।। 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
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**संलग्नित महाविद्यालयांतील 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 **संलग्नित महाविद्यालयांतील 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. Bioinformatics
2. Biotechnology
3. Boichemistry
4. Botany
5. Chemistry
6. Computer Management
7. Computer Science
8. Dairy Science
9. Environmental Science
10. Herbal Medicine
11. Information Technology
12. M.C.A.
13. Microbiology
14. Physics
15. Software Engineering
16. System Administration & Networking
17. 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/पदव्युत्तर–सीबीसीएस अभ्यासक्रम/२०१९–२०/**४६४**
**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) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, 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)**

## Syllabus of

# M.Sc. (Computer Science)

**(Affiliated colleges)**

## (2 years) (Revised CBCS pattern)

## Introduced from Academic Year 2019-2020

# M.Sc. Computer Science (Affiliated Colleges)

**M.Sc. Computer Science** (2years) program / degree is a specialized program in latest advances in computer science issues. It builds the student on higher studies and research awareness in overall computational, IT and ICT fields so as to become competent in the current race and development of new computational sciences. The duration of the study is of four semesters, which is normally completed in two years.

**CBCS pattern**

**The M.Sc. Computer Science** program as per CBCS (Choice based credit system) pattern, in which choices are given to the students under open electives and subject electives. The students can choose open electives from the wide range of options to them.

**Eligibility and Fees**

The eligibility of a candidate to take admission to **M.Sc. Computer Science** program is as per the eligibility criteria fixed by the University. More details on admission procedure and fee structure can be seen from the prospectus of the college / institution as well as on website of the University.

**Credit Pattern**

Every course has corresponding grades marked in the syllabus structure. There are 25 credits per semester. A total of 100 credits are essential to complete this program successfully. The Grading pattern to evaluate the performance of a student is as per the University rules.

Every semester has a combination of Theory (core or elective) courses and Lab courses. Each theory course has 04 credits which are split as 02 external credits and 02 internal credits. The university shall conduct the end semester examination for 02 external credits. For theory internal credit, student has to appear for 02 class test (15 marks) and 01 assignment (20 marks). Every lab course has 02 credits which are split as 01 external credit and 01 internal credit. For lab internal credit, the student has to submit Laboratory Book (05 marks) and remaining 20 marks are for the Lab activities carried out by the student throughout the semester. For lab external credit, 20 marks are reserved for the examinational experiment and 05 marks are for the oral / viva examinations. There is a special skill based activity of 01 internal credits per semester which shall inculcate awareness regarding the domain of computers, IT, and ICT.

The open elective has 04 credits which are purely internal. If students are opting for MOOCs as open elective, then, there must be a Faculty designed as MOOCs course coordinator who shall supervise learning through MOOCS. This is intentionally needed as the MOOCs course coordinator shall verify the MOOC details including its duration, staring date, ending date, syllabus contents, mode of conduction, infrastructure feasibility, and financial feasibility during start of each semester. This is precautionary as the offering of the MOOCs through online platforms are time specific and there must be proper synchronization of semester duration with the MOOCs duration. Students must opt for either institutional / college level open elective or a course from University recognized MOOCs platforms as open electives.

The number of hours needed for completion of theory and practical courses as well as the passing rules, grading patterns, question paper pattern, number of students in practical batches, etc shall be as per the recommendations, norms, guidelines and policies of the UGC, State Government and the SRTM University currently operational. The course structure is supplemented with split up in units and minimum numbers of hours needed for completion of the course, wherever possible.

Under the CBCS pattern, students would graduate **M.Sc. Computer Science** with a minimum number of required credits which includes compulsory credits from core courses, open electives and program specific elective course. All students have to undergo lab / practical activities leading to specific credits and project development activity as a part of professional UG program.

1. M.Sc. Computer Science Degree / program would be of 100 Credits. Total credits per semester= 25
2. Each semester shall consist of three core courses, one elective course, one open elective course and two practical courses. Four theory courses ( core+elective) = 16 Credits. Two practical / Lab courses= 4 Credits in total (02 credits each) , One Open elective= 4 credit, One skill
3. enhancement activity of 01 credits.
4. One Credit = 25 marks , Two Credits = 50 Marks, Four Credits = 100 Marks

## PEO, PO and CO Mappings

1. **Program Name** : M.Sc.(CS) Affiliated Colleges

2. **Program Educational Objectives**: After completion of this program, the graduates / students would

| | |
|---|---|
| PEO I :Technical Expertise | Implement fundamental domain knowledge of core courses for developing effective computing solutions by incorporating creativity and logical reasoning. |
| PEO II : Successful Career | Deliver professional services with updated technologies in computational science based career. |
| PEO III :Hands on Technology and Professional experience | Develop leadership skills and incorporate ethics, team work with effective communication & time management in the profession. |
| PEO IV :Interdisciplinary and Life Long Learning | Undergo higher studies, certifications and research programs as per market needs. |

3. **Program Outcome(s):** Students / graduates will be able to
**PO1:** Apply knowledge of mathematics, science and algorithm in solving Computer problems.
**PO2:** Generate solutions by understanding underlying computer science environment
**PO3:** Design component, or processes to meet the needs within realistic constraints.
**PO4:** Identify, formulate, and solve problems using computational temperaments.
**PO5:** Comprehend professional and ethical responsibility in computing profession.
**PO6:** Express effective communication skills.
**PO7:** Recognize the need for interdisciplinary, and an ability to engage in life-long learning.
**PO8:** Actual hands on technology to understand it's working.
**PO9:** Knowledge of contemporary issues and emerging developments in computing profession.
**PO10:** Utilize the techniques, skills and modern tools, for actual development process
**PO11:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings in actual development work
**PO12:** Research insights and conduct research in computing environment.

