**Ahmednagar Jilha Maratha Vidya Prasarak Samaj’s**

**New Arts, Commerce, and Science College, Ahmednagar**

**(Autonomous)**

**(Affiliated to Savitribai Phule Pune University, Pune)**



**National Education Policy (NEP)**

**Choice Based Credit System (CBCS)**

**Programme Skeleton and Syllabus of**

**B.Sc. (Computer Science) (Major)**

**Implemented from**

**Academic Year 2023-24**

**Credit Distribution: B.ScComputer Science (Major) including Minor and OE and other courses.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | Type of Courses  | III Yr | IV Yrs (Honours) | IV YrsResearch  |
| Major Computer Science | Discipline-Specific Courses (DSC)  | 46 | 74 | 66 |
| Discipline Specific Elective (DSE) | 08 | 16 | 16 |
| Skill Enhancement Courses (SEC) | 06 | 06 | 06 |
| Vocational Skill Courses (VSC) | 08 | 08 | 08 |
| On-Job Training (OJT) | 04 | 08 | 04 |
| Field Project (FP) | 04 | 04 | 04 |
| Community Engagement and Service (CEP) | 02 | 02 | 02 |
| Research project | 00 | 00 | 12 |
| Research Methodology | 00 | 04 | 04 |
|  | Indian Knowledge System | 02 | 02 | 02 |
|  | Total (I, II and III Year)  | 80 | 124 | 124 |
| Minor  | Minor | 20 | 20 | 20 |
| OtherCourses  | Open Elective (OE)/ Multidisciplinary Courses  | 12 | 12 | 12 |
| Co-Curricular Courses | 08 | 08 | 08 |
| Ability Enhancement Courses | 08 | 08 | 08 |
| Value Education Courses | 04 | 04 | 04 |
| Total | 132 | 176 | 176 |

**B. Sc. Programme Framework: Credit Distribution**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | Semester | Level | Major | Minor | OE | CC | AEC | VEC | Total |
| DSC | DSE | SEC | VSC | FP/OJT/IN/CEP | IKS |
| I | I | 4.5 | T | P | T | P | T | P | T | P | T | P |  | T/P | - | - | - | - | - |
| I | II | 4.5 | 4 | 2 | - | - | - | 2 | - | - | - | - | 2 | 03 | 3 | 2 | 2 | 2 | 22 |
|  |  |  | 6 | - | - | - |  | 2 | - | 2 | - | - |  | 03 | 3 | 2 | 2 | 2 | 22 |
| Exit Option: Award of UG Certificate in Major with 44 credits and an additional 4 credit core NSQF course /Internship or Continue with Major and Minor |
| II | III | 5.0 | 6 | 2 | - | - |  | 2 | - | - | - | 2 |  | 03 | 3 | 2 | 2 | - | 22 |
| II | IV | 5.0 | 6 | 2 | - | - |  | - | - | 2 | - | 2 |  | 03 | 3 | 2 | 2 | - | 22 |
| Exit Option: Award of UG Diploma in Major with 88 credits and an additional 4 credit core NSQF course /Internship or Continue with major and minor |
| III | V | 5.5 | 8 | 2 | 2 | 2 | - | - | - | 2 |  | 2 |  | 04 | - | - | - | - | - | 22 |
| III | VI | 5.5 | 6 | 2 | 2 | 2 | - | - | - | 2 |  | 4 |  | 04 | - | - | - | - | - | 22 |
| Exit Option: Award of UG Degree in Major and Minor with 132 credits or continue with Major for a 4-year Degree |
| IV | VII | 6.0 | 8 | 6 | 2 | 2 | RM-4 | - | - | - | - |  | - | - | - | - | - | - | - | 22 |
| IV | VIII | 6.0 | 8 | 6 | 2 | 2 | - | - | - | - | - | 4 |  | - | - | - | - | - | - | - | 22 |
| Four Year UG Degree(Honours) with Major and Minor with 176 credits |
| IV | VII | 6.0 | 6 | 4 | 2 | 2 | RM-4 | - | - | - | 4 |  | - | - | - | - | - | - | - | 22 |
| IV | VIII | 6.0 | 6 | 4 | 2 | 2 | - | - | 0 | - | - | 8 |  | - | - | - | - | - | - | - | 22 |
| Four Year UG Degree (Honours with Research) with Major and Minor with 176 credits |

**B. Sc. Programme Framework: Course Distribution**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | Semester | Level | Major | Minor | OE | CC | AEC | VEC | Total |
| DSC | DSE | SEC | VSC | FP/OJT/IN/CEP | IKS |
| I | - | - | T | P | T | P | T | P | T | P | T | P |  | T | P | - | - | - | - | - |
| I | I | 4.5 | **2** | **1** | **-** | **-** | **-** | 1 | **-** | **-** | **-** | **-** | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
|  | II | 4.5 | **2** | **-** | **-** | **-** |  | 1 | **-** | **1** | **-** | **-** |  | 1 | 1 | 1 | 1 | 1 | 09 |
| Exit Option: Award of UG Certificate in Major with 44 credits and an additional 4 credit core NSQF course /Internship or Continue with major and minor |
| II | III | 5.0 | **2** | **1** | **-** | **-** |  | **1** | **-** | **-** | **-** | **1** |  | 1 | 1 | 1 | 1 | - | 09 |
| II | IV | 5.0 | **2** | **1** | **-** | **-** |  | **-** | **-** | **1** | **-** | **1** |  | 1 | 1 | 1 | 1 | - | 09 |
| Exit Option: Award of UG Diploma in Major with 88 credits and an \additional 4 credit core NSQF course /Internship or Continue with major and minor |
| III | V | 5.5 | **2** | **1** | **1** | **1** | **-** | **-** | **-** | **1** |  | **1** |  | 1 | - | - | - | - | 08 |
| III | VI | 5.5 | **2** | **1** | **1** | **1** | **-** | **-** | **-** | **1** |  | **1** |  | 1 | - | - | - | - | 08 |
| Exit Option: Award of UG Degree in Major and Minor with 132 credits or continue with Major for a 4-year Degree |
| IV | VII | 6.0 | **3** | **3** | **1** | **1** | **0** | **1** | **-** | **-** | **-** | **-** |  | - | - | - | - | - | - | 09 |
| IV | VIII | 6.0 | 3 | **3** | **1** | **1** | **-** | **-** | **-** | **-** | **-** | **1** |  | - | - | - | - | - | - | - | 09 |
| Four Year UG Degree(Honours) with Major and Minor with 176 credits |
| IV | VII | 6.0 | **2** | **2** | **1** | **1** | **0** | **1** | **-** | **-** | **-** | **1** |  | - | - | - | - | - | - | - | 08 |
| IV | VIII | 6.0 | **2** | **2** | **1** | **1** | **-** | **-** | **-** | **-** | **-** | **1** |  | - | - | - | - | - | - | - | 07 |
| Four Year UG Degree (Honours with Research) with Major and Minor with 176 credits |

