।। सा विद्या या विमुक्तये ।।
स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड
"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)
Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade
25 1994 - 2019 SILVER JUBILEE YEAR

## ACADEMIC (1-BOARD OF STUDIES) SECTION

**Phone: (02462) 229542**
**Fax : (02462) 229574**
**Website: www.srtmun.ac.in**
**E-mail: bos.srtmun@gmail.com**

**प्रस्तुत विद्यापीठाच्या संकुलातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील प्रथम वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्याबाबत.**

# प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक ०८ जून २०१९ रोजी संपन्न झालेल्या ४४व्या मा. विद्या परिषद बैठकीतील ऐनवेळचा विषय क्र.११/४४–२०१९** च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **प्रस्तुत विद्यापीठाच्या संकुलातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील प्रथम वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्यात येत आहेत.

1. Botany
2. Certificate Course in Industrial Safety, Health and Environmental Management (SHM)
3. Chemistry
4. Computer Application
5. Computer Network
6. Computer Science
7. Geophysics
8. Mathematics
9. M.C.A.
10. Microbiology
11. Physics
12. Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
**जा.क्र.:** शैक्षणिक–१/परिपत्रक/संकुले/पदव्युत्तर–सीबीसीएस अभ्यासक्रम/२०१९–२०/**४६५**

**दिनांक :** ११.०७.२०१९.

स्वाक्षरित/–
**उपकुलसचिव**
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) मा. संचालक, सर्व संबंधित संकुले, विद्यापीठ परिसर, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

# SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

(NAAC Re-accredited with 'A' Grade)

## School of Computational Sciences

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड.

**CURRICULUM FRAMEWORK AND SYLLABUS**

**FOR OUTCOME BASED EDUCATION IN**

**Master of Computer Applications (M.C.A) Degree Program**

**Program Code: SCS-S-MCA-PG (13-2-4-01) ( For Campus Reference only)**

**FOR THE STUDENTS ADMITTED FROM THE**

**ACADEMIC YEAR 2019-2020 ONWARDS**

www.srtmun.ac.in

BOS meeting approved: __/__/2019 Approved in ____ Academic Council meeting on __/__/2019

# SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

# SCHOOL OF COMPUTATIONAL SCIENCES

## VISION

"Enlightened Student: A Source of Immense Power"

## MISSION

"Swami Ramanand Teerth Marathwada University pledges itself to uphold zealously its mission of promoting acquisition and dissemination of knowledge through fearless and sustained pursuit of excellence aimed at molding personalities of students entering its portals to grow with an upright character filled with enlightenment and to be the value adhering members of a just and humane society".

**As a Department, We are committed to**

- Achieve academic excellence in Computer Applications through innovative teaching and learning processes.
- To prepare the students to be professionally competent to face the challenges in the industry.
- Promote inter-disciplinary research among the faculty and the students to create state of art research facilities.
- To promote quality and ethics among the students.
- Motivate the students to acquire entrepreneurial skills to become global leaders.

The School of Computational Sciences exists since inception of the University and offers Masters, M.Phil. and Ph.D. programs.

Master Degree Programs, M.Sc.(CS), M.Sc.(CN) and M.Sc.(CA), being officered are two years full time post graduate programs revised with industry expectations. These all programs have four semesters, which are normally completed in two years.

The MCA program is a three-year full time AICTE approved program which is normally completed in six semesters.

Above all programs are offered as per CBCS (Choice Based Credit System) pattern, in which within discipline and cross discipline migration choices of courses are given to the students under open electives and subject electives. The students can choose open electives from the same program or from other programs of the same school or from other programs of other schools. The Evaluation of performance of a student for the course under Choice based Credit System (CBCS) is based on principle of continuous assessment through internal and external evaluation mechanisms. CBCS policy had emphasis given on imparting skills to students.

The eligibility criteria and fees structure shall be same as that of Campus Prospectus.

# SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

## SCHOOL OF COMPUTATIONAL SCIENCES

Draft Report on CBCS enabled syllabi of MCA Program.

In compliance with the Hon‟ble Vice Chancellor‟s directions, resolution passed by the Hon‟ble Management Council and in the light of circular being communicated by the Deputy Registrar, Academics, a committee comprising of the Director of the School, Head Department and three faculties from the school have strived hard for reframing and revision the syllabi of 3 years full time MCA course which exists in the school of Computational Sciences.

The committee members agreed unanimously to adhere the guidelines given by AICTE, New Delhi were observed for MCA program well as SRTMUN policy draft on Choice Based Credit System – CBCS, being circulated to the school MCA program. The model CBCS syllabus framed by UGC, New Delhi was also reviewed. It was decided to have at least one open elective as a compulsory course in the program, in all the semesters. Accordingly, the interdisciplinary applications of Computers, IT, Scientific computing allied courses were found out across the various disciplines and relevant courses have been spread over all semesters of all the streams with two internal credits in each semester. The Communication Skills (given in UGC Scheme as a compulsory Ability Enhancement Course (AECC) to be taught) was also introduced as an Open Elective in early semesters.

While restructuring the courses to fit into the CBCS pattern, care has been taken to consider local needs placed in a national context so as to fulfill global demands. Due care is taken to introduce application oriented interdisciplinary learning. Therefore, students pursuing post-graduation degrees over here, in specific courses are encouraged to imbibe knowledge and skills which enable all round personality development, skill enhancement and in-depth learning of technology platforms. Under the CBCS pattern, students would post graduate MCA program with a total number of 26 credits which includes minimum 05 compulsory credits from theory subjects, 4 credits from practical, and 2 credits from University recognized MOOC/ (NPTEL / SWAYAM / others ) OR Intra / Inter Departmental / School Open Electives Wherein the students would be required to choose the courses from the choices available in each semester from each up to $5^{th}$ semester and at the $6^{th}$ semester Major Project Development Activity of 25 credits.

The directions given by Hon‟ble Pro Vice Chancellor sir reading intra school and inter school open electives was specifically accepted by the committee and due care is taken to embed them. Accordingly, horizontal and vertical migration among MCA programs with other programs offered by other schools in the campus is allowed.

The discussions with Hon‟ble Pro Vice Chancellor sir lead to following specific agenda of the CBCS syllabi

1. To provide mobility and flexibility for students within and outside the Computational Science School as well as to migrate between institutions

2. To help students to learn at their own pace

3. To have provision for audit and credit courses

4. To impart more job-oriented skills to students

5. To make any course multi-disciplinary in approach

In order to move ahead on the agenda, the committee members continuously sat together on all week days and finalized all semesters one by one. There were discussions on a uniform structure per semester, which is likewise to be extended across all semesters so as to make a MCA program worth of 155 credits, five semesters have 26 credits each and $6^{th}$ semester of 25 credits.

Accordingly, 05 theory courses of 04 credit each, 02 Lab courses of 02 credits each and 01 open elective course of 02 credits, were drafted for Semester 01 to Semester 03 of MCA program. These courses are marked as compulsory foundation and core courses which at as brush up / revision courses for entry level students. This was intentionally done as the student population coming to school primarily comes from Permanent Non-Grant colleges.

The fourth and fifth semesters have compulsory and departmental elective courses to be completed, with open electives. These are program specific courses which enable in depth learning in the allied courses. The electives are designed as per the relevant demand of a course in IT industry / Research area. In fourth semester, there are 03 theory courses of 04 credits each, 02 specialized electives of 04 credits, 02 Lab courses of 02 credits and 01 open elective of 02 credits. This also sums up to 26 credits.

In the fifth semester there are 03 theory courses of 04 credits each, 02 specialized elective of 04 credits, 02 Lab courses of 02 credits each, 01 mini project activity of 02 credits, This also sums up to 26 credits.

In the Sixth semester, A major project development activity was intentionally introduced for 25 credits so as give a real time feel of industry activities to the students. A unified course numbering system was used for proper numbering of all courses, viz,

Foundation Course

Core Courses

Program Specific Courses

Department Specific Elective Subject for all programs

Mini and Major Project

Open Elective

The definition of credit in CBCS draft is finally taken as per the SRTMUN- CBCS policy, as a weightage to a course, to be given in relation to the hours assigned for the course. Generally, one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours.

First three semesters have compulsory foundation and core courses along with open electives. The fourth and fifth semesters of the program consists of three major components. They are program specific core courses, elective courses and department specific elective courses. Also, a compulsory component of open elective is mandatory per semester.

A core course is the course offered by the parent program, totally related to the major subject, components. Elective Course is also offered by the parent program whose objective is to provide choice and flexibility within the program. The student can choose his/her elective paper. Elective is related to the major subject. The difference between core course and elective course is that there is choice for the student. The program is at liberty to offer certain number of elective courses any semester.

The Departmental elective course is an inter program course offered by a program for the students belonging to other programs. The objective is to provide mobility and flexibility outside the parent program. This is introduced to make every course multi-disciplinary in nature. It is to be chosen from a list of courses offered by various programs in the school. The list is given in the syllabus copy.