4. **Course Outcome(s):** Every individual course under this program has course objectives and course outcomes (CO). The course objectives rationally match with program educational objectives. The mapping of PEO, PO and CO is as illustrated below

5. **Mapping of PEO& PO and CO**

| Program Educational Objectives | Thrust Area | **Program Outcome** | Course Outcome |
|---|---|---|---|
| PEO I | Technical Expertise | PO1,PO2,PO3,PO6 | All core courses |
| PEO II | Successful Career | PO4,PO5,PO11, | All discipline specific electives courses |
| PEO III | Hands on Technology and Professional experience | PO8,PO10 | All Lab courses |
| PEO IV | Interdisciplinary and Life Long Learning | PO7,PO9,PO12 | All open electives and discipline specific electives |

**The detailed syllabus is as below,**

**CBCS Revised Syllabus w.e.f AY: 2019-2020**
**Program: M.Sc.( Computer Science) – Affiliated Colleges**

| Sr. No | Course category | Course Code | Course Title | Internal credits | External credits | Total credits |
|---|---|---|---|---|---|---|
| **First Semester** | | | | | | |
| 1. | **Core Subjects** | CS-101 | Computer Architecture and Microprocessor | 2 | 2 | 4 |
| 2 | | CS-102 | OOP concepts using C++ | 2 | 2 | 4 |
| 3 | | CS-103 | Mathematical Foundation for Computer Science | 2 | 2 | 4 |
| **Choose any one from below elective subjects** | | | | | | |
| 4 | **Elective Subject** | CS-104 A | Relational Database Management System | 2 | 2 | 4 |
| | | CS-104 B | Computer Network | | | |
| **Practical /Lab** | | | | | | |
| 5 | **Lab / Practical** | CS-105 | Lab -1 : C++ Programming | 1 | 1 | 2 |
| | | CS-106 | Lab-2: ALP using 8086 Microprocessor | 1 | 1 | 2 |
| 6 | **Open Elective** | CS-107A | University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR | 4 | 0 | 4 |
| | | CS-107 B | Introduction to E-commerce | | | |
| 7 | **Skill based Activity** | CS-108 | SK-01 | 1 | 0 | 1 |
| | Total credits | | | | | **25** |

**CBCS Revised Syllabus w.e.f AY: 2019-2020**
**Program: M.Sc.( Computer Science) – Affiliated Colleges**

| Sr. No | Course category | Course Code | Course Title | Internal credits | External credits | Total credits |
|---|---|---|---|---|---|---|
| **Second Semester** | | | | | | |
| 1. | **Core Subjects** | CS-201 | Design and Analysis of Algorithms | 2 | 2 | 4 |
| 2 | | CS-202 | Software Engineering | 2 | 2 | 4 |
| 3 | | CS-203 | Programming with VB.NET | 2 | 2 | 4 |
| **Choose any one from below elective subjects** | | | | | | |
| 4 | **Elective Subject** | CS-204 A | Advanced Operating System | 2 | 2 | 4 |
| | | CS-204 B | Compiler Designing | | | |
| **Practical /Lab** | | | | | | |
| 5 | **Lab / Practical** | CS-205 | Lab-3: VB.NET Programming | 1 | 1 | 2 |
| | | CS-206 | Lab-4: Based on Elective Subjects | 1 | 1 | 2 |
| 6 | **Open Elective** | CS-207A | University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR | 4 | 0 | 4 |
| | | CS-207 B | Information Technology | | | |
| 7 | **Skill based Activity** | CS-208 | SK-02 | 1 | 0 | 1 |
| | Total credits | | | | | **25** |

| CS-101 | Semester : I | Computer Architecture and Microprocessor | Credits: 4 |
|---|---|---|---|

**Course Objectives :**

1. To develop Understanding of Internal Architecture of Computer
2. To aware students about Basics of Microprocessor & Assembly Language Programming