**Programme Framework (Course Distribution): B.Sc. (Computer Science) (Major)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Semester | Level | Major | Total |
| DSC | DSE | SEC | VSC | FP/OJT/IN/CEP/PR | IKS |
| T | P | T | P | T | P | T | P | T | P | T | T | P/PR |
| I | I | 4.5 | 2 | 1 | - | - | - | 1 | - | - | - | - | 01 | 03 | 02 |
| I | II | 4.5 | 2 | - | - | - |  | 1 | - | 1 | - | - |  | 02 | 02 |
| II | III | 5.0 | 2 | 1 | - | - |  | 1 | - | - | - | 1 |  | 02 | 03 |
| II | IV | 5.0 | 2 | 1 | - | - |  | - | - | 1 | - | 1 |  | 02 | 03 |
| III | V | 5.5 | 2 | 1 | 1 | 1 | - | - | - | 1 |  | 1 |  | 03 | 04 |
| III | VI | 5.5 | 2 | 1 | 1 | 1 | - | - | - | 1 |  | 1 |  | 03 | 04 |
| B.Sc. Honours |
| IV | VII | 6.0 | 3 | 3 | 1 | 1 | RM-1 | - | - | - | - |  | 05 | 04 |
| IV | VIII | 6.0 | 3 | 3 | 1 | 1 | - | - | - | - | - | 1 |  | 04 | 05 |
| B.Sc. Honours with Research |
| IV | VII | 6.0 | 2 | 2 | 1 | 1 | RM-1 | - | - | - | 1 |  | 04 | 04 |
| IV | VIII | 6.0 | 2 | 2 | 1 | 1 | - | - | - | - | - | 1 |  | 03 | 04 |

**Programme Framework (Credit Distribution): B.Sc. (Computer Science) (Major)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Semester | Level | Major | Total |
| DSC | DSE | SEC | VSC | FP/OJT/IN/CEP/RP | IKS |
|  |  |  | T | P | T | P | T | P | T | P | T | P | **T** |  |
| I | I | 4.5 | 4 | 2 | - | - | - | 2 | - | - | - | - | 02 | 10 |
| I | II | 4.5 | 6 | - | - | - |  | 2 | - | 2 | - | - |  | 10 |
| II | III | 5.0 | 6 | 2 | - | - |  | 2 | - | - | - | 2 |  | 12 |
| II | IV | 5.0 | 6 | 2 | - | - |  | - | - | 2 | - | 2 |  | 12 |
| III | V | 5.5 | 8 | 2 | 2 | 2 | - | - | - | 2 |  | 2 |  | 18 |
| III | VI | 5.5 | 6 | 2 | 2 | 2 | - | - | - | 2 |  | 4 |  | 18 |
| IV | VII | 6.0 | 8 | 6 | 2 | 2 | RM-4 |  | - | - | - | - |  | 22 |
| IV | VIII | 6.0 | 8 | 6 | 2 | 2 | - | - | - | - | - | 4 |  | 22 |
| IV | VII | 6.0 | 6 | 4 | 2 | 2 | RM-4 | - | - | - | - | 4 |  | 22 |
| IV | VIII | 6.0 | 6 | 4 | 2 | 2 | - | - | - | - | - | 8 |  | 22 |

**Programme Framework (Courses and Credits): B.Sc. (Computer Science) (Major)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sr. No. |  Year | Semester | Level | Course Type | Course Code  | Title  | Credits |
|  | I | I | 4.5 | DSC-1 | BS-CS111T | Problem Solving using Computer and ‘C’ Programming  | 02 |
|  | I | I | 4.5 | DSC-2 | BS- CS112T | Database Management Systems  | 02 |
|  | I | I | 4.5 | DSC-3 | BS- CS113P | Lab Course based on C Programming & DBMS  | 02 |
|  | I | I | 4.5 | SEC-1 | BS- CS114T | Analog Electronics | 02 |
|  | I | I | 4.5 | IKS-1 | BS- CS 115T | Science and Technology in Ancient India | 02 |
|  | I | II | 4.5 | DSC-4 | BS- CS121T | Advanced 'C' Programming | 03 |
|  | I | II | 4.5 | DSC-5 | BS- CS122T | Relational Database Management Systems | 03 |
|  | I | II | 4.5 | SEC-2 | BS- CS123P | Lab course on Advanced C Programming & RDBMS | 02 |
|  | I | II | 4.5 | VSC-1 | BS- CS124T | Digital Electronics | 02 |
|  | II | III | 5.0 | DSC-6 | BS- CS231T | Data Structures and Algorithms  | 03 |
|  | II | III | 5.0 | DSC-7 | BS- CS232T | Software Engineering | 03 |
|  | II | III | 5.0 | DSC-8 | BS- CS233P | Lab course on Data Structures and Algorithms | 02 |
|  | II | III | 5.0 | SEC-3 | BS- CS234P | Mini Project on Software Engineering  | 02 |
|  | II | III | 5.0 | FP-01 | BS- CS235P | Project | 02 |
|  | II | IV | 5.0 | DSC-9 | BS- CS242T | Object Oriented Concepts using C++ | 03 |
|  | II | IV | 5.0 | DSC-10 | BS- CS242T | NoSQL | 03 |
|  | II | IV | 5.0 | DSC-11 | BS- CS243P | Lab Course on Object Oriented Concepts using C++ | 02 |
|  | II | IV | 5.0 | VSC-2 | BS- CS244P | Lab Course on NoSQL | 02 |
|  | II | IV | 5.0 | CEP-01 | BS- CS245P | Project | 02 |
|  | III | V | 5.5 | DSC-12 | BS- CS351T | Operating System | 04 |
|  | III | V | 5.5 | DSC-13 | BS- CS352T | Computer Network  | 04 |
|  | III | V | 5.5 | DSC-14 | BS- CS353P | Lab Course on Operating System | 02 |
|  | III | V | 5.5 | DSE-01 | BS- CS355T | Web Tech  | 02 |
|  | III | V | 5.5 | DSE-02 | BS- CS356P | Lab Course on Computer Network | 02 |
|  | III | V | 5.5 | VSC-3 | BS- CS357P | Lab Course on Web Tech | 02 |
|  | III | V | 5.5 | FP-02 | BS- CS358P | Project | 02 |
|  | III | VI | 5.5 | DSC-15 | BS- CS361T | Foundation of Data Science | 03 |
|  | III | VI | 5.5 | DSC-16 | BS- CS362T | Object Oriented Programming using Java | 03 |
|  | III | VI | 5.5 | DSC-17 | BS- CS363P | Lab Course on Data Science | 02 |
|  | III | VI | 5.5 | DSE-03 | BS- CS364T | Python Programming | 02 |
|  | III | VI | 5.5 | DSE-04 | BS- CS365P | Lab Course on Java | 02 |
|  | III | VI | 5.5 | VSC-4 | BS- CS366P | Lab Course on Python | 02 |
|  | III | VI | 5.5 | OJT-01 | BS- CS367P | Project | 04 |

