DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.SU./B.Sc.CBC & GS/11/2022

It is hereby inform to all concerned that, on the recommendation of Faculty of Science & Technology Meeting dated 24.08.2022, **the Academic Council at its meeting held on 29 August 2022 has accepted the following Syllabi of B.Sc. Degree under the Choice Based Credit & Grading System along with Rules and Regualtion** as appended herewith:-

1.	B.Sc.Computer Science (Optional)	Ist and IInd semester
2.	B.Sc.Computer Application (Optional)	Ist and IInd semester
3.	B.Sc.Computer Application (Degree)	Ist and IInd semester
4.	B.Sc.Computer Science (Degree)	Ist and IInd semester
5.	B.Sc.Horticulture (Optional)	Ist to VIth semester
6.	B.Sc.Botany (Optional)	Ist to VIth semester
7.	B.Sc. Agrochemical & fertilizer (Optional)	Ist to VIth semester
8.	B.Sc.Home Science (Optional)	Ist and IInd semester
9.	B.Sc.Automobile Technology (Degree)	Ist and IInd semester
10.	B.Sc.Workshop Technology (Degree)	Ist and IInd semester
11.	B.Sc.Refrigeration and Air Conditioning (Degree)	Ist and IInd semester
12.	B.Sc.Environmental Science (Optional)	Ist and IInd semester
13.	B.Sc.Biotechnology (Degree)	Ist and IInd semester
14.	B.Sc.Biotechnology (Optional)	Ist and IInd semester
15.	B.Sc.Dairy Sci.& Tech (Optional)	Ist and IInd semester
16.	B.Sc.Zoology (Optional)	Ist to VIth semester
17.	B.Sc.Polymer Chemistry (Optional)	Ist and IInd semester
18.	B.Sc.Fisheries Science (Optional)	Ist and IInd semester
19.	B.Sc.Instrumentation Practice (Optional)	Ist semester
20.	B.Sc.Biochemistry (Optional)	Ist and IInd semester
21.	B.Sc.Non Conventional & Conventional Energy (Degree)	Ist and IInd semester

This is effective from the Academic Year 2022-23 and onwards.

All concerned are requested to note the contents of this circular and bring notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
Ref.No. SU/B.Sc./2022/8428-35
Date:-29.08.2022.

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Deputy Registrar,
Academic Section

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1] **The Principal, concerned affiliated College,**
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**
Copy to :-
1] The Director, Board of Examinations & Evaluation,
2] The Section Officer,[B.Sc.Unit] Examination Branch,
3] The Programmer [Computer Unit-1] Examinations,
4] The Programmer [Computer Unit-2] Examinations,
5] The In-charge, [E-Suvidha Kendra],
Rajarshi Shahu Maharaj Examination Branch,
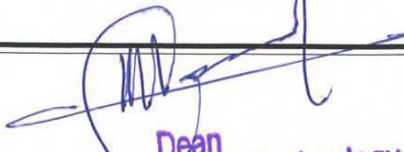6] The Public Relation Officer,
7] The Record Keeper,

JS*29082022/-

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad- 431004(MS) India.

Undergraduate Bachelor Degree Program
In Science (B.Sc.)
Computer Science (Optional Subject)

Course Structure and Curriculum
(Outcome based Curriculum)
Choice Based Credit System
(Effective from Academic Year 2022-23)

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad – 431004 (MS) India.

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

Bharti
chairperson
Ad-hoc Board in CS.

INDEX

1. Preamble

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 outcome s across all undergraduate programs in science, humanities, commerce and professional streams of higher education including computer science.

2.Structure and Curriculum for
Bachelor of Science (B. Sc.) Computer Science
(Optional Subject)

(Choice Based Credit System)

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Choice Based Credit System (CBCS) Curriculum
For
Faculty of Science and Technology
Course Structure and Scheme of Examination
B.Sc. Three Year Undergraduate Degree Program

Semester I

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1A) Core Courses	CMP-111	Computer Fundamental	45(3/week)	2	50	10	40	20
	CMP-112	Operating System	45(3/week)	2	50	10	40	20
	CMP-121	Lab course 1 (based on CMP-111 and CMP-112)	45(3/week)	1.5	50	10	40	20
Ability Enhancement compulsory courses (AECC-1)	CMP-131	Communication skills in English-I	45(4/week)	3	50	10	40	20
	CMP-132	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-I)	45(4/week)	3	50	10	40	20
			225	11.5	250	50	200	100

Total Credits for Semester I : 11.5 (Theory : 10 ; Laboratory : 1.5)

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

Semester II

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1B) Core Courses	CMP-211	Digital Electronic	45(3/week)	2	50	10	40	20
	CMP-212	Basic C Programing	45(3/week)	2	50	10	40	20
	CMP-221	Lab course 2 (based on CMP-211 and CMP-212)	45(3/week)	1.5	50	10	40	20
Ability Enhancement compulsory courses (AECC-2)	CMP-231	Communication skills in English-II	45(4/week)	3	50	10	40	20
	CMP-232	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-II)	45(4/week)	3	50	10	40	20
Non-Credit Course	CMP-213	Constitution of India	45(3/week)	2*				
			225	11.5	250	50	200	100

Total Credits for Semester Ii : 11.5 (Theory : 10 ; Laboratory : 1.5)

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

3. **Vision**

Framing and implementation of curricula and syllabi is envisaged to provide an understanding of the basic connection between theory and experiment and its importance in understanding the foundation of computing. This is very critical in developing a scientific temperament and to venture a career which a wide spectrum of applications as well as theoretical investigations. The undergraduate curriculum provides students with theoretical foundations and practical experience in both hardware and software aspects of computers.