The open electives are of application oriented and inter-disciplinary in nature. These courses can be offered by the concern program or concern school for the students in same program / school or for other schools. These have 02 internal credits.

All faculties were told to outline the specific topics of their interest and elaborate them further with objectives and outcome. The final version of syllabi is outcome oriented which smoothes the understanding of students regarding the skills he/she will be getting after the completion of the course. This has also made faculties to be specialized of the courses being drafted by them.

In order to see the employability of the skills being imparted through the revised syllabi, the syllabi draft was forwarded to Industry experts. Due care is taken to incorporate suggestions and modifications given by these experts. These experts are 1) Dr. Parvin Pawar, Philips Research Lab, Bangalore 2) Mr. Sanjay Kurundkar, Creve Info Tech Ltd, Pune 3) Mr. Ashish Tendulakr, Google Inc, Pune

UGC and AICTE guidelines regarding CBCS syllabi workout were duly considered while framing underlined syllabi. Efforts are made for incorporating skill enhancement components in the underlined syllabi. In order to offer more choices for learning, the certified MOOC courses, Spoken tutorial courses and SWAYAM courses are considered equivalent for open electives. However, in these cases, students must produce certificate towards successful completion of the said courses during the course year in order to claim credits for open electives.

It was decided to pass this draft for final approval from the Administrative Authorities including Dean of the faculty, Hon‟ble Vice Chancellor sir,

Submitted with respects

1. Dr. G.V. Chowdhary, Director

2. Dr. S. D. Khamitkar, HOD

3. Dr. H. S. Fadewar, Assistant Professor

4. Dr. P. U. Bhalcahndra, Assistant Professor

5. Mr. M. R. Mahamune, Assistant Professor

Final draft of syllabi was approved by all the faculties in the school.

1. Dr. N. K. Deshmukh, Assistant Professor

1. Dr.S. N. Lokhande, Assistant Professor

2. Mr. S. R. Mekewad, Assistant Professor

3. Ms. A. H. Sable, Assistant Professor

4. Mr. M. S. Darak. Assistant Professor

5. Mr. M. D. Wangikar, Assistant Professor

Place: Nanded

Date:

Program Educational Objectives (PEO)

Post graduates of MCA program will be

**PEO1**: Utilizing strong technical aptitude and domain knowledge to develop smart software solutions for the upliftment of society.

**PEO2**: Applying research and entrepreneurial skills augmented with a rich set of communication, teamwork and leadership skills to excel in their profession.

**PEO3**: Showing continuous improvement in their professional career through life-long learning, appreciating human values and ethics.

## Graduate Attributes for MCA Program (GA)

**1. Computational Knowledge:**

Apply domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

**2. Problem Analysis:**

Identify, formulate, research literature, and solve *complex* computing problems reaching substantiated conclusions using fundamental principles of computing sciences.

**3. Design /Development of Solutions:**

Design and evaluate solutions for *complex* computing problems that meet specified needs with appropriate consideration for cultural, societal, and environmental considerations.

**4. Conduct Investigations of Complex Computing 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.

**5. Modern Tool Usage:**

Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to *complex* computing activities, with an understanding of the limitations.

**6. Professional Ethics:**

Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

**7. Life-long Learning:**

Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

**8. Project management and finance:**

Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, to manage projects and in multidisciplinary environments.

**9. Communication Efficacy:**

Communicate effectively with the computing community, and with society at large, about *complex* computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

**10. Societal and Environmental Concern:**

Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

**11. Individual and Team Work:**

Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

**12. Innovation and Entrepreneurship**

Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

## Program Outcomes (PO) for Master of Computer Applications (2019-2020)

On completion of MCA program, the students are expected to

**PO1:** Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

**PO2:** Identify, formulate, research literature, and solve complex computing problem searching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

**PO3:** Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

**PO4:** 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**: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

**PO6:** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

**PO7:** Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

**PO8:** Demonstrate knowledge and understanding of the computing 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.

**PO9:** Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

**PO10:** Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

**PO11:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

**PO12:** Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

**PEO-PO Mapping:**

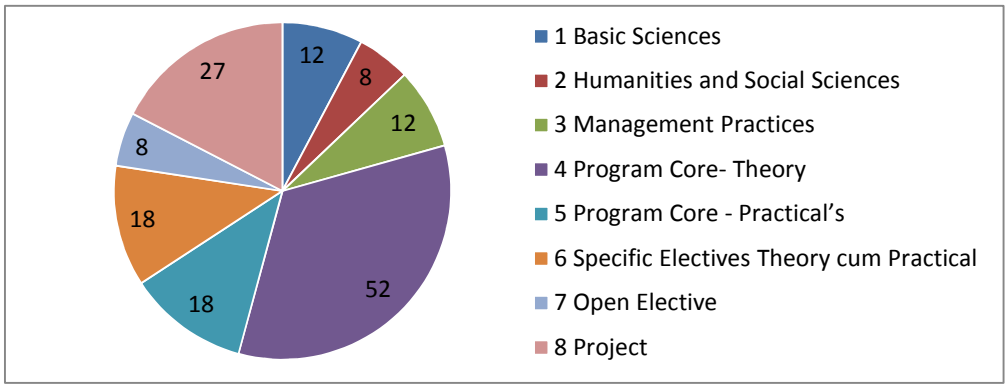
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PEO1 | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| PEO2 | | | | | | | | | | | | |
| PEO3 | | | | | | | | | | | | |

**PO-GA MAPPING:**

| | GA1 | GA2 | GA3 | GA4 | GA5 | GA6 | GA7 | GA8 | GA9 | GA10 | GA11 | GA12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PO1 | | | | | | | | | | | | |
| PO2 | | | | | | | | | | | | |
| PO3 | | | | | | | | | | | | |
| PO4 | | | | | | | | | | | | |
| PO5 | | | | | | | | | | | | |
| PO6 | | | | | | | | | | | | |
| PO7 | | | | | | | | | | | | |
| PO8 | | | | | | | | | | | | |
| PO9 | | | | | | | | | | | | |
| PO10 | | | | | | | | | | | | |
| PO11 | | | | | | | | | | | | |
| PO12 | | | | | | | | | | | | |

**Credit Distribution:**

| Sr. No. | Category of courses | Credits | Percentage of Credits to Total Credits |
|---|---|---|---|
| 1 | Basic Sciences | 12 | 7.74% |
| 2 | Humanities and Social Sciences | 08 | 5.16% |
| 3 | Management Practices | 12 | 7.74% |
| 3 | Program Core- Theory | 52 | 33.55% |
| 4 | Program Core - Practical's | 18 | 11.61% |
| 5 | Specific Electives Theory cum Practical | 18 | 11.61% |
| 5 | Open Elective | 08 | 5.16% |
| 6 | Project | 27 | 17.42% |
| | **Total Credits** | 155 | **100%** |




**Basic Science (BS) & Humanities & Social Sciences Courses:**

| Semester | Name of the Course | Category | Credits |
|---|---|---|---|
| 1 | Mathematical Foundations | BS | 4 |
| 2 | Probability & Statistics | BS | 4 |
| 3 | Graph Theory | BS | 4 |
| | | **BS Total Credits** | **12** |
| 1 | Programming Logic | HSS | 4 |
| 2 | Oral & Written Communication Skills | HSS | 4 |
| | | **HSS Total Credits** | **8** |

**Program Core, Elective & Practical Courses:**

| Semester | No. of Core Theory Courses | Credits | No. of Core Practical Courses | Credits | No. of Specific Elective Courses | Credits | No. of Open Elective Courses | Credits | Total Credits |
|---|---|---|---|---|---|---|---|---|---|
| **I** | 05 | 20 | 02 | 04 | - | - | 01 | 02 | 26 |
| **II** | 05 | 20 | 02 | 04 | - | - | 01 | 02 | 26 |
| **III** | 05 | 20 | 02 | 04 | - | - | 01 | 02 | 26 |
| **IV** | 03 | 12 | 02 | 04 | 02 | 08 | 01 | 02 | 26 |
| **V** | 03 | 12 | 03 | 06 | 02 | 08 | - | - | 26 |
| **VI** | Major Project | | | | | | | | 25 |
| | | | | | | | | **Total Credits** | **155** |
| **I to V** | **Total Credits for Core Courses** | 84 | **Total Credits for Practical Courses** | 22 | **Total Credits for Specific Elective Courses** | 16 | **Total Credits for Open Elective Courses** | 08 | 130 |
| **VI** | **Major Project** | | | | | | | | 25 |
| | | | | | | | | **Total Credits** | **155** |

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**
**SCHOOL OF COMPUTATIONAL SCIENCES**