**B.Sc. (Computer Science) (Major with Honours)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | IV | VII | 6.0 | DSC-18 | BS- CS471T | Paradigm of Programming Languages  | 03 |
|  | IV | VII | 6.0 | DSC-19 | BS- CS472T | Database Technologies  | 03 |
|  | IV | VII | 6.0 | DSC-20 | BS- CS473T | Artificial Ingtellegence  | 02 |
|  | IV | VII | 6.0 | DSC-21 | BS- CS474P | Lab Course on Paradigm of Programming Languages  | 02 |
|  | IV | VII | 6.0 | DSC-22 | BS- CS475P | Lab Course on Database Technologies | 02 |
|  | IV | VII | 6.0 | DSC-23 | BS- CS476P | Lab Course on Artificial Intellegence | 02 |
|  | IV | VII | 6.0 | DSE-05 | BS- CS477T | Web Technolog **OR** Design and Analysis of Algorithms | 02 |
|  | IV | VII | 6.0 | DSE-06 | BS- CS478P (A)ORBS- CS478P (B) | Lab Course on Web Technology **OR** Lab Course based on Design and Analysis of Algoithms  | 02 |
|  | IV | VII | 6.0 | RM-01 | BS- CS479T/P | Project | 04 |
|  | IV | VIII | 6.0 | DSC-24 | BS- CS481T | Advanced Operating Systems | 03 |
|  | IV | VIII | 6.0 | DSC-25 | BS- CS482T | Information System Security | 03 |
|  | IV | VIII | 6.0 | DSC-26 | BS- CS483T | Mobile Technologies | 02 |
|  | IV | VIII | 6.0 | DSC-27 | BS- CS484P | Lab Course on Advanced Operating Systems | 02 |
|  | IV | VIII | 6.0 | DSC-28 | BS- CS485P | Lab Course on Information System Security | 02 |
|  | IV | VIII | 6.0 | DSC-29 | BS- CS486P | Lab Course on Mobile Technologies | 02 |
|  | IV | VIII | 6.0 | DSE-07 | BS- CS487T (A)ORBS- CS487T (B)ORBS- CS487T (C) | Dot NetOR Cloud Computing ORNetwork Cyber Security | 02 |
|  | IV | VIII | 6.0 | DSE-08 | BS- CS488P (A)ORBS- CS488P (B)ORBS- CS486P (C) | Lab Course on Dot Net OR Lab Course on Cloud ComputingORLab Course on Network Cyber Security | 02 |
|  | IV | VIII | 6.0 | OJT-02 | BS- CS489P | Project | 04 |

**B.Sc. (Computer Science) (Major Honours with Research)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | IV | VII | 6.0 | DSC-20 | BS- CS 471T | KLM | 03 |
|  | IV | VII | 6.0 | DSC-21 | BS- CS 472T | NOP | 03 |
|  | IV | VII | 6.0 | DSC-22 | BS- CS 473P | TUV | 02 |
|  | IV | VII | 6.0 | DSC-23 | BS- CS 474P | WXY | 02 |
|  | IV | VII | 6.0 | DSE-05 | BS- CS 475T | WXY | 02 |
|  | IV | VII | 6.0 | DSE-06 | BS- CS 476P | YXZ | 02 |
|  | IV | VII | 6.0 | RM-01 | BS- CS 477T/P | ZAB | 04 |
|  | IV | VII | 6.0 | RP-01 | BS- CS 488P | AAA | 04 |
|  | IV | VIII | 6.0 | DSC-20 | BS- CS 481 | KLM | 03 |
|  | IV | VIII | 6.0 | DSC-21 | BS- CS 482 | NOP | 03 |
|  | IV | VIII | 6.0 | DSC-22 | BS- CS 483 | TUV | 02 |
|  | IV | VIII | 6.0 | DSC-23 | BS- CS 484 | WXY | 02 |
|  | IV | VIII | 6.0 | DSE-07 | BS- CS 485 | WXY | 02 |
|  | IV | VIII | 6.0 | DSE-08 | BS- CS 486 | YXZ | 02 |
|  | IV | VIII | 6.0 | RP-02 | BS- CS 487 | AAA | 08 |

Ahmednagar Jilha Maratha Vidya Prasarak Samaj’s

**New Arts, Commerce and Science College, Ahmednagar**

**(Autonomous)**

**Board of Studies in Computer Science**

|  |  |  |
| --- | --- | --- |
| Sr. No. | Name | Designation |
| 1. |  Prof. M.B. Bhingare | Chairman |
| 2. |  Prof. A.D. Gangarde | Member |
| 3. |  Prof. M.B. Gobare | Member |
| 4. |  Prof. B.M. Danve | Member |
| 5. |  Dr.P.P. Mulay  | Hon.Vice-Chancellor Nominee |
| 6. |  Dr. V.S. Kumbhar | Academic Council Nominee |
| 7. |  Prof. S.D. Pachpande | Academic Council Nominee |
| 8. |  Mr. U.C. Temkar | Industrial Expert |
| 9. |  Mrs. Aboli J.Joshi Potnis | Post Graduate Meriotirious Allumnus |
| 10. |  Prof. S.D. Shelke | Co-Opt (Electronics) |
| 11. |  Prof. S.A. Tarate | Co-Opt (Mathematics) |
| 12. |  Dr. A.A. Kulkarni | Co-Opt (Statistics) |

* **Prologue/ Introduction of the programme:**

Education is the key to development of any society. Role of higher education is crucial for securing right kind of employment and also to pursue further studies in best available world class institutes elsewhere within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Sustained initiatives are required to reform the present higher education system for improving and upgrading the academic resources and learning environments by raising the quality of teaching and standards of achievements in learning outcomes across all undergraduate programs in science, humanities, commerce and professional streams of higher education including computer science. B.Sc. (Computer Science) has been evolving as an important branch of science and engineering throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Computer science is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Computer science has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence, Computational Science, and Software Engineering. Drawing from a common core of computer science knowledge, each specialty area focuses on specific challenges. Computer Science is practiced by mathematicians, scientists and engineers. Mathematics, the origins of Computer Science, provides reason and logic. Computer Science education at undergraduate level (+3) will result in earning Bachelor of Science (BSc) degree in Computer Science. The coursework required to earn a BSc is equally weighted in mathematics and science. B.Sc. with Computer Science are aimed at undergraduate level training facilitating multiple career paths. Students so graduated, can take up postgraduate programmes in Computer Science and can be employable at IT industries. There are several employment opportunities and after successful completion of an undergraduate programme in Computer Science, graduating students can fetch employment directly in companies as Web Developer, Software Engineer, Network Administrator, Data Scientist, or AI/ML personnel.

* **Programme Outcomes (POs)**
1. Demonstrate the aptitude of Computer Programming and Computer based problem solving skills.
2. Display the knowledge of appropriate theory, practices and tools for the specification, design, implementation.
3. Ability to link knowledge of Computer Science with other two auxiliary disciplines of study.
4. Display ethical code of conduct in usage of Internet and Cyber systems.
5. Ability to pursue higher studies of specialization and to take up technical employment.
6. Ability to formulate, to model, to design solutions, procedure and to use software tools to solve real world problems and evaluate.
7. Ability to operate, manage, deploy, configure computer network, hardware, software operation of an organization.
8. Ability to present result using different presentation tools.
9. Ability to appreciate emerging technologies and tools.
10. Apply standard Software Engineering practices and strategies in real-time software project development.
11. Design and develop computer programs/computer -based systems in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics.
12. The ability to work independently on a substantial software project and as an effective team member.