**Course Outcome :**

3. 1. Students will acquire skill of Assembly Language programming using 8086 Microprocessor
4. 2. Student will be familiar with Internal Processing of Computers

| Unit No. | Unit Title | No. Of Lectures |
|---|---|---|
| **Unit-1:** | **Design Methodology** | 10 |
| | Evolution of Computers, Introduction to system modeling, Design Methodology of Combinational and Sequential circuits-Gate level, Register level and Processor level. | |
| **Unit-2:** | **Unit Title Binary Arithmetic** | 10 |
| | Fixed point arithmetic's and algorithms for addition, subtraction, multiplication and division, Floating point arithmetic's and algorithms for addition, subtraction. | |
| **Unit-3:** | **Unit Title Processors Design & Control Units** | 10 |
| | CPU organization, Data representation, Instruction Sets –Format, types, Implementation, CICS and RISC, Control Unit-Hardwired control and design examples, Micro programmed control unit, pipeline control, Interrupt and their types and Branch Instruction processing. | |
| **Unit-4:** | **Unit Title Memory Organization** | 10 |
| | Memory Technologies, Memory System, Virtual memory, Memory hierarchies, Main memory -allocation, Segmentation, High speed-Cache Memory, interleaved and associative memories. | |
| **Unit-5:** | **Unit Title 8085 & 8086 Microprocessor** | **10** |
| | **8085 Microprocessor:** Architecture of 8085 Microprocessor, Features of 8085, Timing diagram of Memory read , memory write, Op code fetch and execute cycle.<br>**8086 Microprocessor:** Architecture of 8086 Microprocessor-EU and BIU, Features of 8086, Pin diagram of 8086, Addressing modes, Instruction set classification, Assembly language programming of 8086. | |

**Text Books**

| | | |
|---|---|---|
| 1. | Computer Architecture & Organization by J.P Hays. | |

**Reference Books**

| | | |
|---|---|---|
| 1. | Fundamentals of Microprocessors by Gaonkar | |
| 2. | Computer System Architecture by M. Morris Mano (PHI) | |
| 3. | Microporcessor and Interfacing: Programming and Hardware by Douglas Hall (McGraw-Hill/Glencoe ) | |

| CS-102 | Semester<br>I | OOP Concepts using C++ | Credits:<br>4 |
|---|---|---|---|

**Course Objectives :**

1. To aware the students with the concept of Object oriented concepts
2. To master students in advanced programming languages faster which is useful for foundation of software development.

**Course Outcome :**

1. Students will have the conceptual knowledge of Object Oriented programming.

2. This course will create foundation for student to learn other Object Oriented Programming Languages such as JAVA.

| Unit No. | Unit Title | No. Of Lectures |
|---|---|---|
| **Unit-1:** | **Introduction and basic concepts of C++** | 10 |
| | Procedure Oriented Programming, Object Oriented Programming Paradigm, Basic concepts of OOP's, Benefits and Applications, Structure of C++ program. | |
| **Unit-2:** | **Tokens, Operators and Functions in C++** | 10 |
| | Keywords, Identifiers, Data-types, Operators in C++, Operator precedence and associatively, Control structures, branching and looping statements, Function, function prototype, default arguments, Reference variable, call by reference, return by reference, Inline function, function overloading . | |
| **Unit-3:** | **Class and object, Constructor and destructor** | 10 |
| | **Class and object:** Specifying a class and object, Nesting of member function, Memory allocation for objects, Static data member, static function, Friend function.<br>**Constructor and destructor:** Introduction to Constructor, Types of constructor, Destructor | |
| **Unit-4:** | **Inheritance and polymorphism** | |
| | Types of inheritance, Virtual base class, Operator overloading (Unary and binary), Virtual function and there rules, Pure virtual function, Abstract class, Pointer to object, This pointer. | 10 |
| **Unit-5:** | **Input / Output Operation** | **10** |
| | Console I/O operation, formatted I/O, unformatted I/O, C++ classes for console I/O, C++ stream classes for file I/O, Opening and closing file, sequential and random access, Error handling during a file operation, command line arguments, Introduction to Templates. | |

**Text Books:**

| | | |
|---|---|---|
| 1. | Object-Oriented Programming with C++ -E-Balgurusamy | |

**Reference Books:**

| | | |
|---|---|---|
| 1. | The C++ Complete Reference -TMH Publication | |
| 2. | Programming with C++, D Ravichandran, TMH | |
| 3. | Let us C++ -Yashwantkanetkar | |

| CS-103 | Mathematical Foundations for Computer Science | Credits: 4 |
|---|---|---|
| | | |
| **Course Objectives:** | | |
| 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 Outcome:** | | |
| 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. | | |
| | | |
| **Unit-1:** | | |
| 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:** | | |
| Propositions and logical operations, Truth tables , Equivalence, Implications ,Laws of logic, Normal Forms, Predicates and Quantifiers, Mathematical Induction. | | |
| | | |
| **Unit-3:** | | |
| 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, Combinations, Elements of Probability, Discrete Probability and Conditional Probability, Generating Functions and Recurrence Relations, Recursive Functions, Introduction to Functional Programming. | | |
| | | |
| **Unit-5:** | | |
| Graphs Definitions, Paths and circuits: Eulerian and Hamiltonian, Types of graphs, Sub Graphs Isomorphism of graphs. | | |
| | | |
| **Unit-6:** | | |
| 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 Mathematical Structures- Bernad Kolman, Robert Busby, Pearson Education. | |
| **2.** | Discrete Mathematical Structures- C. L. Liu, Second Edition, McGraw-Hill Book | |
| **3.** | Discrete Mathematics and applications- K. H. Rosen, Tata McGraw Hill publishing | |
| **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. | |

| CS-104 A Elective | Relational Database Management System | Credits: 4 |
|---|---|---|

**Course Objectives:**

1. To understand the features of Relational database.
2. To describe data models and schemas in DBMS.
3. To use SQL- the standard language of relational databases for database operations.
4. To understand the functional dependencies and design of the databases.