## Scheduling of Courses

| Semester | Theory | | | | | Practical | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| I | MCA 101 Programming Logic | MCA 102 Data Structure using C | MCA 103 Computer Organization & Architecture | MCA 104 Introduction to Mgt. Functions | MCA 105 Mathematical Foundation | MCA 106 Lab-1 C Programming. | MCA 107 Lab-2 COA | MCA 108 Open Elective | 26 |
| II | MCA 201 SAD | MCA 202 DA A using C++ | MCA 203 Management Information System | MCA 204 Prob. & Stat. | MCA 205 Oral & Written Comm. Skills | MCA 206 Lab-3 SAD | MCA 207 Lab-4 C++ Programming. | MCA 208 Open Elective | 26 |
| III | MCA 301 Software Engineering | MCA 302 Visual Programming Tools. | MCA 303 Data Communications & Computer Networks | MCA 304 Relational Database Management System | MCA 305 Graph Theory | MCA 306 Lab-5 Visual Programming Tools. | MCA 307 Lab-6 RDBMS | MCA 308 Open Elective | 26 |
| IV | MCA 401 Compiler Designing | MCA 402 Java Programming. | MCA 403 Operating Systems | MCA 404 Elective-1 | MCA 405 Elective-2 | MCA 406 Lab-7 Java Programming. | MCA 407 Lab-8 Lunux OS | MCA 408 Open Elective | 26 |
| V | MCA 501 Cryptography & Net. Sec. | MCA 502 Data Mining & DW | MCA 503 Theory of Computation | MCA 504 Elective-3 | MCA 505 Elective-4 | MCA 506 Lab-9 DM & DW | MCA 507 Lab-10 Elective-4 | MCA 508 Mini Project | 26 |
| VI | MCA 601: Project Development | | | | | | | | 25 |
| | Synopsis Submission | Progress Report-1 System Analysis | Progress Report-2 Designing & Scheduling | Progress Report-3 Coding and modeling | Progress Report-4 Testing & Implementation | Project Dissertation Documentation | Via voice Project Presentation | | |
| | | | | | | | | Total Credits | 155 |

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**
**SCHOOL OF COMPUTATIONAL SCIENCES**
**Master of Computer Applications (M.C.A) Degree Program**

**COURSES OF STUDY**
**(For the candidates admitted from 2019-2020 onwards)**

**FIRST SEMESTER**

| Course Code | Name of Course | Category | No. Of Hours/Week | | | Credits |
|---|---|---|---|---|---|---|
| | | | L | T | P | |
| **Theory** | | | | | | |
| MCA 101 | Programming Logic | HSS | 4 | 1 | - | 4 |
| MCA 102 | Data Structure using C | PC | 4 | 1 | - | 4 |
| MCA 103 | Computer Organization & Architecture | PC | 4 | 1 | - | 4 |
| MCA 104 | Introduction to Management Function | MP | 4 | 1 | - | 4 |
| MCA 105 | Mathematical Foundation | BS | 4 | 1 | - | 4 |
| **Practical** | | | | | | |
| MCA 106 | Lab-1 C Programming | PCL | - | - | 6 | 2 |
| MCA 107 | Lab-2 Computer Organization & Architecture | PCL | - | - | 6 | 2 |
| Open Elective | | | | | | |
| MCA 108 | Open Elective | OE | 2 | 1 | - | 2 |
| | | **Total** | 22 | 06 | 12 | 26 |

**SECOND SEMESTER**

| Course Code | Name of Course | Category | No. Of Hours/Week | | | Credits |
|---|---|---|---|---|---|---|
| | | | L | T | P | |
| **Theory** | | | | | | |
| MCA 201 | System Analysis and Design | PC | 4 | 1 | - | 4 |
| MCA 202 | Design Analysis & Algorithm using C++ | PC | 4 | 1 | - | 4 |
| MCA 203 | Management Information System | MP | 4 | 1 | - | 4 |
| MCA 204 | Probability & Statistics | BS | 4 | 1 | - | 4 |
| MCA 205 | Oral and Written Communication Skills | HSS | 4 | 1 | - | 4 |
| **Practical** | | | | | | |
| MCA 206 | Lab-3 C++ Programming | PCL | - | - | 6 | 2 |
| MCA 207 | Lab-4 Data Communication | PCL | - | - | 6 | 2 |
| Open Elective | | | | | | |
| MCA 208 | Open Elective | OE | 2 | 1 | - | 2 |
| | | **Total** | 22 | 06 | 12 | 26 |

**THIRD SEMESTER**

| Course Code | Name of Course | Category | No. Of Hours/Week | | | Credits |
|---|---|---|---|---|---|---|
| | | | L | T | P | |
| **Theory** | | | | | | |
| MCA 301 | Software Engineering | PC | 4 | 1 | - | 4 |
| MCA 302 | Visual Programming Tools | PC | 4 | 1 | - | 4 |
| MCA 303 | Data Communication and Computer Networks | PC | 4 | 1 | - | 4 |
| MCA 304 | Relational Database Management System | MP | 4 | 1 | - | 4 |
| MCA 305 | Graph Theory | BS | 4 | 1 | - | 4 |
| **Practical** | | | | | | |
| MCA 306 | Lab-5 Visual Programming | PCL | - | - | 6 | 2 |
| MCA 307 | Lab-6 RDBMS | PCL | - | - | 6 | 2 |
| Open Elective | | | | | | |
| MCA 308 | Open Elective | OE | 2 | 1 | - | 2 |
| | | **Total** | 22 | 06 | 12 | 26 |

**FOURTH SEMESTER**

| Course Code | Name of Course | Category | No. Of Hours/Week | | | Credits |
|---|---|---|---|---|---|---|
| | | | L | T | P | |
| **Theory** | | | | | | |
| MCA 401 | Compiler Designing | PC | 4 | 1 | - | 4 |
| MCA 402 | Java Programming | PC | 4 | 1 | - | 4 |
| MCA 403 | Operating System Concepts | PC | 4 | 1 | - | 4 |
| MCA 404 | Elective-1 | PE | 4 | 1 | - | 4 |
| MCA 405 | Elective-2 | PE | 4 | 1 | - | 4 |
| **Practical** | | | | | | |
| MCA 406 | Lab-7 Java Programming | PCL | - | - | 6 | 2 |
| MCA 407 | Lab-8 Advance Data Structure | PCL | - | - | 6 | 2 |
| Open Elective | | | | | | |
| MCA 408 | Open Elective | OE | 2 | 1 | - | 2 |
| | | **Total** | 22 | 06 | 12 | 26 |

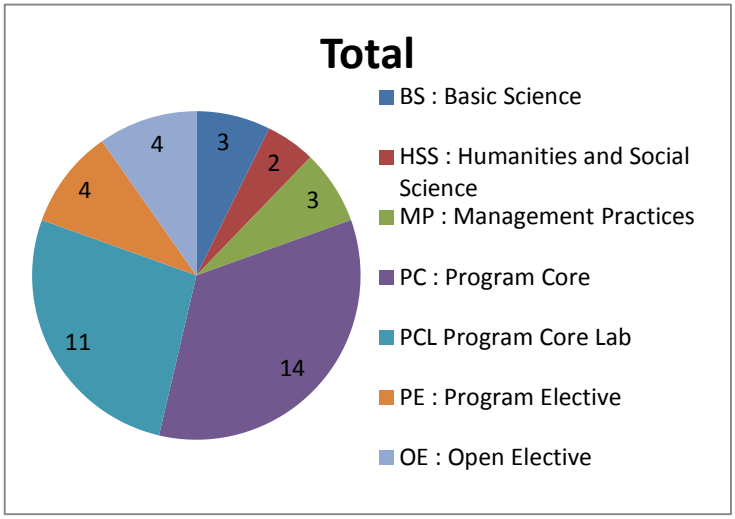
**FIFTH SEMESTER**

| Course Code | Name of Course | Category | No. Of Hours/Week | | | Credits |
|---|---|---|---|---|---|---|
| | | | L | T | P | |
| **Theory** | | | | | | |
| MCA 501 | Cryptography & Network Security | PC | 4 | 1 | - | 4 |
| MCA 502 | Data Mining & Data Warehousing | PC | 4 | 1 | - | 4 |
| MCA 503 | Theory of Computation | PC | 4 | 1 | - | 4 |
| MCA 504 | Elective-3 | PE | 4 | 1 | - | 4 |
| MCA 505 | Elective-4 | PE | 4 | 1 | - | 4 |
| **Practical** | | | | | | |
| MCA 506 | Lab-7 Java Programming | PCL | - | - | 6 | 2 |
| MCA 507 | Lab-8 Based on Elective-4 | PCL | - | - | 6 | 2 |
| MCA 508 | Mini Project | PC | - | - | 6 | 2 |
| | | **Total** | 20 | 05 | 18 | 26 |