**Ahmednagar Jilha Maratha Vidya Prasarak Samaj’s**

**New Arts, Commerce and Science College, Ahmednagar**

**(Autonomous) Syllabus**

**B.Sc. (Computer Science) (Major)**

|  |
| --- |
| **Title of the Course: Problem Solving using Computer and ‘C’ Programming** |
| **Year: I** | **Semester: I** |
| Course Type | Course Code | Credit Distribution | Credits | Allotted Hours | Allotted Marks |
| Theory | Practical |
| CIE | ESE | Total |
| DSC-1 | BS-CS111T | 02 | 00 | 02 | 30 | 15 | 35 | 50 |

**Learning Objectives:**

Ability to work with arrays of complex objects. Understanding a concept of object thinking within the framework of functional model. Understanding a concept of functional hierarchical code organization.

**Course Outcomes (Cos)**

* Explore algorithmic approaches to problem solving.
* Formulate algorithms, pseudocodes and flowcharts for arithmetic and logical problems.
* Understand structured programming approach.
* Develop the basic concepts and terminology of programming in general.
* Develop modular programs using control structures and arrays in ‘C’.

**Detailed Syllabus:**

**Unit I: Fundamental of Computer (Allotted Lectures : 04)**

1.1 Introduction – uses of computer, history of computer, generation of

 computer.

1.2 Different parts of computer (Hardware and Software) – the monitor, the

 system box, keyboard, mouse, peripherals, disc size conversion chart.

1.3 Computer Hardware – CPU, input devices, output devices, storage devices,

 system memory.

1.4 Computer Software – operating system, utility software, application

 software.

**Unit II: Problem Solving Aspects (Allotted Lectures 04)**

2.1 Introduction to problem solving using computers.

2.2 Problem solving steps.

2.3 Algorithms-definition, characteristics, examples, advantages and

 limitations.

2.4 Flowcharts - definition, notations, examples, advantages and limitations,

 Comparison with algorithms.

2.5 Pseudo codes - notations, examples, advantages and limitations.

2.6 Programming Languages as tools, programming paradigms, types of

 languages.

2.7 Converting pseudo-code to programs.

2.8 Compilation process (compilers, interpreters), linking and loading, syntax

 and semantic errors, testing a program.

2.9 Good Programming Practices (naming conventions, documentation,

 indentation).

**Unit III: ‘C’ Fundamentals (Allotted Lectures 06)**

3.1 History of ‘C’ language.

3.2 Application areas.

3.3 Structure of a ‘C’ program.

3.4 ‘C’ Program development life cycle.

3.5 ‘C’ tokens.

 3.5.1 Character set, Keywords, Identifiers.

 3.5.2 Variables, Constants.

 3.5.3 Operators, Expressions, types of operators, Operator precedence and

 Order of evaluation.

3.6 Data Types (Built-in and user defined data types).

3.7 Operators, Expressions, types of operators, Operator precedence and order

 of evaluation.

3.8 Character input and output.

3.9 String input and output.

3.10 Formatted input and output.

**Unit IV: Control Structures (Allotted Lectures 05)**

4.1 Decision making structures: - if, if-else, switch and conditional operator. 4.2 Loop control structures: - while, do while, for.

4.3 Loop interruption statements - break and continue, goto, exit. 4.4 Nested Loops.

**Unit V: Functions (Allotted Lectures 05)**

5.1 Concept of function, Advantages.

5.2 Standard library functions.

5.3 User defined functions: - declaration, definition, call, parameter passing (by value, by reference - overview), return statement.

5.4 Recursive functions.

5.5 Scope of variables and Storage classes.

**Unit Vi: Functions (Allotted Lectures 05)**

6.1 Concept of Array.

6.2 Types of Arrays – One, Two and Multidimensional array.

6.3 Array Operations - declaration, initialization, accessing array elements.

6.4 Memory representation of two-dimensional array (row major and column major)

6.5 Multidimensional Array - 3D Array, visualizing 3D array, declaring 3D array, updating 3D array.

6.6 Passing arrays to function.

6.7 Array applications - finding maximum and minimum, occurrences count, linear search, binary search, sorting an array, merging two sorted arrays, Matrix operations (trace of matrix, addition, transpose, multiplication, symmetric, upper/ lower triangular matrix)

**Suggested Readings/Material:**

1. How to Solve it by Computer, R.G. Dromey, Pearson Education.
2. Problem Solving and Programming Concept, Maureen Sprankle,7th Edition, Pearson Publication.
3. C: The Complete Reference, Schildt Herbert, 4th edition, McGraw Hill.
4. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India.
5. The ‘C’ programming language, Brian Kernighan, Dennis Ritchie, PHI.
6. Programming in C, A Practical Approach, Ajay Mittal, Pearson.
7. Programming with C, B. Gottfried, 3rd edition, Schaum’s outline Series, Tata McGraw Hill.
8. Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill.

**Ahmednagar Jilha Maratha Vidya Prasarak Samaj’s**

**New Arts, Commerce and Science College, Ahmednagar**

**(Autonomous) Syllabus**

**B.Sc. (Computer Science) (Major)**

|  |
| --- |
| **Title of the Course: Database Management Systems**  |
| **Year: I** | **Semester: I** |
| Course Type | Course Code | Credit Distribution | Credits | Allotted Hours | Allotted Marks |
| Theory | Practical |
| CIE | ESE | Total |
| DSC-2 | BS-CS112T | 02 | 00 | 02 | 30 | 15 | 35 | 50 |

**Learning Objectives:**

Produces an Entity-Relationship model from a realistic problem specification. Describes the conceptual schema of a database. Describes the physical schema of a database. Uses formal design techniques to produce a database schema. Applies normalization techniques. Prepares logical construction.

**Course Outcomes (Cos)**

1. Understand the fundamental concepts of database.
2. Understand creations, manipulation and querying of data in databases.
3. Solve real world problems using appropriate set, function, and relational models.
4. Design E-R Model for given requirements and convert the same into database tables. 5. Use SQL.

**Detailed Syllabus: Example**

**Unit I: Introduction to DBMS (Allotted Lectures 03)**

1.1 Introduction.

1.2 File system Vs DBMS.

1.3 Levels of abstraction & data independence.

1.4 E.F. Codd’s Rules, Structure of DBMS.

1.5 Users of DBMS, Advantages of DBMS.

**Unit II: Conceptual Design (Allotted Lectures 09)**

2.1 Overview of DB design process.

2.2 Introduction to Data Models (E-R model, Relational model, Network model, Hierarchical model).

2.3 Conceptual design using ER data model (entities, attributes, entity sets, relations, relationship sets).

2.4 Constraints (Key constraints, Integrity constraints, referential integrity, unique constraint, Null/Not Null constraint, Domain, Check constraint, Mapping constraints).

2.5 Extended features – Specialization, Aggregation, Generalization.

2.6 Pictorial representation of ER(symbols).

2.7 Structure of Relational Databases (concepts of a table).

2.8 DBMS Versus RDBMS.

2.9 Case Studies on ER model.

**Unit III: Relational Database Design (Allotted Lectures 07)**

3.1 Introduction to Relational-Database Design (undesirable properties of a RDB design).

3.2 Functional Dependency (Basic concepts, F+, Closure of an Attribute set, Armstrong’s axioms).

3.3 Concept of Decomposition.

3.4 Desirable Properties of Decomposition (Lossless join, Lossy join, Dependency Preservation).

3.5 Keys Concept with Examples: Candidate Keys and Super Keys, Algorithm to find the super keys / primary key for a relation.