4. **Mission**

The curriculum in computer science is integrated with courses in the sciences and the humanities to offer an education that is broad, yet of enough depth and relevance to enhance student employment opportunities upon graduation. As a Bachelor's degree program, the curriculum is based on the criterion that graduates are expected to function successfully in a professional employment environment immediately upon graduation.

5. **Program Educational Objectives:**

Program Educational Objectives (PEOs) are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. These objectives describe the expected accomplishments of our graduates during the several years following graduation.

Objective 1: Our graduates will apply their knowledge and skills to succeed in their careers and/or obtain advanced degrees.

Objective 2: Our graduates will behave ethically and responsibly, and will remain informed and involved as full participants in their profession and society.

Objective 3: Our graduates will creatively solve problems, communicate effectively, and successfully function in diverse and inclusive multi-disciplinary teams.

Objective 4: Our graduates will apply principles and practices of computing grounded in mathematics and science to successfully complete software-related projects to meet customer business objectives and/or productively engage in research.

6. **Program Outcomes (POs) and Program Specific Outcomes:**
   Program Outcomes (POs)

S.No	Program Outcomes (POs)
1	**Engineering knowledge:** Apply the knowledge of algorithm, data structure and programming to the solution of real time problems.
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the computer science practice.
5	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
6	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
7	**Project management:** Demonstrate knowledge and understanding of the science principles and apply these for real time applications.
8	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

S.No	Program Specific Outcomes (PSOs)
1	Model computational problems by applying mathematical concepts and design solutions using suitable data structures and algorithmic techniques
2	Design and develop solutions by following standard software engineering principles and implement by using suitable programming languages and platforms
3	Develop system solutions involving both hardware and software modules

7. Eligibility:

1. He/ She must have passed the higher secondary (multipurpose) examination conducted by H.S.C. board Government of Maharashtra with science / 0technical subjects Or an Examination of any statutory University and Board recognized as equivalent thereto.

2. OR He / She must have passed examination prescribed at the end of second year of the junior college conducted by the H.S.C. board, Government of Maharashtra with English, Second language, Physics, Chemistry, Mathematics and or Biology or one of the technical subjects prescribed at the said examination as the optional or elective subjects or an examination recognized as equivalent thereto.

3. He/ She must have passed at qualifying examination. A candidate who has passed the B.Sc. examination of this university may be allowed to present himself subsequently at the degree examination in a subject or subjects other than those he has taken earlier provided that he puts in three years of attendance as a regular candidate for First, Second and Third year in the subject or subjects concerned excluding compulsory English, Second Language and remaining optional subject(s). A candidate shall not be allowed to appear for such examination if he has passed the higher examination.

8. Duration

The undergraduate program in Computer Science is offered though the courses designed for granting the following B.Sc degrees. All the courses are of 3-year duration spread over six semesters.

9. Medium of Instructions

The medium of instruction for this course is English.

10. Attendance:

This course is the practical course so, student should need minimum 40 % attendance for appearing the examination.

11. Curriculum for Semester I

Course Code: **CMP-111** Course Title: **Computer Fundamental** Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)
Objective: To impart basic introduction to computer hardware, components, computer number system, how the CPU works, fundamental about algorithms and flowchart as well as different type of software.
UNIT-1: Introduction to Computers: (10 period) Definition of Computers, History and Generations of Computers, Characteristics of computer, Classification of Computers. Fundamental Block diagram of Computer: CPU, Input & Output Unit. Input devices, Output devices, Types of printer's, Memory, CD-ROM, Hard disk, Floppy disk.
UNIT-2: Software: (10 period) Definition of Software, Types of Software-System software, Application software and Utility software. Computer Languages: Definition, types of Programming languages, Language Processors: Assemblers, Interpreters, Compiler and Editors. Introduction to Operating Systems: Types of Operating System, Functions of Operating System examples. MS-DOS Internal and External Commands.
UNIT-3:Internet, World Wide Web: (10 period) Introduction to Internet, Internet Access, Internet Basics, Protocols-TCP/IP,HTTP,FTP, Addressing, World Wide Web(WWW), Web Pages & HTML, Web browsers, Searching for information-search engines. Internet chat.Applications of Internet. Advantages and Disadvantages of Internet
UNIT-4: Number Systems and Arithmetic   (10 period) Decimal Number System & Binary Number System, Decimal to Binary conversion, Binary to Decimal Conversion,. Binary Arithmetic : Binary addition, subtraction, Multiplication & division Hexadecimal number system , Hexadecimal to binary,Binary to Hexadecimal, Hexadecimal to decimal conversion Binary subtraction using 1' complement, 2'scomplement method.
UNIT-5: Tutorial and Assignment (05 period)