**SIXTH SEMESTER**

| Course Code | Name of Course | Category | No. Of Hours/Week | | | Credits |
|---|---|---|---|---|---|---|
| | | | L | T | P | |
| | | | | | | |
| MCA 601 | Major Project Activity | PC | - | - | 12 | 25 |
| | | **Total** | - | - | 12 | 25 |

| | |
|---|---|
| PC | : Program Core |
| BS | : Basic Science |
| HSS | : Humanities & Social Science |
| MP | : Management Practices |
| PCL | : Program Core Lab |
| PE | : Program Elective |
| OE | : Open Elective |
| L | : Lecture |
| T | : Tutorial |
| P | : Practical |



**Notes**

1. For Theory, 04 credits means 02 internal credits and 02 external credits
2. For Practical, 02 credits means 01 internal and 01 external credits
3. For Mini Project Development Activity, 02 credits are purely internal
4. For Major Project Development Activity, 12 Internal and 13 External Credits
5. For Open electives, 02 credits are purely internal credits
6. Student has to earn at least 02 credits in any semester from the interdisciplinary open elective course offered by other school.
7. * Internal Assessment evaluation pattern will differ from subject to subject and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern
8. ** External Assessment Examination will be conducted for maximum marks of 50 marks for the award of end semester examination marks

| Code: | MCA101 | Programming Logic | Credits: 04 |
|---|---|---|---|
| | | | |
| **Course Objectives:** | | | |
| This course provides a complete introduction to programming in C, including both ANSI C and Kernighan & Ritchie C. In addition to covering basic syntax and semantics, the course emphasizes problem solving methodology and modular programming techniques. | | | |
| | | | |
| **Course Outcome:** | | | |
| Upon successful completion of this course, students will understand the facility in using common programming constructs, including loops and conditionals; Facility in performing stream input/output; Facility in incorporating auxiliary libraries into a C program. | | | |
| CO1: Describe the reason why different constructs are available for iteration, such as "for" loops, "do...while" loops<br>CO2: Demonstrate the difference between iteration and recursion in terms of C programming<br>CO3: Develop C programs for arrays and linked lists<br>CO4: Develop C programs for Data structure concept with functions<br>CO5: Summarize the Hardware interaction using Port I/O<br>CO6: Develop C programs for File Management concept | | | |
| **Unit-1:** | **Introduction** | | |
| What is a Programming Language, What is a Compiler, C Syntax and Constructs<br>Writing C Programs Gearing up with logic and algorithms, flowcharts. Building logic for writing C Programs. | | | |
| | | | |
| **Unit-2:** | **C programming constructs** | | |
| Basic input and Output in C , variables, declarations, operators, functions<br>Steps to Compiling a Program , Compilation Phases, Multi-File Compilation, Header Files The Standard Library | | | |
| | | | |
| **Unit-3:** | **Advanced C programming features** | | |
| Control structures and Loops Pointers, Addresses and Memory | | | |
| | | | |
| **Unit-4:** | **Parameter passing** | | |
| Passing Parameters by Address, Arrays, Address Structures, Pointers and Arrays | | | |
| **Text Books:** | | | |
| **1.** | The C Programming Language (2nd edition), Brian W. Kernighan, Dennis M. Ritchie, Prentice Hall Software Series. | | |
| **2.** | C : The Complete Reference by Herbert Schildt. | | |
| **Reference Books** | | | |
| **1.** | Programming in ANSI C by E Balagurusamy | | |
| **2.** | Let Us C by YashavantKanetkar | | |

| **Mapping with Program Outcomes** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| CO1 | L | - | - | - | - | - | - | - | - | - | - | - |
| CO2 | S | S | S | M | S | - | M | - | - | M | - | - |
| CO3 | S | S | S | M | S | - | - | - | M | - | - | - |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO4 | S | S | S | M | S | - | M | - | - | - | - | - |
| CO5 | M | - | - | - | - | - | M | - | - | M | - | - |
| CO6 | S | S | S | M | S | - | - | - | - | - | - | - |
| S- Strong; M-Medium; L-Low | | | | | | | | | | | | |

| Code: | MCA 102 | Data Structures using C | Credits: 04 |
|---|---|---|---|

**Course Objectives:**

1. IT will demonstrate familiarity with major algorithms and data structures.
2. Analyze performance of algorithms.
3. Choose the appropriate data structure and algorithm design method for a specified application.
4. Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs.
5. Use various data structures effectively in application programs.
6. Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, merge sort, quick sort and heap sort.
7. Understand and apply fundamental algorithmic problems including Tree traversals, Graph traversals, and shortest paths.
8. Demonstrate understanding of various searching algorithms.
9. Compare different implementations of data structures and to recognize the advantages and disadvantages of the different implementations.

**Course Outcome:**

CO1: Explain the organization and operations of data structures Stack, Queues, Trees, Graphs, Heaps and Hash tables.
CO2: Compare and contrast the functionalities and applications of different data structures
CO3: Demonstrate specific search and sort algorithms using data structures given specific user requirements.
CO4: Apply the operations of data structures in designing software procedures based on specific requirements
CO5: Assess the applicability of given data structures and associated operations to real time computer applications
CO6: Identify suitable algorithms with appropriate data structures for real time software requirements
CO7: Modify the existing operations of data structures for changing needs of the software requirements

| Unit-1: | Introduction to Algorithm |
|---|---|

Data, Variables ( Local and Global), Data types, arrays Introduction to Algorithm, The efficiency of Algorithms, Analysis of Algorithms, overview of Space and Time Complexities, some fundamental algorithms for exchange , counting , summation

| Unit-2: | Introduction to data structures |
|---|---|

Introduction to data structures, Basic terminology, Primitive data structure operations
Overview of STACKS, QUEUES, LINKED LISTS, BINARY TREES and GRAPHS ( Basic Definition , Representations, Characteristics , Types, Applications )

| Unit-3: | Tree and Graph |
|---|---|

Minimum Spanning Trees, Growing a minimum spanning tree, The algorithms of Kruskal and Prim Graphs : DFS and BFS algorithms associated with Graphs, Single-source shortest Paths, The Bellman-ford algorithm

| Unit-4: | Sorting and Searching |
|---|---|

Introduction to searching and sorting problems, Linear search , Binary search, Selection sort

| | |
|---|---|
| , Bubble sort , Insertion sort , Merge sort, Complexities of searching and sorting algorithms | |
| | |
| **Unit-5:** | **Divide and Conquer Techniques** |
| Divide and conquer, General method, Binary search, Merge sort, Strassen‟s matrix multiplication | |
| | |
| **Unit-6:** | **Advanced Data Structure** |
| Introduction to Greedy method, The general method, Container loading knapsack problem, Introduction to Dynamic Programming, General method, Introduction to NP Theory | |
| | |
| **Text Books:** | |
| **1.** | Fundamentals of Computer Algorithms- Ellis Horowitz, Satraj Sahani, University Press |
| **2.** | Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition. |
| **Reference Books** | |
| **1.** | How to solve it by Computers- R.G. Dromey , 8th Edition , Pearson Education |
| **2.** | Data Structures, Lipschutz , Tata McGraw Hills |

**Mapping with Program Outcomes**

| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **P11** | **P12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | M | - | - | - | - | - | - | - | - | -- | - | - |
| **CO2** | M | L | - | - | - | - | - | - | - | - | - | - |
| **CO3** | S | L | - | - | - | - | - | - | - | - | - | - |
| **CO4** | S | L | M | L | L | - | M | - | - | - | - | - |
| **CO5** | S | L | M | M | L | - | S | - | - | - | - | - |
| **CO6** | S | L | M | M | - | - | S | - | - | - | - | - |
| **CO7** | S | L | M | M | L | - | S | - | - | - | - | - |

| Code: | MCA-103 | Computer Architecture & Organization | Credits: 04 |
|---|---|---|---|

**Course Objectives:**

1. To have a thorough understanding of the basic structure and operation of a digital computer.
2. To study the different ways of communicating with I/O devices and standard I/O interfaces.
3. To learn the architecture and assembly language programming of 8085microprocessor.
4. To study peripherals and their interfacing with 8085 microprocessor.

**Course Outcome:**

CO1: Explain about computer architecture
CO2: Understanding Logic gates, flip flops and counter
CO3: Pipeline processing
CO4: Compute simple arithmetic operations for fixed-point and Apply floating- point addition, subtraction, multiplication & division.
CO5: Develop a base for advance micro-processors
CO6: Learn the concepts of parallel processing, pipelining and inter processor communication.
CO7: Exemplify in a better way the I/O and memory organization.
CO8: Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

**Unit-1:**

Number system :Introduction to Number system, BCD, ASCII, Conversion of Numbers from one Number system to the other, Binary arithmetic, Signed numbers , 1"s and 2"s complement method.

**Unit-2:**

Logic Gates: Basic Logic Gates , Basic Theorems and Properties of Boolean Algebra , NAND, NOR implementation, Sum of Products, Product of Sums, Karnaugh map, Don't Care Conditions.