**Unit IV: Normalization (Allotted Lectures 05)**

4.1 Functional Dependency – Armstrong’s axioms, trivial functional dependency.

4.2 Normalization.

4.2.1 First Normal Form.

4.2.2 Second Normal Form.

4.2.3 Third Normal Form.

4.2.4 Boyce Codd Normal Form

**Unit IV: SQL (Allotted Lectures 06)**

5.1 Introduction to query languages.

5.2 Basic structure.

5.3 DDL Commands.

5.4 DML Commands.

5.5 Forms of a basic SQL query (Expression and strings in SQL).

5.6 Set operations.

5.7 Aggregate Operators and functions.

5.8 Date and String functions.

5.9 Null values.

5.10 Nested Subqueries.

5.11 SQL mechanisms for joining relations (inner joins, outer joins and their types).

5.12 Views. Examples on SQL (case studies).

**Suggested Readings/Material:**

1. How to Solve it by Computer, R.G. Dromey, Pearson Education.

2. Problem Solving and Programming Concept, Maureen Sprankle,7th Edition, Pearson Publication.

3. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S. Sudarshan, ISBN:9780071289597, Tata McGraw-Hill Education.

4. Database Management Systems, Raghu Ramakrishnan, ISBN: 9780071254342, Mcgraw-hill higher Education.

5. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill.

6. Science/Engineering/Math; 3 Edition, ISBN: 9780072465631.

7. Database Systems, Shamkant B. Navathe, Ramez Elmasri, ISBN:9780132144988, PEARSON HIGHER EDUCATION.

8. Beginning Databases with PostgreSQL: From Novice to Professional, Richard Stones, Neil Matthew, SBN:9781590594780, Apress.

9. PostgreSQL, Korry Douglas, ISBN:9780672327568, Sams.

10. Practical PostgreSQL (B/CD), John Worsley, Joshua Drake, ISBN:9788173663925Shroff/O'reilly.

11. “An introduction to Database systems”, Bipin C Desai, Galgotia Publications.

**Ahmednagar Jilha Maratha Vidya Prasarak Samaj’s**

**New Arts, Commerce and Science College, Ahmednagar**

**(Autonomous)**

**Syllabus**

**B.Sc. (Computer Science) (Major)**

|  |
| --- |
| Title of the Course: Lab Course on C Programming &DBMS |
| Year: I | Semester: I |
| CourseType  | Course Code | Credit Distribution | Credits | Allotted Hours | Allotted Marks |
| Theory | Practical |
| CIE | ESE | Total |
| DSC-3 | BS-CS113P | 00 | 02 | 02 | 30 | 15 | 35 | 50 |

**Learning Objectives:**

1. To develop programming skills using the fundamentals and basics of C language.

2. To learn problem solving techniques.

3. To study the advantages of user defined data type which provides flexibility for application

 development

4. To study the basics of pre-processors available with C compiler.

5. To enable effective usage of arrays, structures, functions and pointers.

6. Learn and practice data modeling using the entity-relationship and developing database

 designs.

7. Understand the use of Structured Query Language (SQL) and learn SQL syntax.

8. Apply normalization techniques to normalize the database

9. Understand the needs of database processing and learn techniques for controlling the

 consequences of concurrent data access.

10. Understand the needs of Database Design

**Course Outcomes (Cos)**

1. Design E-R Model for given requirements and convert the same into database tables.

2. Devise pseudocodes and flowchart for computational problems.

3. Write, debug and execute simple programs in ‘C’.

4. Create database tables in PostgreSQL.

5. Write and execute simple, nested queries.

**Detailed Syllabus: Example**

|  |
| --- |
| **Course Contents** |
| **Guidelines:****Lab Book:** The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the set of assignments which the student mustcomplete as a part of this course. |
| assignment includes the Assignment Title, Problem statement, Date of submission, Assessment date, Assessment grade and instructors sign.Programming Assignments:Programs should be done individually by the student in the respective login. The codes should be uploaded on either the local server, Moodle, Github or any open source LMS. Print-outs of the programs and outputmay be taken but not mandatory for assessment. |
| **DBMS Assignments:**For each problem/case study, the student must design the database model in the form of an E-R diagram. Table design should be based on the same and must include proper constraints and integrity checks. The students have to create, populate the tables and then perform the activities specified in each of the assignments. A pool of databases will get created as student progresses through the assignments and these databases can be repeatedly used in subsequent assignments. A separate softcopy ofthe queries must be maintained for each assignment. |
| **Assessment:**Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes and goodprogramming practices. |
| **Operating Environment:**For ‘C’ Programming:Operating system: LinuxEditor: Any Linux based editor like vi, gedit etc. Compiler: cc or gcc.For DBMS:Operating System: Linux Operating systemDBMS: PostgreSQL Language: SQL |

|  |  |
| --- | --- |
| **Unit** | **Suggested List of Assignments:** |
| **I)** | **A) Problem Solving and C programming:** |
| **1.** | **Assignment 1. 04** |
|  | Problem Solving using Pseudo code and Flowchart, Simple programs, |
|  | Understanding errors and error handling. |
| **2.** | **Assignment 2. 02** |
|  | HTML |
| **3.** | **Assignment 3. 04** |
|  | Decision Making Control Structures. |
| **4.** | **Assignment 4. 04** |
|  | Loop Control Structures |
| **5.** | **Assignment 5. 04** |
|  | Functions (User Defined functions, Library functions and Recursion). |
| 6 | **Assignment 6. 04** |
|  | Arrays (1-D and 2-D, 3-D). |
| **II)** | **B) Database Management Systems** |
| **1.** | **Assignment 1. 02** |
|  | Internal and External DOS commands, Linux commands. |
| **2.** | **Assignment 2. 02** |
|  | To create simple tables with only the primary key constraint (as a table |
|  | level constraint & as a field level constraint) (include all data types) |
| **3.** | **Assignment 3. 03** |
|  | To create more than one table, with referential integrity constraint, PK |
|  | constraint. |
| **4.** | **Assignment 4. 03**  |
|  | To create one or more tables with following constraints, in addition to the first two constraints (PK & FK) 1. Check constraint
2. Unique constraint
3. Not null constraint
 |
| **5** | **Assignment 5. 03** |
|  | To drop a table, alter schema of a table, insert / update / delete records using tables created in previous Assignments. (use simple forms of insert / update / delete statements) |
| **6** | **Assignment 6. 03** |
|  | To query the tables using simple form of select statement Select <field- list> from table [where <condition> order by <field list>] Select <field- list, aggregate functions > from table [where <condition> group by <> having <> order by <> |
| **7** | **Assignment 7. 03** |
|  | To query table, using set operations (union, intersect) |
| **8** | **Assignment 8. 02** |
|  | To query tables using nested queries (use of ‘Except’, exists, not exists, all clauses.  |
| **9** | **Assignment 9. 02** |
|  | To create views. |
|  | **Suggested Readings:** Laboratory handbook prepared by the college. |

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**Syllabus**

**B.Sc. (Computer Science) (Major)**

|  |
| --- |
| Title of the Course: Analog Electronics |
| Year: I | Semester: I |
| CourseType  | Course Code | Credit Distribution | Credits | Allotted Hours | Allotted Marks |
| Theory | Practical |
| CIE | ESE | Total |
| SEC-1 | BS-CS114T | 02 | 00 | 02 | 30 | 15 | 35 | 50 |

**Learning Objectives:**

* To study passive and active electronic components.
* To study the semiconductor devices.
* To analyze different electronic circuits.
* To study and understand the applications of electronic devices.