References

1. Fundamentals of Computers, V. Rajaraman 6th edition PHI Learning Private Limited 2014

2. Fundamentals of Information Technology ByChetanSrivastava, Kalyani Publishers

3. Fundamentals of Computers By V.Rajaraman, PHI Publication ,IVth Edition.

4. Fundamentals of Programming By Raj K.Jain, S.Chand Publication

5. Digital Electronics and Micro-Computers – R.K.Gaur ,DhanpatRai Publication

Additional Reference:

1. Computer Today By Suresh K. Basandra, GalgotiaPublication,Updated Edition 2. Computer Fundamental ByB.Ram, BPB Publication.

3. Digital Electronics and Logic Design – N.G.Palan, Technova Publication

Course Code: **CMP-112**
Course Title: **Operating System**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective: To introduce students the basic functioning of operating systems as resource manager and its Salient features. Also to study about process states, scheduling, Memory and I/O Management techniques.

Unit-I: Introduction to Software: (05 periods)

Software: Definition, classification of software, operating system as the main component of system software.

Unit-II: Operating System Fundamental (10 periods)

Operating Systems: OS as a resource manager, Structure of OS, Evolution of OS, OS functions, Characteristics of modern OS, Types of O.S.: Early systems, simple batch systems, multiprogramming batch systems, Time sharing system, Personal Computer systems, Parallel systems, Distributed systems, Real time systems.

Unit-III:I/O Management(10 periods)

I/O Management I/O System Components : I/O Devices , I/O, Hardware , Application I/O interface, Secondary Storage Structure : Disk fundamental, Disk Scheduling , Disk Management

Device Characteristics Input and Output devices, Storage devices, Device allocations, I/O scheduler, Introduction to Virtual Devices, Dedicated Devices, shared devices and virtual devices, Generalized strategies.

Unit-IV:Process Management and Memory Management (15 periods)

Concept of Process: Process State, Operation on Processes, thread.CPU Scheduling: Types of Schedulers, Criteria for scheduling, Scheduling Algorithms. Process Synchronization: Need for synchronization, Critical Section, Hardware Synchronization, Semaphores,

Monitors, Problem of synchronization. Deadlocks: Concept of Deadlock, Deadlock Modeling, Methods for Handling Deadlock

Address Binding, Logical Vs. Physical Address space, Memory Allocation, Paging, Segmentation, Segmentation and paging.

UNIT-5: Tutorial and Assignment   (05 periods)

Core References:
1. "Operating System", By S.R.Sathe& Anil S.Mokhade , MacMillan Publication.
 2. "Operating System", By Stuart E.Madnick, John J.Donovan.

Additional References:
1.Operating System Concepts- A. Silberzchaz& P.B. Galvin, Addison – Wesley Publishing Company

| Course Code: **CMP-121** |
| Course Title: **Lab course 1 (Based on CMP-111 and CMP-112)** |
| Total Credits: 1.5 |
| Contact Hours: 03 Hours (Week) |
| Marks: 50 |

Practical based on CMP-111

1. Student should prepare a report based on computer component such as monitor, printer, CPU, Pen drive, CD –ROM , Hard Disk

2. Create a partition of computer drive creation, formatting the drive and deleting the partition.

3. Create a user and password of computer user and Reset a computer password using CMOS battery.

4. Practical on office word tool as a creation, edit, insertion of table in the new word file.

5. Practical based on MS-Excel for creation of student data with name, marks, roll no for sorting and mark sheet creation.

6. Perform practical of DOS internal commands. DIR,TYPE,DEL, MD,CD,COPY,RMDIR,VER,DATE,TIME, CLS EXIT.

7. Write a comparative report of different web browser such as opera, Microsoft edge, chrome and mozila Firefox.

8. Create an IP setting and home network setting for the computer.

9. Connect internet using wifi for a computer.

10. Practical based on online meeting using zoom, Google meet and skype

11. Practical based on remote desktop using any desk software.

12. Solve one example of binary to decimal, octal and hexadecimal number.

13. Solve one example of decimal to binary, octal and hexadecimal

14. Solve one example of octal to hexadecimal, decimal and binary.

Minimum three practical on each unit

Practical based on CMP-112

1. Execution of DOS internal and External commands
2. Study and explain the types of operating systems (their types with structure, functionality, dependencies, application software with their differences).
3. Installation of any one of the operating system.
4. Present the output of different file operation.
5. Implement any file allocation technique (Linked, Indexed or Contiguous) .(any one)
6. Present the output of following CPU Scheduling algorithm.(any one)
   a. FCFS
   b. SJF
   c. Priority
   d. Round Robin
7. Present the output of following Page Replacement Algorithm.(any one)
   a. FIFO
   b. LRU

Minimum three practical on each unit

12. Curriculum for Semester II

Course Code: **CMP-211**
Course Title: **Digital Electronic**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective: To convey basic introduction of computer system architecture, the structure of computer, working gates and its functionality. To impart basic knowledge in digital logic and circuits and to introduce basic concepts of data communications. Student will be able to learn basic concepts of digital logic and the design of basic logic circuits using commonly used combinational and sequential circuits.