**Unit-3:**

Processor Organization :General Register Organization, Stack Organization, Addressing modes, Instruction codes, Instruction Formats.

**Unit-4:**

Control Unit :Register transfer and micro operations, Timing and Control, Control Memory, Micro programming, Hard wired control

**Unit-5:**

Introduction to Microprocessor : Internal Architecture, Instruction Set

**Unit-6:**

Input – Output organization :Peripheral Devices, Input /Output interface, Asynchronous Data Transfer (Strobe & Handshaking Method), Modes of Transfer,

**Text Books:**


| | |
|---|---|
| **1.** | Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw-Hill. |

| | |
|---|---|
| **2.** | John P. Hayes, "Computer Architecture and Organization", Third Edition. |
| **3.** | B. Govindarajulu, "Computer Architecture and Organization: Design Principles and Applications", Second Edition, Tata McGraw-Hill. |
| **Reference Books** | |
| **1.** | M. Morrris Mano, "Digital Logic and Computer Design", PHI. |
| **2.** | M. Morrris Mano, " Computer system architecture " 3rd Edition, PHI/ Pearson Education. |
| **3.** | Albert Paul Malvino, Donald P. Leach, " Digital Principles and Applications " , Tata Mc GrawHill Pub. Company Ltd. |
| **4.** | J.P.Hayes, " Computer Architecture and Organization" Tata Mc Graw Hill Pub. Company Ltd. |

**Mapping with Program Outcomes**

| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | S | M | L | M | S | S | - | | - |
| **CO2** | S | S | S | M | M | L | M | M | S | - | - | - |
| **CO3** | S | S | S | M | M | L | L | M | S | - | - | - |
| **CO4** | S | S | S | M | M | L | L | M | S | - | - | - |
| **CO5** | S | S | S | M | M | L | S | M | L | - | - | - |
| **CO6** | S | S | S | S | M | L | L | M | S | - | - | - |
| **CO7** | S | S | S | S | M | L | L | M | S | - | - | - |
| **CO8** | S | S | S | S | M | L | L | M | S | - | - | - |

S- Strong; M-Medium; L-Low

| Code: | MCA -104 | Introduction to Management Functions | Credits: 04 |
|---|---|---|---|
| **Course Objectives**<br>In this paper, the domain specific knowledge from which most of the Computer applications arises will be imparted. Particulars, this paper is an overview of all functional areas of management namely, HRD, Marketing, Finance, Manufacturing, and Strategy. Some of these topics will be taught elaborately in subsequent papers. | | | |
| **Course Outcomes** | | | |
| CO1: Understanding of various management concepts and contribution of various management gurus.<br>CO2: understanding the importance of planning and controlling and how to implement it.<br>CO3: Study the motivation theories and use it in real world problems.<br>CO4: understanding the quality concepts and social responsibility of Business. | | | |
| **Unit-1:** | **Introduction to Management** | | |
| Definition, Characteristics of management, Importance of Management, Administration , Management thoughts: Contribution of F.W. Taylor , Henry Fayol , Peter Drucker, etc Management process school, Systems Management School, | | | |
| | | | |
| **Unit-2:** | **Planning and Controlling** | | |
| Planning: Definition, Characteristics, Nature, Importance, Types of Plans:(Standing and Single Use Plans),Planning Process Controlling: Concept, Definition, Principles of Controlling, Objectives of controlling, Importance of Controlling | | | |
| | | | |
| **Unit-3:** | **Organizing** | | |
| Concept, Definition, Process of organization, Principles of organization, Authority, Responsibility and Delegation, Forms of organization. Centralization and Decentralization | | | |
| | | | |
| **Unit-4:** | **Leadership and Motivation** | | |
| Concept of Leadership, Definition, Qualities of Leadership, Leadership Styles Motivation: Meaning and Definition, Theories of Motivation1. Maslow‟s Need Hierarchy McGregor‟s Theory “X‟ and Theory „Y” | | | |
| | | | |
| **Unit-5:** | **Staffing** | | |
| Human Resource Planning, Recruitment, Selection, Training, Training and development, Performance appraisal methods | | | |
| | | | |
| **Unit-6:** | **Quality Concepts and Social responsibility of Business** | | |
| Total Quality Management, ISO, Quality Circle Social Responsibility of Business: Definition, Responsibilities towards owners, workers, consumers, suppliers, state, society etc. | | | |
| | | | |
| **Text Books:** | | | |
| **1.** | Essentials Of Management: Harold Koontz , Heinz Weihrich, Tata Mcgraw Hill. | | |
| **2.** | Principles And Practice Of Management: Dr. S. C. Saxena, Sahitya Bhavan Publications. | | |
| **Reference Books** | | | |
| **1.** | Principles Of Management: R. N. Gupta, S. Chand & Company | | |

**Mapping with Program Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | S | M | L | M | S | S | - | | - |
| **CO2** | S | S | S | M | M | L | M | M | S | - | - | - |
| **CO3** | S | S | S | M | M | L | L | M | S | - | - | - |
| **CO4** | S | S | S | M | M | L | L | M | S | - | - | - |

S- Strong; M-Medium; L-Low

| Code: | MCA -105 | Mathematical Foundations | Credits: 04 |
|---|---|---|---|
| **Course Objectives**<br>Cultivate clear thinking and creative problem solving. Thoroughly train in the construction and understanding of mathematical proofs. Exercise common mathematical arguments and proof strategies. | | | |
| **Course Outcomes**<br>At the end of the course student will be able to Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving. Ability to understand use of functions, graphs and their use in programming applications. Apply discrete structures into computing problems, formal specification, artificial intelligence, cryptography, Data Analysis. | | | |
| CO1: Prove implication problems using truth table method, replacement process, Analyze method, truth table, technique, rules of inference method<br>CO2: Obtain PCNF and PDNF of given logical expression<br>CO3: Check the validity of the verbal or symbolic arguments using rules of inference<br>CO4: Construct verbal arguments with predicates in symbolic form and also to validate them<br>CO5: Represent the given relation in matrix, digraph and vice versa<br>CO6: Verify a given function is objective or not, and also to find composition of functions<br>CO7: Design Karnaugh map to get simplified form of a Boolean function<br>CO8: Check whether the given grammar is regular or not using pumping lemma | | | |
| **Unit-1:** | **Set theory** | | |
| Sets, Venn diagrams, Operations on Sets, Laws of set theory, Power set and Products, Partitions of sets, The Principle of Inclusion and Exclusion | | | |
| | | | |
| **Unit-2:** | **Prepositional calculus** | | |
| Propositions and logical operations, Truth tables , Equivalence, Implications ,Laws of logic, Normal Forms, Predicates and Quantifiers, Mathematical Induction | | | |
| | | | |
| **Unit-3:** | **Relations and functions** | | |
| Relations, Paths and Digraphs, Properties and types of binary relations , Operations on relations, Closures, Warshall‟s algorithm, Equivalence and partial ordered relations, Poset, Hasse diagram and Lattice ,Functions: Types of functions - Injective, Surjective and Bijective Composition of functions , Identity and Inverse function, Pigeon-hole principle | | | |
| | | | |
| **Unit-4:** | **Permutations and combinations** | | |
| Permutations, Combinations, Elements of Probability, Discrete Probability and Conditional Probability, Generating Functions and Recurrence Relations, Recursive Functions, Introduction to Functional Programming | | | |
| | | | |
| **Unit-5:** | **Graph Theory** | | |
| Graphs Definitions, Paths and circuits: Eulerian and Hamiltonian, Types of graphs, Sub Graphs Isomorphism of graphs | | | |
| | | | |
| **Unit-6:** | **Algebraic structure** | | |
| Algebraic structures with one binary operation: semigroup, monoid and group, Abelian group Isomorphism, Homomorphism and Automorphism, Cyclic groups, Normal subgroups, Codes and group codes | | | |
| | | | |

| Text Books: | |
|---|---|
| **1.** | Discrete Mathematics and applications- K. H. Rosen, Tata McGraw Hill publishing Company |
| **2.** | Discrete Mathematical Structures- C. L. Liu, Second Edition, McGraw-Hill Book Company. |
| **3.** | Discrete Mathematical Structures- BernadKolman, Robert Busby, Pearson Education. |
| **Reference Books** | |
| **1.** | Discrete Mathematical Structures- Y N Singh, Wiley-India Press. |
| **2.** | Discrete Mathematics for Computer Scientists and Mathematicians- J. L. Mott, A.Kandel, Prentice Hall of India. |
| **3.** | Discrete Mathematical Structures with Applications to Computer Science- Discrete Mathematics for Computer Scientists and Mathematicians, Tata Mcgraw-Hill. |

**Mapping with Program Outcomes**

| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | S | M | L | M | S | S | - | | - |
| **CO2** | S | S | S | M | M | L | M | M | S | - | - | - |
| **CO3** | S | S | S | M | M | L | L | M | S | - | - | - |
| **CO4** | S | S | S | M | M | L | L | M | S | - | - | - |
| **CO5** | S | S | S | M | M | L | S | M | L | - | - | - |
| **CO6** | S | S | S | S | M | L | L | M | S | - | - | - |
| **CO7** | S | S | S | S | M | L | L | M | S | - | - | - |
| **CO8** | S | S | S | S | M | L | L | M | S | - | - | - |

S- Strong; M-Medium; L-Low

| Code: | MCA -106 | Lab -1 C Programming | Credits: 02 |
|---|---|---|---|

**Course Objectives**

This Laboratory course will enable students to identify, formulate and solve real world engineering problems that require usage of algorithms in C. The course serves as a foundation laboratory for improving the problem solving skills of students.