**Course Outcomes (COs)**

After completion of the course, the students will be able to –

1. Understand difference between passive and active components.

2. Understand different sensors.

3. Develop an understanding of the basic operation and characteristics of different type of

 diodes and familiarity with its working and applications.

4. To become familiar with construction, working and characteristics of BJT,FET and MOSFET.

**Detailed Syllabus:**

**Unit I: Passive Components (10)**

Introduction of Electronics, Concept of Analog electronics, Classification of electronic components, Passive electronic components: resistors, capacitors, inductors, transformer, switches, cables and connectors, fuses (only basic concept, basic working and application is expected), series and parallel combination of resistors, capacitors and inductors.

**Unit II:** **Semiconductor Diodes and Circuits (10)**

Basics of Semiconductor, intrinsic and extrinsic semiconductor, P and N type semiconductors, formation of PN junction diode, forward and reverse bias characteristics, Types of diodes- Zener diode, Light Emitting Diode, Photo Diode, Varactor diode, Solar Cell (construction, working principle, characteristics, applications).

Rectifiers- half wave and full wave circuits, Zener diode as a voltage regulator, Opto-coupler concept. Basic block diagram of power supply.

**Unit III:**  **BJT, FET, MOSFET and its applications (15)**

Bipolar Junction Transistor (BJT) types, symbol, construction, working principle, transistor configurations - CB, CC (only concept), CE configuration: input and output characteristics, the definition of α, β and ϒ, the concept of biasing , Need of biasing, fixed bias, potential divider bias, DC load line and Q point, Classification based on Q point, transistor as a CE

 amplifier, concept of gain and bandwidth,.

Symbol, types, construction, working principle, I-V characteristics of Junction Field Effect Transistor (JFET), Metal Oxide Semiconductor FET (MOSFET). Comparison of JFET and MOSFET.

Applications: - Transistor as a switch, JFET as voltage variable resistor, MOSFET as a switch.

**Unit IV:** **Operational Amplifier and its Applications (06)**

Block diagram, symbol, characteristics of ideal and practical op-amp. The concept of virtual ground, Differential and common mode gain, CMRR. Applications: inverting amplifier, non-inverting amplifier, voltage follower, comparator, adder, subtractor, integrator and differentiator.

**Unit IV: Sensors (04)**

Sensors: Definition, active and passive sensors. Temperature sensor (thermistor, LM-35), optical sensor (LDR), Passive Infrared sensor (PIR), PIR Sensor intruder detection system, ultrasonic sensor.

**Suggested Readings/Material:**

1. Electronic Devices and Circuit Theory - Robert L. Boylestad and Louis Nashelsky.

2. Electronic Devices and Circuits I – T.L.Floyd- PHI.

3. Integrated Electronics – Millmam and Halkias.

4. Electronic Devices and Circuits – Bogart.

5. Principals of Electronics - V.K. Mehta, S.Chand and Co.

6. A text book of electrical technology - B.L.Theraja, S.Chand.

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**Syllabus**

**B.Sc. (Computer Science) (Major)**

|  |
| --- |
| Title of the Course: Science and Technology in Ancient India |
| Year: I | Semester: I |
| CourseType  | Course Code | Credit Distribution | Credits | Allotted Hours | Allotted Marks |
| Theory | Practical |
| CIE | ESE | Total |
| IKS-1 | BS-CS115T | 02 | 00 | 02 | 30 | 15 | 35 | 50 |

**Learning Objectives:**

1. To introduce learners to the landscape of Vedic literature with broad taxonomy of Indian

 knowledge systems.

2. Creating awareness amongst the youths about the true history and rich culture of the country.

3. Understanding the scientific value of the traditional knowledge of India.

4. Promoting the youths to do research in the various fields of Indian knowledge system.

**Course Outcomes (Cos):**

1. Youth will be aware about the true history and rich culture of the country, also the history of

 printing and publishing in India.

2. Youths can do research in various interdisciplinary courses of Indian knowledge system.

**Detailed Syllabus:**

|  |  |  |
| --- | --- | --- |
| **Unit I** | **Importance of the Study of History of Science**1.1 Indian Knowledge System and overview.1.2 Importance of Ancient Knowledge1.3 Defining Indian Knowledge system.1.4 The IKS corpus- a classification framework1.5 The Vedic corpus - Introduction to Vedas and four Vedas 1.6 Vedic life features | **15** |
| **Unit II** | **History of Mathematics in Ancient India**2.1 Number system and unit of measurements.2.2 Gautam Buddha philosophy on number system.2.3 Historical evidence of number system in India.2.4 Features of Indian Number System.2.5 Approaches to represent Number.2.6 Measurement of time, distance and weight.2.7 Pingala and the binary system.2.8 Great mathematicians and their contributions2.9 Unique aspects of Indian Mathematics. | **15** |

**Suggested Readings**

**Material: https://ndl.iitkgp.ac.in/ https://doaj.org/ https://www.doabooks.org/**

**https://nptel.ac.in/ https://shodhganga.inflibnet.ac.in/ https://epgp.inflibnet.ac.in/ https://oatd.org/ https://openknowledge.worldbank.org/ http://liiofindia.org/ http://www.oapen.org/content/**

**https://www.ncbi.nlm.nih.gov/pmc/?cmd=search&term https://dev.gutenberg.org/ https://www.highwirepress.com/ https://libguides.southernct.edu/openaccess http://agris.fao.org/agris-search/index.do https://www.sciencedirect.com/#open-access https://www.aiddata.org/**

**https://ilostat.ilo.org/ https://academic.oup.com/journals/pages/open\_access https://www.projecteuclid.org/librarians/lib\_oa https://www.springeropen.com/journals https://www.tandfonline.com/openaccess/openjournals https://www.cambridge.org/core/what-we-publish/open-access**

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**Syllabus**

**B.Sc. (Computer Science) (Major)**

|  |
| --- |
| Title of the Course: Advanced ‘C’ Programming |
| Year: I | Semester: II |
| CourseType  | Course Code | Credit Distribution | Credits | Allotted Hours | Allotted Marks |
| Theory | Practical |
| CIE | ESE | Total |
| DSC-4 | BS-CS121T | 03 | 00 | 03 | 45 | 15 | 35 | 50 |

**Learning Objectives:**

* Implement problem solving skills using pointer concept of the programming languages.
* Work efficiently with files using the programming languages.
* Efficiently use data structures for problem solving.
* Learn the functions of Structures and Unions

## Course Outcomes (Cos):

1. Develop modular programs using control structures, pointers, arrays, strings and structures.
2. Design and develop solutions to real world problems using C. 3.Organization of code with complex data types and structures.
3. Develop programs using files.
4. Develop advanced concepts of programming using the ‘C’ language.