Unit-I: Boolean Algebra and Logic Gates: (10 periods)

Postulates of Boolean Algebra Theorems of Boolean Algebra: Complementation , commutative, AND, OR, Associative, Distributive,Absorption laws , DE Morgan's theorems, Reducing Boolean expressions Logic Gates : AND, OR, NOT, Ex-OR, Ex-NOR, NAND as Universal building block Logic diagrams of Boolean expressions Boolean expressions for logic diagrams

Unit-II: Combinational and Sequential circuit (10 periods)

Introduction of Minimization techniques, Minterms and Maxterms, K-Map, K-Map for 2,3 and 4 variable.

Combinational circuit and sequential circuit introduction, Half adder, half substractor, Full Adder ,Full Subtractor, Multiplexer, demultiplexer, encoder, decoder, BCD to Decimal decoder 2 : 4 demultiplexer,4 line to 1 line multiplexer

Unit-III: Flip Flops (10 periods)

Introduction : RS FF,Clocked RS FF, D Flip Flops,Triggering, preset and clear,JK FF , T FF,Race around Condition

Unit-IV Counters Introduction:(10 periods)

Asynchronous/ ripple counter Modulus Counter , MOD-12 counter, Synchronous counter :

Synchronous serial & synch parallel counterbid counter, Ring counter

UNIT-5: Tutorial and Assignment   (05 periods)

Core Reference:
1. Digital Electronics and Micro-Computers – R.K.Gaur ,DhanpatRai Publication
2. Digital fundamentals –Floyd & Jain –Pearson Education
3. Introduction to computers –Norton –McGraw Hill 4. Digital fundamentals –Floyd & Jain –Pearson Education

Additional Reference:
1. Digital Electronics and Logic Design – N.G.Palan ,Technova Publication
2. Computer fundamentals –B.Ram –New Age International

| Course Code: **CMP-212** |
| Course Title: **Basic C Programing** |
| Total Credits: 02 |
| Contact Hours: 30 (Clock Hours) |
| Marks: 50 |
| Periods: 45 (45 minutes each) |

Objective: To expose students to algorithmic thinking and problem solving and impart moderate skills in programming using C Language in an industry-standard. Introduce students to learn basic features, Create, execute simple C programs using conditional statements, loops and arrays.

Unit-I: Introduction (10 periods)
An Overview of C , History of Programming language type, C as a Structured Language, Features of C. Data Types Data Types: int, char, float, double. Declaration & Initialization, Example.
Character set, C Token, Identifier & Keywords, Variables, Constant and its types. Integer constant, floating point constant, character constant, string constants, Operators: Arithmetic, Relational, Logical, Unary operators, Increment & decrement Assignment and Conditional operator.

Unit-II :C Program & I/O statements (10 periods)
Structure of C Program, Compilation & Execution of C program, I/O: Introduction, Formatted Input/output function: scanf & printf, Escape sequence characters.

Unit-III: Control and Iterative Statements(10 periods)
 Simple if, nested if, if-else, else if ladder, Switch-case statement, The conditional expression (? : operator),while and do-while loop, and for loop, break & continue statement, goto statement

Unit-IV: Arrays Introduction(10 periods)
 Declaration and initialization Accessing array elements, Memory representation of array. One dimension and multidimensional arrays, character array, Introduction to string

UNIT-5: Tutorial and Assignment   (05 periods)

References
1. Let us C : Y. P. Kanetkar [BPB publication]
2. Programming in C : E. Balaburuswamy [Tata McGraw hill]
3. Programming in C : Goterfried [Shaums' Series]

Course Code: **CMP-221**
Course Title: **Lab course 1 (based on CMP-211 and CMP-212)**
Total Credits: 1.5
Contact Hours: 03 Hours (Week)
Marks: 50

Objective: student understands the practical and logical application of programming language. The use of C logical statement in real time example solving. The student should understand the working of logic gate with its application in real time era.

Practical based on Digital Electronic
1. The practical should be done on kit for AND, OR , NOT, NAND, NOR , X-OR and X-Nor gate **(If kit not available use the software simulation for practical)**
2. Study of Components: Identification and testing of resistors, capacitors, inductors, diodes, LEDs & transistors
3. Study of Logic Gates: Study of truth table of basic gates, realization of Boolean functions
4. Study of Half adder and Full Adder
5. Study of Half Subtractor and Full Subtractor
6. Study of Implementation of a 3:8 decoder,
7. Study of 4-line to 16 bit decoder
8. Study of BCD to 7-segment decoder
9. Study of Generating a Boolean expression with a multiplexer
10. Study of Clocked JK Flip Flop 11. Study of 4-bit ripple counter 12. Study of Parallel-in, serial-out, 4-bit shift register

Practical based Basic C Programing

1.Installation of C Program:

Download and installation of C programming software. Discussion on available c software and use of each individually.