**Course Outcomes**

At the end of the course student will be able to Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving. Ability to understand use of functions, graphs and their use in programming applications. Apply discrete structures into computing problems, formal specification, artificial intelligence, cryptography, Data Analysis.

CO1: Design algorithms for the given problem specifications.
CO2: Write C programs for the designed algorithm specification.
CO3: Write C programs to implement linear data structures : Stack andQueue using arrays and linked list in an application context
CO4: Implement Non linear data structures: Graph, Trees, Hashtable in an application context
CO5: Implement specific sort algorithms in application context.
CO6: Generate different test cases for testing the validity of the developed programs
CO7: Write technical report on the observations from the experiments

**Develop C programs for**

1. Conditional and Iterative Structures
2. Arrays, Functions and Strings
3. Structures and Unions
4. Pointers
5. File Handling
6. Stack ADT implementation – Array implementation
7. Queue ADT implementation – Linked list implementation
8. Binary Search tree implementation
9. Hash table implementation
10. Graph representation and traversals
11. Sorting Algorithms:
    A) Sorting algorithm of O(n2 )
    B) Sorting algorithm of O(n log n)

**Note:**

The Exercises are collection of program specifications shall be designed by the course instructor and assigned to the students.

**Reference Books**


| | |
|---|---|
| **1.** | Brian W Kernighan & Dennis Ritchie, "The C programming language", 2nd Edition, Prentice Hall ,2015 |
| **2.** | Yashavant Kanetkar," Let us C", BPB Publications 8th Edition, 2014 |
| **3.** | Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Printice hall International, 2010. |
| **4.** | Mark Allen Weiss,"Data Structures and Algorithm Analysis in C", Pearson Education, 2011. |
| **5.** | Robert Kruse & Clovis L. Tondo " Data Structures and Program Design in C",Prentice Hall , 2012. |

**Mapping with Program Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | L | L | M | M | - | - | - | - | - |
| **CO2** | S | S | S | L | M | M | M | - | - | - | - | - |
| **CO3** | S | S | S | L | M | M | M | - | - | - | - | - |
| **CO4** | S | S | S | L | M | M | M | - | - | - | - | - |
| **CO5** | S | S | S | L | M | M | M | - | - | - | - | - |
| **CO6** | S | S | S | M | L | M | M | - | - | - | - | - |
| **CO7** | S | M | M | L | L | M | L | - | M | - | - | - |

S- Strong; M-Medium; L-Low

| Code: | MCA -107 | Lab -2 Computer Organization & Architecture | Credits: 02 |
|---|---|---|---|

**Course Objectives**

This Laboratory course will enable students to learn various logic gates and logic circuits and perform the logical operations like flip-flops; Encoder, Decoder, etc. The course serves as a foundation laboratory for improving the logic building and perform electronic operations.

**Course Outcomes**

At the end of the course student will be able to Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving. Ability to understand use of functions, graphs and their use in programming applications. Apply discrete structures into computing problems, formal specification, artificial intelligence, cryptography, Data Analysis.

CO1: Perform various logic circuit operations
CO2: Understanding the familiarity with IC-Chips.
CO3: Design Adder/ Subtracter
CO4: Understand the concepts of Multiplexer/ De-multiplexer

**Develop C programs for**

1. Review of the different logic design ckts.,
   e.g. a) Flip/Flop(RS, JK, D, T), b)Register,(4/8 bit Synchronized Data Transfer), c)Tri-state logic Gates
2. Familiarity with state of art IC-chips,
   e.g. a)Multiplexer , b) Decoder, c) Encoder, d) Counter, e)Shift-Register, f)adder Truth Table verification and clarification from Data-book.
3. Design a BCD adder.
4. Design an Adder/Subtracter composite unit .
5. Design a carry-look ahead Adder.
6. Design a ripple counter and carry-look ahead counter and assess the complexity of both the ckts.
7. Use a multiplexer unit to design a composite ALU .
8. Design a multiplex display unit using counter, multiplexer, decoder etc.
9. Design a keyboard Encoder unit in 2 Dimension.
10. Test a RAM chip and cascade two chips for vertical and horizontal expansion. Use wired OR tri-state output interconnection.
11. Use ALU chip for multibit arithmetic operation.

**Note:**

The Exercises are collection of program specifications shall be designed by the course instructor and assigned to the students.

**Reference Books**


| | |
|---|---|
| **1.** | Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", MIT Press, Third Edition 2009 |
| **2.** | Tanaenbaum A.S.,Langram Y. Augestein M.J " Data Structures using C" Pearson Education , 2004 |
| **3.** | Mark Allen Weiss,"Data Structures and Algorithm Analysis in C", Pearson Education, 2011. |
| **4.** | Robert Kruse & Clovis L. Tondo " Data Structures and Program Design in C",Prentice Hall , 2012 |
| **5.** | Ellis Horrowitz et al.," Fundamentals of Data Structures in C", Silicon press, Second edition, 2007. |

**Mapping with Program Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | L | L | M | M | - | - | - | - | - |
| **CO2** | S | S | S | L | M | M | M | - | - | - | - | - |
| **CO3** | S | S | S | L | M | M | M | - | - | - | - | - |
| **CO4** | S | S | S | L | M | M | M | - | - | - | - | - |

S- Strong; M-Medium; L-Low

| Code: | MCA -108 | Presentation Skills and Open Elective | Credits: 02 |
|---|---|---|---|

**Presentation Skills Course Objectives**

This course will enable students to learn various presentation skills and improve their soft skills. This course will also provide a platform to students to presentation. It will motivate them for public speaking.

**Course Outcome:**

CO1: Students will be able to make presentations and participate in group discussions with high level of self-confidence.
Co2: Students will be able to perform well in the interviews
Co3: They will have adequate reading and writing skills needed for workplace situations

| | |
|---|---|
| **Syllabus** | Preparing slides with animation related to the current topic –organizing the material - Introducing oneself to the audience –introducing the topic –answering questions – individual presentation practice—presenting the visuals effectively –10 minute presentation |
| | **Guidelines for Seminar** |

**1.** Students need to confirm Presentation Topic with consent of guide

**2.** Student should submit the presentation report in hard copy (spiral binding) and Soft Copy (Report + Presentation) as per the guideline below

- 2.1 Introduction of Seminar Topic
- 2.2 Abstract of study
- 2.3 Survey/Analysis
- 2.4 Detail Study
- 2.5 Results
- 2.6 Conclusion
- 2.7 References

**2.** Student should Give Presentation (With PPT)

**Open Elective Course Objectives**

Students can choose one of the open electives offered by various schools of campus or the courses offered on various e-learning platforms like SWAYAM/MOOC/NPTEL, etc. But they need to take prior permission from School Director before joining one of these elective courses. \they must produce successful completion certificate / credits earned to the School after completing the underwent course.