**Detailed Syllabus:**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Course Contents** | **Allocated****Hours** |
| **I** | **Pointers:*** 1. Introduction to Pointers.
	2. Declaration, definition, initialization, dereferencing.
	3. Pointer arithmetic.
	4. Relationship between Arrays & Pointers- Pointer to array, Array of pointers.
	5. Multiple indirection (pointer to pointer).
	6. Functions and pointers- Passing pointer to function, Returning pointer from function, Function pointer.
	7. Dynamic memory management.
	8. Memory leak, dangling pointers.
	9. Types of pointers.
 | **10** |
| **II** | **Strings:*** 1. String Literals, string variables, declaration, definition, initialization.
	2. Syntax and use of predefined string functions
	3. Array of strings.
	4. Strings and Pointers.

Command line arguments. | **07** |
| **III** | **Structures and Unions:*** 1. Concept of structure, definition and initialization, use of typedef.
	2. Accessing structure members.
	3. Nested Structures.
	4. Arrays of Structures.
	5. Structures and functions- Passing each member of structure as a separate argument, Passing structure by value / address.
	6. Pointers and structures.
	7. Concept of Union, declaration, definition, accessing union members.

Difference between structures and union. | **10** |
| **IV** | **File Handling:*** 1. Introduction to streams.
	2. Types of files.
	3. Operations on text files.
	4. Standard library input/output functions.

Random access to files. | **06** |
| **V** | **Preprocessor:*** 1. Role of Preprocessor.
	2. Format of preprocessor directive.
	3. File inclusion directives (#include).
	4. Macro substitution directive, argumented and nested macro.
	5. Macros versus functions
 | **04** |
| **VI** | **Graphics using C:*** 1. Introduction – definition, applications.
	2. Interactive and passive graphics.
	3. Basic concept of Computer Graphics - pixel, resolution, lines, polylines, polygon, curves, filled region, text.
	4. Display processor.
	5. CRT, Color Monitor.
	6. Random scan and Raster scan display.
	7. Direct view storage tube.
	8. Flat panel display.

Programs on graphics. | **08** |
|  | **Suggested Readings:**1. C: The Complete Reference, Schildt Herbert, 4th edition, McGraw Hill.
2. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India
3. The ‘C’ programming language, Brian Kernighan, Dennis Ritchie, PHI.
4. Programming in C, A Practical Approach, Ajay Mittal, Pearson.
5. Programming with C, B. Gottfried, 3rd edition, Schaum’s outline Series, Tata McGraw Hill.
6. Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill.
 |  |

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**New Arts, Commerce and Science College, Ahmednagar**

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**Syllabus**

**B.Sc. (Computer Science) (Major)**

|  |
| --- |
| Title of the Course: Relational Database Management Systems |
| Year: I | Semester: II |
| CourseType  | Course Code | Credit Distribution | Credits | Allotted Hours | Allotted Marks |
| Theory | Practical |
| CIE | ESE | Total |
| DSC-5 | BS-CS122T | 03 | 00 | 03 | 30 | 15 | 35 | 50 |

**Learning Objectives:**

* Introduction to relational database systems.
* Include the relational model, SQL, transactions, database design, and concepts and algorithms for building database management systems.

**Course Outcomes (Cos)**

1. Develop database management concepts.
2. Design E-R Model for given requirements and convert the same into database tables.
3. Use database techniques such as SQL & PL/SQL.
4. Explain transaction Management in relational database System.
5. Use advanced database Programming concepts.

**Detailed Syllabus:**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Course Contents** | **Allocated****Hours** |
| **I** | **Relational Database Design Using PLSQL:*** 1. Introduction to PLSQL.
	2. PL/PgSqL: Datatypes, Language structure.
	3. Controlling the program flow, conditional statements, loops.
	4. Stored Procedures.
	5. Stored Functions.
	6. Handling Errors and Exceptions.
	7. Cursors.
	8. Triggers.
 | **08** |
| **II** |  **Transaction Concept and Concurrency Control:*** 1. Describe a transaction, properties of transaction, state of the transaction.
	2. Executing transactions concurrently associated problem in concurrent execution.
	3. Schedules, types of schedules, concept of Serializability, Precedence graph for Serializability.
	4. Ensuring Serializability by locks, different lock modes, 2PL and its variations.
	5. Basic timestamp method for concurrency, Thomas Write Rule.
	6. Locks with multiple granularity, dynamic database concurrency (Phantom Problem).
	7. Timestamps versus locking.

Deadlock and deadlock handling - Deadlock Avoidance (wait-die, wound-wait), Deadlock Detection and Recovery (Wait for graph). | **10** |
| **III** | **Database Integrity and Security Concepts:*** 1. Domain constraints.
	2. Referential Integrity.
	3. Introduction to database security concepts.
	4. Methods for database security.
		1. Discretionary access control method.
		2. Mandatory access control.
		3. Role base access control for multilevel security.
	5. Use of views in security enforcement.
	6. Overview of encryption technique for security.

Statistical database security. | **06** |
| **IV** | **Crash Recovery:*** 1. Failure classification.
	2. Recovery concepts.
	3. Log base recovery techniques (Deferred and Immediate update).
	4. Checkpoints, Relationship between database manager and buffer cache. Aries recovery algorithm.
	5. Recovery with concurrent transactions (Rollback, checkpoints, commit).
	6. Database backup and recovery from catastrophic failure.
 | **04** |
| **V** | **Other Databases:*** 1. Introduction to Parallel and distributed Databases.
	2. Introduction to Object Based Databases.
	3. XML Databases.
	4. NoSQL Database.
	5. Multimedia Databases.
	6. Big Data Databases.
 | **02** |
|  | **Suggested Readings:**1. Database System Concepts, By Silberschatz A., Korth H., Sudarshan S., 6th Edition, McGraw Hill Education.
2. Database Management Systems, Raghu Ramakrishnan, Mcgraw- Hill Education.
3. Database Systems, Shamkant B. Navathe, Ramez Elmasri, PEARSON HIGHER EDUCATION.
4. Fundamentals of Database Systems, By: Elmasri and Navathe, 4th Edition Practical PostgreSQL O’REILLY.
5. Database Management Systems, RaghuRamakrishnan and Johannes Gehrke, McGraw-Hill Science/Engineering/Math; 3rd edition, ISBN: 9780072465631.
6. NoSQL Distilled, Pramod J. Sadalage and Martin Fowler, Addison Wesley.
7. An Introduction to Database Systems”, C J Date, Addison-Wesley.
8. Database Systems: Concepts, Design and Application”, S.K. Singh, Pearson, Education.
9. NoSQL Distilled, A Brief Guide to the Emerging World of Polyglot Persistence: by Pramod J. Sadalage, Martin Fowler, Addison-Wesley, Pearson Education, Inc.
10. MongoDB: The Definitive Guide, Kristina Chodorow, Michael

Dirolf, O’Reilly Publications . |  |

**Ahmednagar Jilha Maratha Vidya Prasarak Samaj’s**

**New Arts, Commerce and Science College, Ahmednagar**

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**Syllabus**

**B.Sc. (Computer Science) (Major)**

|  |
| --- |
| Title of the Course: Lab Course on Advanced C & RDBMS. |
| Year: I | Semester: II |
| CourseType  | Course Code | Credit Distribution | Credits | Allotted Hours | Allotted Marks |
| Theory | Practical |
| CIE | ESE | Total |
| SEC-2 | BS-CS123P | 02 | 00 | 02 | 30 | 15 | 35 | 50 |

**Learning Objectives:**

* Imbibe thorough knowledge in advanced C programming concepts.
* Have proficiency in applying advanced C programming concepts to solve any real world problem.
* Organize data and identify relationships between key data points.
* Ease to sort and find information, which helps organizations make business decisions more efficiently and minimize costs.
* To work well with structured data.