2. Input Output statement program

Minimum 10 program on input and output statement, data type and constant.

3.List of Program for student to understand the concept of programing

- Find Area, Perimeter of Triangle & Rectangle.
- Find maximum amongst 3 numbers.
- Program for nested loops.
- Program to Calculate x y
- Program to check Prime Number, Program reverse of digit.
- Program to find Armstrong Number.
- Program to print the Fibonacci Series
- Searching and element from array.
- Transpose of matrices
- Multiplication of matrices
- Sorting array using the bubble sort technique
- Program for factorial of number

| Course Code: **CMP-213** |
| Course Title: **Constitution of India** |
| Total Credits: NA (Non-Credit Course) |
| Contact Hours: 30 (Clock Hours) |
| Periods: 45 (45 minutes each) |

Objective: To objective of this paper is to introduce the Indian constitution of student.

Unit-I: (05 periods)

1. Meaning and concept of Indian Constitution.

2. Nature of constitution.

3. Brief idea of Indian Constitution.

Unit-II: Silent Feature of Indian Constitution (10 periods)

Written and Enacted Constitution; The longest and most detailed Constitution of the World; Rigidity and Flexibility Constitution; Parliamentary system of Government; Federal system with unitary basis; Adult Franchise; Single Citizenship; Sovereign, Democratic, Republic; Secularism; directive Principles of state policy; independent Judiciary; Fundamental Rights; Fundamental Duties.

Unit-III: (10 periods)

A. **Fundamental Rights**
   Concept of State (Art-12); Righty of Equality (Art-14 to 18); Right to Freedom (Art-19 to 22); Right against Exploitation (Art-23 & 24); Right to Religion (Art-25 to 28) ; Right to Minorities (Art-29 & 30) Constitutional Remedies(Art-32).
B. **Fundamental Duties (Art-51 A)**

Unit-IV: Directive Principles of State Policy (DPSP's) (15 periods)

1. Meaning and Significance of Directive Principles.
2. Classification / Principles of D. P. S. P.
3. Relationship between F. Rs. and D. P. S. P.

Executives

A) Union Government : The President, Council of Ministers and Prime Minister
B) State Government: The Governor, Council of Ministers and Chief Minister

UNIT-5: Tutorial and Assignment   (05 periods)

References

1. Constitution of India, Bare Act. Govt. of India.
2. Subhash C. Kashyap, Our Constitution (An Introduction of Indian Constitution and Constitutional) low, National Book Trust, India 2001.
3. Avasti & Maheshwari, Indian Constitution, Lakshmi Narain Agrwal Agra 2017.
4. Basu D. D. , Introduction to the Constitution of India, Laxis Nexis 2013.
5. Sharma L. N. Indian Prime Minister, The MacMillan company of India, 1976.
6. Jain H. M. Union Executive, Chaitanya Publication House 1969.
7. Dr. S. N. Busi, Dr. B. R. Ambedkar, Framingof Indian Constitution, 1st Edition 2015.
8. M. P. Jain, Indian Constitution Law 7th Edition Nexis 2014
9. M. P. Jain, Outline of Indian Legal and Constitutional History Laxis Nexis 2014
10. भारताचे संविधान
11. प्रदीप गायकवाड, (संपादक) भारताचे संविधान शिल्पकार डॉ. बाबासाहेब आंबेडकर दीक्षाभूमी संदेश, नागपूर २००६
12. डॉ. भा.ल. भोळे, भारताचे शासन आणि राजकारण, विद्या प्रकाशन नागपूर

NOTE: All latest volumes of above-mentioned books must be preferred. The above list of books is not an exhaustive one.

Two Internal Test (45 Minutes)	10 Marks
Two Home Assignment	10 Marks

Dr.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

CIRCULAR NO.SU/B.Sc./CBC&GS /65/2023

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies, Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted the **following syllabi of Bachelor of Science with Practical Pattern of Question Paper under the scheme of Choice Based Credit & Grading System** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc. Home Science (Degree)	IIIrd & IVth semester
2.	B.Sc. Information Technology (Degree)	IIIrd & IVth semester
3.	Bachelor of Computer Application (Degree)	IIIrd & IVth semester
4.	B.Sc.Botany (Optional)	IIIrd & IVth semester
5.	B.Sc.Dairy Science & Technology(Optional)	IIIrd & IVth semester
6.	B.Sc.Fisheries Science (Optional)	IIIrd & IVth semester
7.	B.Sc.Computer Science (Optional)	IIIrd & IVth semester
8.	B.Sc.Zoology (Optional)	IIIrd & IVth semester

This is effective from the Academic Year 2023-24 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.No.SU/2023/30210-26
Date:- 26.05.2023.