**Course Outcome:**

1. To study the basic concepts of relational databases
2. Learn and practice data modelling using the entity-relationship and developing database designs.
3. Understand the use of Structured Query Language (SQL) and learn SQL syntax for writing queries.
4. Apply normalization techniques to normalize the databases.

**Unit-1:** Introduction

Problems in Traditional file oriented approach, Three level architecture of DBMS, basic database components like schema, views, instances, General Architecture of DBMS, Roles of DBA, Data Dictionary, Advantages and Disadvantages of DBMS.

**Unit-2:** DATA Models

Concepts of Abstraction and Data Model, Discussions on data modeling using Entity Relationship model, Discussions on data modeling using Relational Model, E-R to Relational Conversion.

**Unit-3:** Relational Algebra

Basics of Relational Algebra, selection, projection, division, cross product Operators Set Operators, Join and its types, writing Relational Algebra notations for user queries.

**Unit-4:** Basic Normalization

Introduction to attributes, Keys, relationships and their types, Anomalies in databases, understanding Functional Dependencies(Determinant, partial, full, transitive, multi valued, etc), normalization process, First Normal form, Second Normal Form, Third Normal Form etc.

**Unit-5:** Advance Normalization

Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.

**Unit-6:** SQL

Introduction to data retrieval languages like QBE, QUEL, SQL Discussions on SQL, Table , View Definitions ,DDL Statements, DML Statements, DCL Statements , TCL statements , SQL Functions ,Introduction to PL/SQL , Cursors.

**Text Books:**


| | |
|---|---|
| **1.** | Database Management Systems- Raghu Ramakrishnan, Johannes, Gehrke, Tata McGraw Hill. |
| **2** | Database System Concepts- Silber Schatz Korth, Tata McGraw Hill. |


**Reference Books**


| | |
|---|---|
| **1.** | Fundamental of Database System- Sham Kanth B. Navathe, Pearson Education. |
| **2.** | Introduction to Database management System- Bipin Desai, Galgotia Publications. |
| **3.** | Oracle Development Language Oracle PL/SQL Programming, Steven Feuerstein , O'Reilly |
| **4.** | ORACLE documentations on ORACLE PRESS / Internet. |

| CS-104 B Elective | Computer Network | Credits: 4 |
|---|---|---|

**Course Objectives:**

To understand the basic concepts of computer network and firm foundation for understanding how data communication occurring using computer network. It is based around the OSI Reference Model which deals with the major issues and related protocol studies in the various layers (Physical, Data Link, Network, Transport, Session, Presentation and Application) of the model.

**Course Outcome:**

1.analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies;
2.specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols;
3.analyze,specify and design the topological and routing strategies for an IP based networking infrastructure
4.Have a working knowledge of datagram and internet socket programming

| | |
|---|---|
| **Unit-1:** | Introduction to computer networks and Internet |

Understanding of network and Internet, The network edge, The network core, Understanding of Delay, Loss and Throughput in the packet-switching network, protocols layers and their service model, History of the computer network

| | |
|---|---|
| **Unit-2:** | Application Layer |

Principles of computer applications, Web and HTTP, E-mail, DNS, Socket programming with TCP and UDP

| | |
|---|---|
| **Unit-3:** | Transport Layer |

Introduction and transport layer services, Multiplexing and Demultiplexing, Connection less transport (UDP), Principles of reliable data transfer, Connection oriented transport (TCP), Congestion control.

| | |
|---|---|
| **Unit-4:** | Network Layer |

Introduction, Virtual and Datagram networks, study of router, IP protocol and addressing in the Internet, Routing algorithms, Broadcast and Multicast routing

| | |
|---|---|
| **Unit-5:** | The Link layer and Local area networks |

Introduction and link layer services, error-detection and correction techniques, Multiple access protocols, addressing, Ethernet, switches.

| | |
|---|---|
| **Unit-6:** | Introduction to LAN |

Devices, Topologies, Tools, Cables, Configuration

**Text Books:**

| | |
|---|---|
| **1.** | Computer Networking-A Top-Down approach, 5thedition, Kurose and Ross, Pearson |