**Reference Books**


| | |
|---|---|
| **1.** | T. Meenakshi Raman and Sangeeta Sharma. Technical Communication: Principles and Practice. New Delhi: Oxford, 2009 |
| **2.** | P. Bhatnagar. English for Competitive Examinations. 3rdEdition. New Delhi: Macmillan, 2009 |
| **3.** | Kapoor, A. N. A Guide to Business Correspondence and Communication Skills. NewDelhi: S. Chand, 2004 (Revised & Enlarged Edition) |
| **4.** | Sadanand Kamlesh and Susheela Punitha. Spoken English: A Foundation Course.Part 2. Mumbai: Orient BlackSwan, 2009 |

| Code: | MCA-201 | System Analysis and Design | Credits: 04 |
|---|---|---|---|
| | | | |
| **Course Objectives:** | | | |
| System analysis helps in discovering means to design systems where sub-system may have apparently conflicting objectives. It helps in achieving inter compatibility and unity of purpose of sub-systems. It offers a means to create understanding of the complex structures. | | | |
| | | | |
| **Course Outcome:** | | | |
| After successfully completing this course, students will understand concepts of Analysis and Designing Information Systems. Students will understand writing system proposals, system development scheduling, and cost-benefits analysis etc. also dealing with quality assurance. | | | |
| CO1: To learn basic things of systems, System development Life cycle, and System Analyst.<br>CO2: To determine specific needs of system.<br>CO3: Discuss approaches and tasks of system. Planning for developing system<br>CO4: Evaluate tools and techniques.<br>CO5: Use appropriate methods and techniques to design software.<br>CO6: Implementation of Developed System, Evaluation and Testing of system. | | | |
| | | | |
| **Unit-1:** | **Introduction to Systems** | | |
| System Definition, Characteristics, Elements and Types of system, Need of System Analysis and design, Role and Qualities of System Analyst, System Development Life Cycle | | | |
| | | | |
| **Unit-2:** | **Unit Name** | | |
| Project Initiation, Feasibility study, Ascertaining HW/SW needs, Criteria for HW/SW selection, Make v/s Buy Decision, Cost Benefit Analysis | | | |
| | | | |
| **Unit-3:** | **Unit Name** | | |
| Structured Analysis tools- DFD, Data Dictionary, Decision Tree, Decision Table, Structured English, Activity planning control, Activity Diagrams, Case modelling, UML, Class Diagram | | | |
| | | | |
| **Unit-4:** | **Unit Name** | | |
| System Proposal, Project Scheduling, Information Gathering Tools- Interviews, Questionnaire, JAD, Prototyping | | | |
| | | | |
| **Unit-5:** | **Unit Name** | | |
| System Design, Input/output Design, From Design, Database Design, File organization | | | |
| | | | |
| **Unit-6:** | **Unit Name** | | |
| System Implementation Plan, Activity Network for Conversion, Combating Resistance to Change, System Testing, Test Plan AND test data, Types of System Test, Quality Assurance, Documentation | | | |
| | | | |
| **Text Books:** | | | |
| **1.** | System Analysis and Design, Kendall & Kendall, Pearson Education, Inc., Prentice Hall. | | |
| | | | |
| **Reference Books** | | | |
| **1.** | Modern System Analysis and Design, Jeffrey A. Hoffer, Prentice-Hall, Inc. | | |
| **2.** | System Analysis and Design, Awad E.M., Galgotia Publications Pvt. Ltd | | |
| | | | |

**Mapping with Program Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | S | M | L | M | S | S | - | | - |
| **CO2** | S | S | S | M | M | L | M | M | S | - | - | - |
| **CO3** | S | S | S | M | M | L | L | M | S | - | - | - |
| **CO4** | S | S | S | M | M | L | L | M | S | - | - | - |
| **CO5** | S | S | S | M | M | L | S | M | L | - | - | - |
| **CO6** | S | S | S | S | M | L | L | M | S | - | - | - |

S- Strong; M-Medium; L-Low

| Code: | MCA-202 | Design and Analysis of Algorithms using C++ | Credits: 04 |
|---|---|---|---|

**Course Objectives:**

Reinforce basic design concepts (e.g., pseudo code, specifications, top-down design)
Knowledge of algorithm design strategies
Familiarity with an assortment of important algorithms
Ability to analyze time and space complexity

**Course Outcome:**

CO1: Describe basic organization of computer and the architecture of 8086 microprocessor.
CO2: Implement assembly language program for given task for 8086 microprocessor.
CO3: Demonstrate control unit operations and conceptualize instruction level parallelism.
CO4: Demonstrate and perform computer arithmetic operations on integer and real numbers.
CO5: Categorize memory organization and explain the function of each element of a memory hierarchy.
CO6: Identify and compare different methods for computer I/O mechanisms

**Unit-1:**

Review of Algorithms , complexity notations, elementary data structures , Graphs and Trees Algorithms on graphs including searching algorithms like DFS and BFS , Shortest path Algorithms like , the Bellman-ford algorithm, the Dijkstra algorithm ,the Floyd-Warshall algorithm, Johnson‟s algorithm.

**Unit-2:**

Divide and conquer mechanism ,General method, binary search, merger sort, quick sort, Strassen‟ s matrix multiplication.

**Unit-3:**

The Greedy method ,The general method, container loading knapsack problem, job sequence with deadlines.

**Unit-4:**

Introduction to Spanning trees , Minimum Spanning Trees ,Growing a minimum spanning tree, the algorithms of Kruskal and Prim.

**Unit-5:**

Introduction to String matching: Robin – Karp algorithm, Knuth – Morris Pratt algorithm, Algorithm for parallel computers, parallelism, the PRAM models and simple PRAM algorithms. Amortized Analysis method , Aggregate Analysis, The Accounting Method Dynamic Programming mechanism : General method and one example.

**Unit-6:**

Introduction to NP completeness , Polynomial Time , Polynomial Time Verification , NP Completeness and reducibility, NP completeness proofs , NP completeness problems

**Text Books:**


| | |
|---|---|
| 1. | Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahani, Universities Press Inc |
| 2. | Introduction to Algorithms, Corman , Leiserson and others , 2nd edition , PHI |
| 3. | Design and Analysis of Algorithms , Dave and Dave , Pearson Education Inc |


**Reference Books**


| | |
|---|---|
| 1. | Data Structures, Lipschutz , Tata McGraw Hills |
| 2. | Design Methods and Analysis of Algorithms , S.K.Basu , PHI. |

| | |
|---|---|
| **3.** | The Art of Computer Programming, Vol 1,2,3 , Dr.Kunth , Addison Wesley |
| **4.** | The Design and Analysis of Computer Algorithms, Aho , Hopcroft and Ullman, Addison Wesley. |

**Mapping with Program Outcomes**

| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | S | M | L | M | S | S | - | | - |
| **CO2** | S | S | S | M | M | L | M | M | S | - | - | - |
| **CO3** | S | S | S | M | M | L | L | M | S | - | - | - |
| **CO4** | S | S | S | M | M | L | L | M | S | - | - | - |
| **CO5** | S | S | S | M | M | L | S | M | L | - | - | - |
| **CO6** | S | S | S | S | M | L | L | M | S | - | - | - |

S- Strong; M-Medium; L-Low

| Code: | MCA-203 | Management Information System | Credits: 04 |
|---|---|---|---|

**Course Objectives:**

This is an active learning-oriented course designed to provide a managerial understanding and approach to the technical subject of Information System and Technology Management. The course will illustrate the important role that information systems play in an organization; and provide the student with a background to understand the subject and a foundation upon which to build his or her management decisions. Topics include Managing Information Assets, IT Technology and Strategy and IT Technology and Organization. This course is the capstone course for acquiring knowledge in Management Information System (MIS). It focuses on issues of real world application faced by the IT managerial professional in modern organizations.

**Course Outcome:**

CO1: Describe the changing organizational environment and the use of information technology to manage contemporary organizations;
CO2: Identify the business impacts of business and social networking, as well as ways the IT Managerial professional can leverage the new reality of human connectivity on the Internet;
CO3: Learn IT Managerial Professional leadership responsibilities and opportunities;
CO4: Apply MIS to current enterprise systems best practices in terms of the relationship between customer preferences and shareholder wealth;
CO5: Apply the technological foundations of information systems, i.e., hardware, software and telecommunications;
CO6: Evaluate the organizational context of information systems, including decision making and information processing concepts;
CO7: Identify best practices for one of the Internet's newest and most revolutionary technologies: cloud computing and ways it is shaping the new economics of business.

| Unit-1: | Management Information system |
|---|---|

Need, Purpose and objectives-contemporary approaches to MIS–Information as a strategic resources-use of information for competitive advantage-capital MIS as an instrument for the organizational change.

| Unit-2: | Information Management and Decision Making |
|---|---|

Model of Decision Making – Classical, administrative and Herbert Simon‟s Models, Attributes of Information & its relevant to decision making – Types of Information.

| Unit-3: | Information Technology |
|---|---|

Definition, IT Capabilities and their organizational impact – Telecommunication and Networks – Types and Topologies of Networks – IT in enabled Services such as call Centers, Geographical Information System etc

| Unit-4: | DBMS & Systems Analysis and Design |
|---|---|

Data warehousing and Data mining, System Development Life Cycle – Alternative Systems Building Approaches – Proto Typing Development Strategies-Structured Analysis -Prototyping- Rapid Developing Tool s – CASE Tool s –Object oriented systems (only introduction to these tools and techniques).

| Unit-5: | Decision Support System |
|---|---|

Group Support System – Executive Information Systems - Executive Support Systems –Experts Systems and Knowledge based Experts Systems – Artificial Intelligence.

| Unit-6: | Management Issues in MIS |
|---|---|
| Information Security and controls- Quality assurance – Ethical and Social Dimension – Intellectual Property Rights as related to IT services/ IT products – Managing Global Information Systems. | |
| | |
| **Text Books:** | |
| **1.** | Brown, C.V., DeHayes, D.W., Hoffer, J.A., Martin, E.W., & Perkins, W.C. (2012). Managing Information Technology. (7th Ed). Pearson/Prentice Hall. |
| **2.** | Management Informant ion Systems, Jawadekar Tata McGraw Hill. |
| **Reference Books** | |
| **1.** | Management Information Systems-Landon 7th Edition, Pearson Education, Asia. |
| **2.** | Management Information Systems, Davis and Olson, Tata McGraw Hill . |
| **3.** | Management Information Systems, Jayant Oke. |