Deputy Registrar,
Academic Section

Copy forwarded with compliments to :-
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   Dr. Babasaheb Ambedkar Marathwada University,
2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**
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2] The Section Officer,[B.Sc.Unit] Examination Branch,Dr.BAMU,A'bad.
3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
6] The Public Relation Officer, Dr.BAMU,A'bad.
7] The Record Keeper, Dr.BAMU,A'bad.

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad- 431004(MS) India.

Undergraduate Bachelor Degree Program
In Science (B.Sc.)
Computer Science (Optional Subject)

Second Year Syllabus
(III and IV semester)

Course Structure and Curriculum
(Outcome based Curriculum)
Choice Based Credit System
(Effective from Academic Year 2023-24)

Dr. BabasahebAmbedkarMarathwada University
Aurangabad – 431004 (MS) India.

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

INDEX

1. Preamble

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 outcome s across all undergraduate programs in science, humanities, commerce and professional streams of higher education including computer science.

2. Structure and Curriculum for Bachelor of Science (B. Sc.) Computer Science (Optional Subject)

(Choice Based Credit System)

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Choice Based Credit System (CBCS) Curriculum
For
Faculty of Science and Technology
Course Structure and Scheme of Examination
B.Sc. Three Year Undergraduate Degree Program

Semester I

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1A) Core Courses	CMP-111	Computer Fundamental	2 hours	2	50	10	40	20
	CMP-112	Operating System	2 hours	2	50	10	40	20
	CMP-121	Lab course 1 (based on CMP-111 and CMP-112)	3 hours	1.5	50	10	40	20
Ability Enhancement compulsory courses (AECC-1)	CMP-131	Communication skills in English-I	3 hours	3	50	10	40	20
	CMP-132	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-I)	3 hours	3	50	10	40	20
Non-Credit Course	CMP-113	Constitution of India	2 hours					
			13	11.5	250	50	200	100

Total Credits for Semester I : 11.5 (Theory : 10 ; Laboratory : 1.5)

Semester II

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1B) Core Courses	CMP-211	Digital Electronic	2 hours	2	50	10	40	20
	CMP-212	Basic C Programing	2 hours	2	50	10	40	20
	CMP-221	Lab course 2 (based on CMP-211 and CMP-212)	3 hours	1.5	50	10	40	20
Ability Enhancement compulsory courses (AECC-2)	CMP-231	Communication skills in English-II	3 hours	3	50	10	40	20
	CMP-232	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-II)	3 hours	3	50	10	40	20
Non-Credit Course	CMP-213	Constitution of India	2 hours					
			15	11.5	250	50	200	100

Total Credits for Semester Ii : 11.5 (Theory : 10 ; Laboratory : 1.5)

Semester III

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1D) Core Courses	CMP-311	Data Structure	2 hours	2	50	10	40	20
	CMP-312	Advance C Programming	2 hours	2	50	10	40	20
	CMP-321	Lab course 3 (based on CMP-311)	3 hours	1.5	50	10	40	20
	CMP-322	Lab course 4 (based on CMP-312)	3 hours	1.5	50	10	40	20
Skill Enhancement course (SEC-2)	CMP-313	(Select any one from CMP313(A) and CMP313(B) CMP313(A) :- Office Automation CMP313(B):-HTML Programming	2 hours	2	50	10	40	20
Ability Enhancement	CMP-331	Communication skills in English-III	3 hours	3	50	10	40	20
compulsory courses (AECC-4)	CMP-332	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-III)	3 hours	3	50	10	40	20
Non-Credit Course	Non-Credit Course							

Total Credits for Semester III : 15 (Theory : 12 ; Laboratory : 3)

Semester IV

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1D) Core Courses	CMP-411	DBMS using SQL	2 hours	2	50	10	40	20
	CMP-412	Object Oriented Programing using C++	2 hours	2	50	10	40	20
	CMP-421	Lab course 5 (based on CMP-411)	3 hours	1.5	50	10	40	20
	CMP-422	Lab course 6 (based on CMP-412)	3 hours	1.5	50	10	40	20
Skill Enhancement course (SEC-2)	CMP-413	Select any one from CMP413(A) and CMP413(B) CMP413(A): Digital Marketing CMP413(B):- PHP Programming	2 hours	2	50	10	40	20
Ability Enhancement compulsory courses (AECC-4)	CMP-431	Communication skills in English-IV	3 hours	3	50	10	40	20
	CMP-432	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-IV)	3 hours	3	50	10	40	20
Non-Credit Course	CMP-413	Environment Science	2 hours					
			20	15	350	70	280	140

Total Credits for Semester IV : 15 (Theory : 12 ; Laboratory : 3)

Curriculum for

Semester III

Course Code: **CMP-311**
Course Title: **Data Structure**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective:

- To provide fundamental knowledge of data structures and how they are organized/arranged in computer memory.
- To provide knowledge on how data structures are implemented and processed.
- To familiarize with basic techniques of algorithm analysis.
- To equip with the implementation techniques of complex algorithms of insertion, deletion and modification of data stored in various data structures.
- To provide knowledge of the basic functioning of searching and sorting algorithms.