**Reference Books**

| | |
|---|---|
| **1.** | Computer Networks (4th edition), Andrew Tanenbaum, Prentice Hall |
| **2.** | Computer Networking and the Internet (5thedition),Fred Halsall, Addison Wesley |
| **3.** | Data Communications and Networking (4th edition), Behrouz Forouzan, McGraw Hill |

| CS-105 | Semester: I | Lab-1 : C++ Programming | Credits: 2 |
|---|---|---|---|
| **Course Objectives :**<br><br>1. Get hands on experience with C++ Programming.<br>2. Write and execute program logic in C++ | | | |
| **Course Outcome :**<br><br>1. Confidence in C++.<br><br>2. Students will be skilled to learn fundamentals of advanced internet programming languages | | | |
| At least 15 C++ programs | | | |

| CS-106 | Semester: I | Lab-2 : ALP using 8086 Microprocessor | Credits: 2 |
|---|---|---|---|
| **Course Objectives :**<br><br>1. Get hands on experience with Assembly Language Programming.<br>2. Write and debug programs in TASM/MASM/hardware kits | | | |
| **Course Outcome :**<br><br>1. Lab work will skill to apply the fundamentals of assembly level programming of microprocessors.<br><br>2. Students will be skilled to learn fundamentals of designing embedded systems | | | |
| At least 15 Assembly language programs using 8086 Microprocessor | | | |

| CS- 107 A | First semester | Open Elective | Credits: 04 |
|---|---|---|---|
| **Open Elective : University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses** | | | |

**OR**

**CS-107 B Introduction to E-Commerce**

| Unit | Title | Details of Topic |
|---|---|---|
| Unit I | **Introduction to E-Commerce** | E-commerce: The revolution is just beginning, E-commerce : A Brief History, Understanding E-commerce: organizing Themes |
| Unit II | **E-commerce business models and concepts, The internet and World Wide Web: E-commerce infrastructure** | E-commerce Business Models, Major Business to Consumer (B2C) business models, Major Business to Business (B2B) business models, Business models in emerging E-commerce areas, How the Internet and the web change business: strategy, structure and process, The Internet: Technology Background, The Internet Today, Internet II- The Future Infrastructure, The World Wide Web, The Internet and the Web : Features |
| Unit III | **Building an e-commerce web site, Security and payment** | Building an E-commerce Web Site: A systematic Approach, The e-commerce security environment, Security threats in the e-commerce environment, Technology solution, Management policies, Business procedures, and public laws, Payment system, E-commerce payment system, Electronic billing presentment and payment |
| Unit IV | **E-commerce marketing concepts, Online retailing and services** | Consumer online: The Internet Audience and Consumer Behaviour, Basic Marketing Concepts, Internet Marketing Technologies, B2C and B2B E-commerce marketing and business strategies, The Retail sector, Analyzing the viability of online firms, E-commerce in action: E-tailing Business Models, Common Themes in online retailing, The service sector: offline and online, Online financial services, Online Travel Services, Online career services |
| Unit V | **Social networks, auctions, and portals** | Social networks and online communities, Online auctions, E-commerce portals |

**Books Recommended:**


1. Kenneth C. Laudon, E-Commerce : Business, Technology, Society, 4th Edition, Pearson
2. S. J. Joseph, E-Commerce: an Indian perspective, PHI


| CS-108 | First semester | Skill based Activity<br><br>SK-01: PC Assembly and Maintenance | Credits: 01 |
|---|---|---|---|
| Scope : Practically understand the PC and surrounding peripherals. The student will assemble / setup and upgrade personal computer systems; install OS and other application software, diagnose and isolate faulty components; optimize system performance and install / connect peripherals. | | | |

**Second Semester**

| CS-201 | Semester: II | Design and Analysis of Algorithms | Credits: 4 |
|---|---|---|---|

**Course Objectives :**

1. To understand the concept of designing an algorithm.
2. To learn advance algorithm techniques that are related to real life problem.

**Course Outcome :**

1. This course will aware the implementation of various advance algorithms to solve real world problem

2. Students will be skilled to select appropriate design techniques to solve various problems problems.

| Unit No. | Unit Title | No. Of Lectures |
|---|---|---|
| **Unit-1:** | **Introduction to data structure** | 10 |
| | Concepts of data and algorithm, Time and space Complexity of a given algorithm | |
| **Unit-2:** | **Divide and Conquer** | 10 |
| | General Method, Binary search, Merge sort, Quick sort, Strassen's matrix multiplication | |
| **Unit-3:** | **Greedy method** | 10 |
| | General method, Knapsack problem, Optimal storage on tapes, Job sequencing with deadlines, Optimal merge pattern, Minimum spanning tree, Shortest path | |
| **Unit-4:** | **Dynamic Programming** | 10 |
| | The general method, Multistage graphs, Optimal binary search tree, Reliability Design, Travelling sales person problem | |
| **Unit-5:** | **Basic search, traversal techniques and Backtracking** | **10** |
| | Binary tree traversal Preorder, Inorder and Postorder Traversal, Breadth first search(BFS), Depth first search(DFS),<br>**Backtracking:** The general method, 8-Queens problem, Sum of subsets, Graph coloring, Hamiltonian cycle. | |

**Text Books:**

| | | |
|---|---|---|
| 1. | Fundamentals of computer algorithm by Horowitz Sahani,Galgotial Publication | |

| CS-202 | Semester: II | Software Engineering | Credits: 4 |
|---|---|---|---|

**Course Objectives :**

1. To develop software engineering skills and testing plans.
2. To understand system concepts and its application in Software development

