, intellectual honesty, Role of Engineers and Managers, Ethical issues in Diverse workplace, competition, free will, Confidentiality, employee rights, Intellectual property rights, discrimination.

**[Unit 5]**

Ecology, Engineering, Economy, Risk benefit analysis and reducing risk SDGs, Corporate social responsibility and Corporate Sustainability, CSR in India, Sustainability Case Studies.

**Reference Books:**

1. Subramanian R. Professional Ethics, Oxford Publication, 2013.
2. Nagarasan R.S. Professional Ethics and Human Values, New Age International Publications, 2006.
3. Mike W Martin and Roland Schinzinger, Ethics in Engineering,4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014

**MCA25AU308: Disaster Maganement**

**[Unit 1]**

Introduction on Disaster Different Types of Disaster:

A) Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc

B) Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc. Causes, effects and practical examples for all disasters.

**[Unit 2]**

Risk and Vulnerability Analysis

1. Risk: Its concept and analysis

2. Risk Reduction

3. Vulnerability: Its concept and analysis

4. Strategic Development for Vulnerability Reduction

**[Unit 3]**

Disaster Preparedness and Response Preparedness-

1. Disaster Preparedness: Concept and Nature

2. Disaster Preparedness Plan

3. Prediction, Early Warnings and Safety Measures of Disaster.

4. Role of Information, Education, Communication, and Training.

5. Role of Government, International and NGO Bodies.

6. Role of IT in Disaster Preparedness

**[Unit 4]**

Rehabilitation, Reconstruction and Recovery

1. Reconstruction and Rehabilitation as a Means of Development.

2. Damage Assessment

3. Post Disaster effects and Remedial Measures.

4. Creation of Long-term Job Opportunities and Livelihood Options,

5. Disaster Resistant House Construction

6. Sanitation and Hygiene

7. Education and Awareness,

8. Dealing with Victims' Psychology,

9. Long-term Counter Disaster Planning

10. Role of Educational Institute.

**Reference Books:**

1. Dr. Mrinalini Pandey, Disaster Management, Wiley India Pvt. Ltd.

2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill Education (India) Pvt. Ltd.

3. Jagbir Singh Disaster Management: Future Challenges and Opportunities, K W Publishers Pvt. Ltd

**MCA25AC401P: Project Stage –II (In-house)/ Internship and Project in the Industry**

In this course, it is expected that students will go to industry for internship for one semester and do industry-based project in that period. Student will be assigned one department or one Industry guide to monitor progress of the student. After, completion of the Internship student will submit project report to the dept. and project examination will be conducted in consultation with the industry guide. In case, if student not opting / not doing Internship in the Industry, such students can do project work in the department.