**Course Outcomes (Cos)**

1. Use SQL & PL/SQL.
2. Perform advanced database operations.
3. Write, debug and execute programs using advanced features in ‘C’.
4. Develop code related to function and procedure.
5. Develop program on file handling.

**Detailed Syllabus: Example**

|  |
| --- |
| **Course Contents** |
| **Guidelines:****Lab Book:** The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the set of assignments which the student must complete as a part of this course.**Submission:****Programming Assignments:** |
| Programs should be done individually by the student in respective login. The codes should be uploaded on either the local server, Moodle, Github or any open source LMS. Print-outs of the programs and output may be taken but not mandatory for assessment.RDBMS Assignments:For each problem/case study, the student must design the database model in the form of an E-R diagram. Table design should be based on the same and must include proper constraints and integrity checks. The students have to create, populate the tables and then perform the activities specified in each of the assignments. A separate softcopy of the table creation statements and queries must be maintained for each assignment.**Assessment:**Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes and goodprogramming practices. |
| **Operating Environment:**For ‘C’ Programming:Operating system: Linux.Editor: Any Linux based editor like vi, gedit etc. Compiler: cc or gcc.For DBMS:Operating System: Linux Operating system. DBMS: PostgreSQL 11 and higher.Language: PL/SQL. |

|  |  |  |
| --- | --- | --- |
| **Unit** | **Suggested List of Assignments:** | **Allocated****Hours** |
| **I)** **1.****2.****3.****4.****5.****6.****7.** | 1. **Advanced C Programming:**

**Assignment 1.**Simple Pointers:* 1. Pointer initialization and use of pointers.
	2. Pointer Arithmetic.

**Assignment 2.**Dynamic Memory Allocation.**Assignment 3.**String handling using standard library functions.**Assignment 4.** Structure and Unions. **Assignment 5.**File Handling. **Assignment 6.** C Preprocessors. **Assignment 7.**Graphics programs using C1. Basic graphics shapes construction (Line, circle, arc, ellipse, rectangle)
2. Animation using increasing circle field with different color and pattern.
3. Making screen saver.
4. Moving coloured car using inbuilt function.
5. Print name in hindi script on console output.
6. Control a ball using arrow keys.
 | **04****04****04****04****03****03****03** |
| **II )****1.** | 1. **Relational Database Management Systems: Assignment 1: Stored Procedure:**
	1. A Simple Stored Procedure.
	2. A Stored Procedure with IN, OUT and IN/OUT parameter.
 | **04** |
| **2.** | **Assignment 2: Stored Function:** | **04** |
|  | 1) A Simple Stored Function. |  |
|  | 2) A Stored Function that returns. |  |
|  | 3) A Stored Function recursive. |  |
| **3.** | **Assignment 3: Cursors:** | **04** |
|  | 1) A Simple Cursor. |  |
|  | 2) A Parameterize Cursor. |  |
| **4.** | **Assignment 4: Exception Handling:** | **04** |
|  | 1) Simple Exception- Raise Debug Level Messages. |  |
|  | 2) Simple Exception- Raise Notice Level Messages. |  |
|  | 3) Simple Exception- Raise Exception Level Messages. |  |
| **5.** | **Assignment 5: Triggers:** | **04** |
|  | 1) Before Triggers (insert, update, delete). |  |
|  | 2) After Triggers (insert, update, delete). |  |
|  |  **Suggested Readings:** Laboratory handbook prepared by the College. |  |

**Ahmednagar Jilha Maratha Vidya Prasarak Samaj’s**

**New Arts, Commerce and Science College, Ahmednagar**

**(Autonomous)**

**Syllabus**

**B.Sc. (Computer Science) (Major)**

|  |
| --- |
| Title of the Course: Digital Electronics |
| Year: I | Semester: II |
| CourseType  | Course Code | Credit Distribution | Credits | Allotted Hours | Allotted Marks |
| Theory | Practical |
| CIE | ESE | Total |
| VSC-1 | BS-CS124T | 02 | 00 | 02 | 45 | 15 | 35 | 50 |

**Learning Objectives:**

1. To understand representation of information in various number systems.
2. To convert data from one number system to another and do various arithmetic operations.
3. To study basic and derived logics gates and design of digital circuits.
4. To analyze logic systems and able to design combinational and sequential circuits.

**Course Outcomes (Cos):**

After completion of the course, the students will be able to –

1. Understand and represent numbers in powers of base and converting one from the other, carry out arithmetic operations.
2. Understand basic logic gates and concepts of Boolean algebra.
3. Understand K-map and reduce/simplify Boolean expressions.
4. Analyze and design of combinational and sequential circuits.

**Detailed Syllabus:**

**Unit I: Number Systems and Digital codes (08)**

Introduction to decimal, binary, octal and hexadecimal number systems and their inter-conversions, the concept of 1’s and 2’s complements, binary addition, binary subtraction using 1’s and 2’s complements. BCD code, Excess-3 code, Gray code and ASCII code. Gray to Binary and Binary to Gray conversion.

**Unit II: Logic Gates and Boolean Algebra (12)**

Logic gates: basic and derived (symbol, Boolean equation and truth table), concept of universal gates. Introduction of CMOS and TTL logic families. Laws of Boolean Algebra, De-Morgan’s theorems, simplification of logic equations using Boolean algebra, minterms, maxterms, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form. Introduction to Karnaugh map, problems based on SOP (up to 4 variables), digital designing using K-map for 3-bit gray to binary and binary to gray conversion. Ex-OR gate as a 4-bit Parity Checker and Generator.

**Unit III: Combinational Circuits (13)** Introduction to Combinational Circuits, half adder, full adder, half subtractor, full subtractor, four-bit parallel adder, universal adder / subtractor, digital comparator, introduction to ALU.

Introduction, Multiplexer (2:1, 4:1), demultiplexer (1:2, 1:4) and their applications. Concept of code converters. Encoders: decimal to binary, hexadecimal to binary, priority encoder. Decoders: BCD to decimal and BCD to seven segment decoder.

**Unit IV: Sequential Circuits (12)**

Introduction, Flip flops: RS, clocked RS, JK, D and T. Race around condition, Master-slave JK. Counters: asynchronous and synchronous, binary counter, up, down, up-down counter, modulus counters, decade counter.

Shift registers: SISO, SIPO, PISO, PIPO shift registers, ring counter, universal 4-bit shift register.

**Suggested Readings/Material:**

1. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994).

2. M. Morris Mano Digital System Design, Pearson Education Asia.

3. Digital electronics - G. K. Kharate, Oxford University Press.

4. Modern Digital Electronics- R.P. Jain, Tata McGraw- Hill.