**Course Outcome :** After completion of this course students will be able to

1. Learn various methods of software development.
2. Apply various software testing techniques.

| Unit No. | Unit Title | No. Of Lectures |
|---|---|---|
| **Unit-1:** | **Software and Software Engineering** | 10 |
| | The Evolving Role of Software, Software Characteristics, Categories of Computer Software, The Software Myths, Software Engineering – A layered Technology, The software process, The nature of Software, Legacy Software. | |
| **Unit-2:** | **Process models** | 10 |
| | A generic process model, A Process Framework, The capability Maturity Model Integration (CMMI), Process Patterns ,Process Assessment, The Waterfall Model, Prototyping Model, Spiral Model, Fourth generation techniques, Personal software process, Team software process, Process Assessment and improvement. | |
| **Unit-3:** | **Requirements Engineering & Design concepts** | 10 |
| | Requirements Engineering, Initiating the Requirements Engineering Process, Eliciting Requirements, Negotiating Requirements, Validating Requirements, Developing use cases, Design Process and Design Quality, Design Concepts, The Design Model, Pattern Based Software Design, Web App Design Quality, Design Goals, Web App Engineering Layers, The Web Engineering Process, Web Engineering Best Practices. | |
| **Unit-4:** | **Software Testing Strategies** | 10 |
| | Software Testing fundamentals, A strategic Approach to software Testing, Strategic Issues, Test Strategies for Conventional Software, Validation Testing, System Testing, Debugging, White Box Testing, Black Box Testing, Control Structure Testing, System Testing, Model based Testing, Debugging Process, Debugging Strategies, Correcting the errors. | |

**Reference Books:**


| | | |
|---|---|---|
| 1. | Software Engineering –A Practitioner's approach, Sixth Edition, Roger S. Pressman, McGraw-Hill Higher Education; (1 August 2007),ISBN-10: 0077227808 | |
| 2. | Software Engineering –A Practitioner's approach, Fifth Edition, Roger S. Pressman, McGraw-Hill Higher Education; (1 August 2005) | |
| 3. | Fundamentals of Software Engineering Second Edition, Rajib Mall, Prentic-Hall India. | |

| CS-203 | Semester: II | Programming with VB .NET | Credits: 4 |
|---|---|---|---|

**Course Objectives :**

1. To provide the knowledge of .Net framework along with VB.Net language
2. To skill the students for developing windows base applications.

**Course Outcome :**

1. Students will able to develop simple as well as complex applications using .Net framework

2. Students will learn to use web applications for creating GUI based programs.

| Unit No. | Unit Title | No. Of Lectures |
|---|---|---|
| **Unit-1:** | Introduction to Visual Programming using VB.Net | 10 |
| | Event-Driven Programming , Installing Visual Basic 2010, The Visual Studio 2010 IDE 6, The Profile Setup Page, The Menu, The Toolbars, Creating a Simple Application, Windows in the Visual Studio 2010 IDE, The Toolbox, Modified Hungarian Notation, The Code Editor | |
| **Unit-2:** | Variables and Dates | 10 |
| | **Comments and Whitespace**: Comments, Whitespace, **Data Types**: Numbers, Common Integer Math Operations, Integer Math Shorthand, The Problem with Integer Math, Floating-Point Math, Other States, Single-Precision Floating-Point Numbers, **Working with Strings**: Concatenation, Using the Concatenation Operator Inline, More String Operations, Substrings, Formatting Strings, Localized Formatting, Replacing Substrings, **Using Dates**: Formatting Date Strings, Extracting Date Properties, Date Constants, Defining Date Literals, Manipulating Dates, Boolean | |
| **Unit-3:** | Storing Variables and Methods | 10 |
| | Binary, Bits and Bytes, Representing Values, Converting Values **Methods:** Why Use Methods? | |
| **Unit-4:** | Controlling the flow, Array and Data Structure | 10 |
| | **The If Statement**: The Else Statement, Allowing Multiple Alternatives with ElseIf, Nested If Statements, Single-Line If Statement, Comparison Operators, Using Not Equal To, Using the Numeric Operators, The And and Or Operators, Using the And Operator, More on And and Or String Comparison,<br>**Select Case**: Case-Insensitive Select Case, Multiple Selections, the Case Else Statement, Different Data Types with Select Case<br><br>**Loops:** The For ... Next Loop, Using the Step Keyword, Looping Backwards, the For Each ... Next Loop, The Do ... Loop Loops, Do While ... Loop, Acceptable Expressions for a Do ... Loop, Other Versions of the Do ... Loop, Nested Loops, Quitting Early, Quitting Do ... Loops, Infinite Loops<br>**Data Structure Arrays**: Defining and Using Arrays, Using For Each ... Next, Passing Arrays As Parameters, Sorting Arrays, Going Backwards, Initializing Arrays with Values | |
| **Unit-5:** | Building Windows Applications **and Menus** | **10** |