**Mapping with Program Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | M | S | - | L | - | L | - | L | - | - | L | - |
| **CO2** | L | M | - | L | - | - | - | M | - | - | L | - |
| **CO3** | S | S | S | M | M | - | - | L | - | L | L | - |
| **CO4** | S | S | S | M | L | - | - | M | S | L | L | - |
| **CO5** | S | S | S | M | M | L | S | M | L | - | - | - |

S- Strong; M-Medium; L-Low

| Code: | MCA-204 | Probability and Statistics | Credits: 04 |
|---|---|---|---|
| | | | |
| **Course Objectives:** | | | |
| Distinguish between quantitative and categorical data, Apply different statistical measures on data, Identify, formulate and solve problems, Classify different types of Probability and their fundamental applications | | | |
| | | | |
| **Course Outcome:** | | | |
| CO1: Apply probability theory via Bayes‟ Rule<br>CO2: Describe the properties of discrete and continuous distribution functions<br>CO3: Assess the sampling distribution, efficiency and biasedness of estimatorsUse statistical tests in testing hypotheses on data<br>CO4: Analyze goodness of fit, ANOVA for one-way and two-way classification data | | | |
| | | | |
| **Unit-1:** | **Introduction to Probability** | | |
| Random experiment, Sample space, Events, Axiomatic Probability, Algebra of events | | | |
| | | | |
| **Unit-2:** | **Conditional Probability** | | |
| Conditional Probability, Multiplication theorem of Probability, Independent events, Baye's Theorem | | | |
| **Unit 3:** | **Random variables** | | |
| Discrete random variable, Continuous random variable, Two-dimensional random variable, Joint probability distribution, Stochastic independence | | | |
| . | | | |
| **Unit-4:** | **Mathematical Expectation** | | |
| Expected value of a random variable, Expected value of a function of a random variable, Properties of Expectation and Variance, Covariance, Binomial distribution –Poison distribution-Uniform distribution -Normal distribution | | | |
| | | | |
| **Unit-5:** | **Measures of Central Tendency &Measures of Dispersion** | | |
| Frequency Distribution, Histogram, Stem and leaf diagram, ogives, Frequency Polygon, Mean, Median, Mode, Range, Quartile Deviation, Mean Deviation, Box whisker plot, Standard Deviation, Coefficient of Variation | | | |
| | | | |
| **Unit-6:** | **Skewness, Correlation & Regression** | | |
| Karl Pearson's coefficient of Skewness, Bowley's coefficient of Skewness, Scatter Diagram, Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient , Linear Regression and Estimation, Coefficients of regression | | | |
| | | | |
| **Text Books:** | | | |
| 1. | Fundamentals of Mathematical Statistics – 1st Edition S.C.Gupta, V.K.Kapoor , S Chand | | |
| 2. | Introduction to Probability & Statistics – 4th Edition J.Susan Milton, Jesse C. Arnold Tata McGraw Hill | | |
| 3. | Probability and Statistics with Reliability, Queuing, And Computer Science Applications (English) 1st Edition:Kishore Trivedi, PHI | | |
| **Reference Books** | | | |
| 1. | Fundamentals of Statistics : 7th edition S C Gupta, Himalaya Publishing house | | |
| 2. | Schaum's Outlines Probability, Random Variables & Random Process 3rd Edition Tata McGraw Hill | | |
| 3. | Probability & Statistics for Engineers: Dr J Ravichandran, Wiley | | |

**Mapping with Program Outcomes**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | M | M | - | L | L | - | - | L | L | - | L | - |
| **CO2** | L | - | M | - | M | - | S | M | - | - | L | - |
| **CO3** | S | L | - | - | S | L | - | S | - | S | - | - |
| **CO4** | S | M | M | S | - | - | M | S | - | M | - | - |

S- Strong; M-Medium; L-Low

| Code: | MCA -207 | Lab -3 C++ Programming | Credits: 02 |
|---|---|---|---|

**Course Objectives**

This Laboratory course will enable students to identify, formulate all techniques of software development in the C++ Programming Language and demonstrate these techniques by the solution of a variety of problems spanning the breadth of the language.

**Course Outcomes**

At the end of the course student will be able to Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving. Ability to understand use of functions, graphs and their use in programming applications. Apply discrete structures into computing problems, formal specification, artificial intelligence, cryptography, Data Analysis.

CO1: Explain the concepts of oops for building object based applications.
CO2: Write a program in different logic with suitable validations for a given problem.
CO3: Implement the techniques and features of the Object Oriented Programming constructs to construct an application.
CO4: Implement method overloading and method overriding for different user specifications.
CO5: Write programs implementing inheritance for an application domain.
CO6: Write technical report on the observations from the experiments.

Develop C++ programs for

1. Constructor and copy constructor.
2. Storage classes like auto, extern, register and static.
3. Static member data, static member function and bitwise operators.
4. Overloading and method overriding.
5. Inheritance
6. Pointer Arithmetic.
7. Inline Functions.
8. Functions & Recursion.
   a. Recursion
   b. Function with "this" pointer
9. Friend Function & Friend Class.
10. Exception handling methods.
11. Overload Unary & Binary Operators as Member Function & Non Member Function.
    a. Unary operator as member function
    b. Binary operator as non member function
12. Class Templates

**Note:**

The Exercises are collection of program specifications shall be designed by the course instructor and assigned to the students.

**Reference Books**


| | |
|---|---|
| **1.** | Bjarne Stroustrup ,"The C++ Programming Language", 4th Edition, Addison-Wesley, 2015 |
| **2.** | Scott Meyers," Effective C++ 55 Specific Ways to Improve Your Programs and Designs", Third Edition, Addison-Wesley, 2011 |
| **3.** | Paul Deital & Harvey Deital, "C++ How to Program", 7th Edition, Pearson Education, 2010 |
| **4.** | Stanley Lippman, "C++ Primer", 4th Edition, Pearson Education, 2007. |
| **5.** | Yashavant P. Kanetkar, "Let Us C++", BPB Publications, 2007. |

| | |
|---|---|
| **6.** | Robert Laffore, "Object Oriented Programming using C++", 4th Edition, Sams Publishing, 2002. |

**Mapping with Program Outcomes**

| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | M | S | S | S | - | - | - | - | - | - |
| **CO2** | S | M | S | S | M | - | - | - | - | - | - | - |
| **CO3** | S | M | M | S | S | S | - | - | - | - | - | - |
| **CO4** | S | S | M | S | S | M | - | - | - | - | - | - |
| **CO5** | S | S | S | S | S | M | - | - | - | - | - | - |
| **CO6** | S | S | S | S | S | M | - | - | - | - | - | - |

S- Strong; M-Medium; L-Low

| Code: | MCA -208 | Case Study and Open Elective | Credits: 02 |
|---|---|---|---|

**Case Study Course Objectives**

This course will enable students to learn how to develop a case study and improve their academic writing skills. This course will also provide a platform to students to improve their thinking process and develop a theoretical module on a real world problem.

**Course Outcome:**

CO1: Students will be able to write a report in the form of case study and participate in group discussions with high level of self-confidence.
Co2: Students will be able to develop a theoretical module.
Co3: They will have adequate reading and writing skills needed for workplace situations

| | |
|---|---|
| **Syllabus** | Preparing a case study report with a PPT presentation on recent topic –organizing the material -Introducing oneself to the audience –introducing the topic –answering questions –individual presentation practice—presenting the visuals effectively –10 minute presentation |
| | **Guidelines for Seminar** |

**1.** Students need to confirm case study with consent of guide

**2.** Student should submit the report in hard copy (spiral binding) and Soft Copy (Report + Presentation) as per the guideline below

- 2.1 Introduction of Topic
- 2.2 Abstract of study
- 2.3 Survey/Analysis
- 2.4 Detail Study
- 2.5 Results
- 2.6 Conclusion
- 2.7 References

**2.** Student should Give Presentation (With PPT)

**Open Elective Course Objectives**

Students can choose one of the open electives offered by various schools of campus or the courses offered on various e-learning platforms like SWAYAM/MOOC/NPTEL, etc. But they need to take prior permission from School Director before joining one of these elective courses. \they must produce successful completion certificate / credits earned to the School after completing the underwent course.

**Reference Books**


| | |
|---|---|
| **1.** | Case Study Handbook: How to Read, Discuss and Write Persuasively About Cases by Ellet, Harvard Business Publication. |
| **2.** | Case Study Handbook, Revised Edition, William Ellet, Harvard Business Review |