UNIT-1: Introduction to Data Structures and Algorithm Analysis: (10 period)

Introduction , Need of Data Structure ,Definitions - Data and information, Data type, Data object, ADT, Data Structure ,Types of Data Structures

Algorithm analysis: Space and time complexity, Graphical understanding of the relation between, different functions of n, examples of linear loop, logarithmic, quadratic loop etc. Best, Worst, Average case analysis, Asymptotic notations (Big O, Omega Ω,Theta)

UNIT-2: Array: (10 period)

ADT of array, Operations Array applications - Searching Sequential search, variations - Sentinel search, Probability search, ordered list search, Binary Search Comparison of searching methods , Sorting Terminology- Internal, External, Stable, In-place Sorting

Comparison Based Sorting - Lower bound on comparison based sorting, Methods- Bubble Sort, Insertion Sort, Selection Sort, Algorithm design strategies - Divide and Conquer strategy, Merge Sort, Quick Sort, complexity analysis of sorting methods

UNIT-3: Linked List: (10 period)

List as a Data Structure, differences with array. Dynamic implementation of Linked List, internal and external pointers, Types of Linked List – Singly, Doubly, Circular

Operations on Linked List - create, traverse, insert, delete, search, sort, reverse, concatenate, merge, time complexity of operations.

Applications of Linked List – polynomial representation, Addition of two polynomials

Generalized linked list – concept, representation, multiple-variable polynomial representation using generalized list

UNIT-4: Stack and Queue	(10 period)

UNIT-4: Stack and Queue   **(10 period)**

    Introductionof Stack: Operations – init(), push(), pop(), isEmpty(), isFull(), peek(), time complexity of operations.

    Implementation- Static and Dynamic with comparison, Applications of stack Expression types - infix, prefix and postfix, expression conversion and evaluation (implementation of infix to postfix, evaluation of postfix)

    Introduction of Queue: Operations - init(), enqueue(), dequeue(), isEmpty(), isFull(),peek(),time complexity of operations, differences with stack.

    Types of Queue - Linear Queue, Circular Queue, Priority Queue, Double Ended Queue

UNIT-5: Tutorial and Assignment (05 period)

References

1. Classic Data Structures-D. Samanta, Prentice Hall India Pvt. Ltd.

2. Fundamentals of Data Structures in C- Ellis Horowitz, SartajSahni,Susan Anderson-Freed, 2nd Edition, Universities Press.

3. Data Structures using C and C++-YedidyahLangsam, Moshe J. Augenstein, Aaron M.Tenenbaum, Pearson Education

4. Data Structures: A Pseudo code approach with C, Richard Gilberg ,Behrouz A. Forouzan, Cengage Learning.

5. Introduction to Data Structures in C-Ashok Kamthane, Pearson Education

6. Algorithms and Data Structures, Niklaus Wirth, Pearson Education

Course Code: **CMP-312** Course Title: **Advance C Programming** Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)

Objective:
 	
The students would be able
    1. To obtain in depth knowledge of C language.
    2. To understand advanced features of C Programming Language .

UNIT-1: Functions: (10 period)
        User Defined Functions : Introduction, Elements of UDF
        Categories of UDF : No argument no return value , Arguments but no return value, No argument but returns a value, Arguments with return value
        Recursion , Nesting Function, Variable Scope , Visibility and lifetime in function, Storage Classes

UNIT-2: Structures, Unions: (10 period)
        Structures : Defining a structure, Accessing a structure variable, Operations on structure members, Copying and comparing variables, Arrays of structure Arrays within Structures ,
        Unions: introduction, example.

UNIT-3: Pointer: (10 period)
        Definition and Concept : Advantage of using pointer, Pointer arithmetic
        Pointer: Array of pointers, Pointers and Functions
        Dynamic Memory Allocation: Memory Allocation Function, malloc() , calloc(), realloc(), free()

UNIT-4: Files and Preprocessors   (10 period)
        Files : Concepts of File Management , Files functions – fopen(), fclose(), fprintf(), fscanf(), fseek(), ftell(), rewind(), putc(), getc(), putw(), getw() , Error handling functions . Command line argument
        Preprocessors: Types of Preprocessors, Macro substitution directives
        File inclusion directives, Compiler control directives

UNIT-5: Tutorial and Assignment (05 period)

References

1. Simplifying C (First Edition 2010), Publication : Dreamtech, by Harshal Arolkar and Sonal Jain

2. Programming in ANSI C (Fifth Edition 2011), Publication : Mc Graw Hill, by Balagurusamy

3. Programming in C (First Edition 2011), Publication : Oxford Higher Education, by Reema Thareja

4. Programming In C (Second Edition), Publication : Pearson Education, by Ashok N. Kamthane

Course Code: **CMP-321**
Course Title: **Lab course 3 (based on CMP-311)**
Total Credits: 1.5
Contact Hours: 03 Hours (Week)
Marks: 50