| | | |
|---|---|---|
| | **The If Statement**: The Else Statement, Allowing Multiple Alternatives with ElseIf, Nested If Statements, Single-Line If Statement, Comparison Operators, Using Not Equal To, Using the Numeric Operators, The And and Or Operators, Using the And Operator, More on And and Or String Comparison,<br>**Select Case**: Case-Insensitive Select Case, Multiple Selections, the Case Else Statement, Different Data Types with Select Case<br>**Loops:** The For ... Next Loop, Using the Step Keyword, Looping Backwards, the For Each ... Next Loop, The Do ... Loop Loops, Do While ... Loop, Acceptable Expressions for a Do ... Loop, Other Versions of the Do ... Loop, Nested Loops, Quitting Early, Quitting Do ... Loops, Infinite Loops<br>**Data Structure Arrays**: Defining and Using Arrays, Using For Each ... Next, Passing Arrays As Parameters, Sorting Arrays, Going Backwards, Initializing Arrays with Values<br>**Understanding Menu Features**: Images, Access Keys, Shortcut Keys, Check Marks, The Properties Window, Creating **Menus**: Designing the Menus, Adding Toolbars and Controls, Coding Menus, Coding the View Menu and Toolbars | |
| **Text Books:** | | |
| 1. | Visual Basic.Net Paperback – 2004<br>by Shirish Chavan (Author), pearson publications | |
| Reference Books: | | |
| 1. | .NET 4.5 Programming 6-in-1, Black Book Paperback – 2013<br>by Kogent Learning Solutions Inc. (Author) | |
| 2. | Programming VB .NET (English, Paperback, Morrison Jonathan) | |

| **CS-204 A Elective** | **Semester:**<br>**II** | **Advanced Operating System** | **Credits: 4** |
|---|---|---|---|

**Course Objectives :**

1. To learn the mechanisms of OS to handle processes and threads and their communication
2. To learn the advanced mechanisms involved in process , file and memory management in contemporary OS

**Course Outcome :**

1. Students will be able to Analyze the structure of OS and basic architectural components involved in OS design

2. Students will be able to Conceptualize the components involved in designing a contemporary OS

| **Unit No.** | **Unit Title** | **No. Of Lectures** |
|---|---|---|
| **Unit-1:** | **Introduction to UNIX/Linux Kernel** | 10 |
| | System Structure, User Perspective, Assumptions about Hardware, Architecture of UNIX Operating System, Concepts of Linux Programming-Files and the File system, Processes, Users and Groups, Permissions, Signals, Inter-process Communication | |
| **Unit-2:** | **File and Directory I/O** | 10 |
| | Buffer headers, structure of the buffer pool, scenarios for retrieval of a buffer, reading and writing disk blocks, inodes, structure of regular file, | |

| | | |
|---|---|---|
| | open, read, write, lseek, close, pipes, dup, open, creat, file sharing, atomic operations, dup2,sync, fsync, and fdatasync, fcntl, /dev/fd, stat,fstat, lstat, file types, Set-User-ID and Set-Group-ID, file access permissions, ownership of new files and directories, access function, umask function, chmod and fchmod, sticky bit, chown, fchown, and lchown, file size, file truncation, file systems, link, unlink, remove, and rename functions, symbolic links, symlink and readlink functions, file times, utime, mkdir and rmdir, reading directories, chdir, fchdir, and getcwd, device special files | |
| **Unit-3:** | **Process Environment, Process Control and Process Relationships** | 10 |
| | Process states and transitions, layout of system memory, the context of a process, saving the context of a process, sleep, process creation, signals, process termination, awaiting process termination, invoking other programs, the user id of a process, changing the size of the process, The Shell, Process Scheduling | |
| **Unit-4:** | **Memory Management** | 10 |
| | The Process Address Space, Allocating Dynamic Memory, Managing Data Segment, Anonymous Memory Mappings, Advanced Memory Allocation, Debugging Memory Allocations, Stack-Based Allocations, Choosing a Memory Allocation Mechanism, Manipulating Memory, Locking Memory, Opportunistic Allocation (TextBook-1: Chapter 8) Swapping, Demand Paging | |
| **Unit-5:** | **Signal Handling** | **10** |
| | Signal concepts, signal function, unreliable signals, interrupted system calls, reentrant functions, SIGCLD semantics, reliable-signal technology, kill and raise, alarm and pause, signal sets, sigprocmask, sigpending, sigsetjmp and siglongjmp, sigsuspend, abort, system function revisited, sleep | |
| **Text Books:** | | |
| 1. | Linux System Programming, O"Reilly, by Robert Love. | |
| **Reference Books:** | | |
| 1. | Windows Internals, Microsoft Press, by Mark E. Russinovich and David A. Soloman. | |
| 2. | The Design of the UNIX Operating System, PHI, byMaurice J. Bach. | |
| 3. | Advanced Programming in the UNIX Environment, Addison-Wesley, by Richard Steve | |

| **CS-204 B Elective** | **Semester: II** | **Compiler Designing** | **Credits: 4** |
|---|---|---|---|
| **Course Objectives :**<br>1. Describe the design of a compiler including its phases and components.<br>2. To explore the students step by step conversion of Source program into Object code | | | |
| **Course Outcome :**<br>1. To realize the students basics of compiler design and apply for real time applications.<br>2. Students will get knowledge about compiler generation tools and techniques | | | |
| **Unit No.** | **Unit Title** | | **No. Of** |

| | | Lectures |
|---|---|---|
| **Unit-1:** | **Introduction to Compilers and Programming Languages** | 10 |
| | Compilers and translators, The structure of compiler, Compiler writing tools, High level programming languages, Definitions of programming languages, A lexical and syntactic structure of a language, Data structures, Operators, Statements | |
| **Unit-2:** | **Lexical Analysis & Syntax Analysis** | 10 |
| | Lexical analysis, Role of a Lexical analyzer, A simple approach to the design of lexical analyzer, regular expressions, Syntax analysis, Finite automata, Minimizing number of states of a DFA, Implementation of a lexical analyzer, Context free grammars | |
| **Unit-3:** | **Basic parsing techniques** | 10 |
| | Introduction to parsers, Shift reduce parsing, Top-down parsing, Operator Precedence parsing, Predictive parsers, LR, SLR and LALR parsers. | |
| **Unit-4:** | **Syntax Directed Translation and Symbol tables** | 10 |
| | Introduction, Syntax directed Schemes5.3 Implementation of Syntax directed translators, Intermediate code, Postfix notation and evaluation of postfix expressions, Parse trees and syntax trees Symbol Tables -The contents of a symbol table, Data structures for a symbol table | |
| **Unit-5:** | **Error detection and recovery and Code Optimization** | **10** |
| | Errors, Lexical-phase errors, Syntactic phase errors, Semantic errors. Introduction to Code Optimization: Sources of optimization, Loop optimization | |
| **Text Books:** | | |
| 1. | Principals of Compiler Design By Alfred V. Aho, Jeffrey D. Ullman | |
| **Reference Books:** | | |
| 1. | Compilers - Principles, Techniques and Tools - A.V. Aho, R. Shethi and J.D. | |
| 2. | Introduction to System Software By D. M. Dhamdhere | |
| 3. | | |

| **CS-205** | **Semester:** **II** | **Lab-3 : Vb.Net Programming** | **Credits: 2** |
|---|---|---|---|
| At least 15 programs covering all theoretical aspects. Concerned teacher shall frame these experiments well in advance, before commencement of the semester | | | |

| CS-206 | Semester: II | Lab-4 : Based on Elective Subject CS-204 A or CS-204 B | Credits: 2 |
|---|---|---|---|
| At least 15 programs covering all theoretical aspects. Concerned teacher shall frame these experiments well in advance, before commencement of the semester | | | |

| CS- 207 A | Second semester | Open Elective | Credits: 04 |
|---|---|---|---|
| **Open Elective : University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses** | | | |

**OR**

**Course Code: CS-207 B**
**Paper Title: Information Technology**

**Course Objectives**:

1. Introduce students to foundation of Information technology

**Course outcome:** After complication of this course student will be able to:

1. Understand basic concepts in IT and their use in actual working

**Unit 1: Computer Organization, Memory and Storage**

Introduction, Basic Computer Organization, Input Devices, Output Devices, Central Processing Unit, The System Bus Architecture, Memory or Storage Unit

**Unit 2: Information Technology Basics**

Introduction, Need for Information Storage and Processing, Information Technology Components, Role of Information Technology, Information Technology and the Internet

**Unit 3: Internet and its Tools**

Introduction, Internet Evolution, Basic Internet Terminology, Data over Internet, Modes of Data Transmission, Types of Networks, Types of Topologies, Protocols used in the Internet, Getting Connected to Internet Applications, Internet Applications, Computer Ethics,

**Unit 4: Emerging Trends in IT**

Introduction, Electronic Commerce (E-Commerce),Electronic Data Interchange (EDI)
Smart Cards, Mobile Communication, Internet Protocol TV

**Unit 5: Computer Programming and Languages**

Introduction, Planning a Computer Program, Steps for Program Development ,Problem Solving Tools, Program Control Structures, Generations of Computer Languages, Program Methodology, Programming Models

**Reference books**

Fundamentals of Information Technology, Wiley India Editorial Team, ISBN: 9788126543557

| CS- 208 | Second semester | Skill based Activity<br><br>SK-02: Networking Essentials | Credits: 01 |
|---|---|---|---|
| **Scope :** Networking Essentials deals with knowing what is a network, how to install, configure, and troubleshoot a computer network It includes knowledge of the fundamental building blocks that form a modern network, such as various cables, switches, routers, connectors, LAN-NIC cards and network operating systems. It then provides in-depth coverage of the most important concepts in contemporary networking like connecting computers/ peripherals, servers and clients, Wi-Fi connectivity, etc. Students are expected to have the skills to build a network / LAN from scratch and maintain, upgrade, and troubleshoot an existing network. | | | |