1. Write a program to store the elements in 1-D array and perform the operations like searching, sorting and reversing the elements.
2. Read the two arrays from the user and merge them and display the elements in sorted order
3. Write a program to perform the Matrix addition, Multiplication and Transpose Operation.
4. Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations
5. Write a program to convert an infix expression to postfix and prefix conversion
6. Write a program to implement Tower of Hanoi problem.
7. Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations.
8. Write a program to implement the concept of Circular Queue
9. Write a program to implement the concept of Deque.
10. Write a program to create the tree and display the elements.
11. Write a program to construct the binary tree
12. Write a program for inorder, postorder and preorder traversal of tree
13. Write a program to create a single linked list and display the node elements in reverse order
14. Write a program to search the elements in the linked list and display the same

Minimum three practical on each unit

Course Code: **CMP-322**
Course Title: **Lab course 4 (based on CMP-312)**
Total Credits: 1.5
Contact Hours: 03 Hours (Week)
Marks: 50

1. Write a program to calculate average temperature of five days. Create temp() function.
2. Write a program that uses recursive function fibo() that generates a Fibonacci series containing N elements.
3. Write a program that uses a recursive function fact() that finds the factorial of a given number N.
4. Program to find if the given no. is prime or not. The function should accept the number as argument and return if the no. is prime or not.
5. Write a function which accepts a character array as argument from the user. The function should print the ASCII equivalent of all the characters in the string.
6. Write a program to define structure with tag state with fields state name, number of districts and total population. Read and display the data.
7. Write a program to create a list of books details. The details of a book include title, author, publisher, publishing year, number of pages, and price.
8. Define a structure called Item with members : Item_code, Item_name, Price. Create an array of five Items. Create a function which accepts the Item array and modifies each element with an increase of 10% in the price.
9. Define a structure to represent a date. Use your structures that accept two different dates in the format mm dd of the same year. Write a C program to display the month names of both dates.
10. Define a structure that can describe a Hotel. It should have members that include name, address, grade, room charges, grade and no of rooms. Write a function to print out all hotel details with room charges less than a given value
11.1 Write a program to display contents of file on the screen. The program should ask for file name. Display the contents in capital case.
12. Write a program to find size of the file.
13. Write a program to combine contents of two files in a third file. Add line number at the beginning of each line.
14. Write a program to display number 1 to 100. Redirect the output of the program to text file.
15. Write a program to write contents of one file in reverse into another file

Minimum three practical on each unit

Course Code: **CMP-313(A)** Course Title: **Office Automation** Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)
Objective: The students would be able 1. To obtain in skill regarding the office tool and its related applications. 2. To understand advanced features office tool.
UNIT-1: DOS and Windows Environment: (10 period) DOS organization, DOS commands, Operating System: Batch, multi-programming, Time sharing, Networks operating system, On-line and Real time operating system, Distributed operating system, Multi-processor, Multi-tasking. Graphical OS: Fundamentals of windows, Types of windows, Anatomy of windows, Windows explorer, Customizing windows, Control panel, Taskbar setting, Open Network and sharing centre.
UNIT-2: Word Processor: (10 period) Applications of word processor, Common packages, Creating and saving documents, Editing documents, Formatting text and paragraphs, Use of header footer, Insert table, Edit table, Mail merge, Macros
UNIT-3: Spread Sheet: (10 period) Concept of worksheets and workbooks, Creating workbook, Editing a work sheet, Formatting data, Doing basic calculations using formulae, Using simple statistical functions, Inserting charts, Printing workbook.
UNIT-4: Power Point   **(10 period)** Templates, Views, Formatting slide, Slides with graphs, Animation, using special features, presenting slide shows
UNIT-5: Tutorial and Assignment (05 period)

References

1. R.K. Taxali: Introduction to Software Packages, Galgotia Publicaions.
2. MS–Office 2003, Compiled by SYBIX.
3. MS–Office 2003, BPB Publications.
4. Introduction to Computer, P.K. Sinha.
5. Fundamental of Computers – By V. Rajaraman B.P.B. Publications

Course Code: **CMP-313(B)**
Course Title: **HTML Programming**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective:

The students would be able
1. To obtain in skill regarding the web development and its related applications.
2. To understand advanced features HTML.

UNIT-1: Introduction: (10 period)

Basic Concept , Internet, Internet Domains world wide web,

Protocols definition, Overview of TCP/IP, Telnet.

Web page, Web site , web browser , Web server ,web, Client, Communication between browser and web, server, Web site architecture.

Structure of HTML program HTML paired tags,Text formatting: paragraph, line break, headings , drawing lines.Text styles: Bold, italics,underline. Lists: types of lists viz. unordered, ordered, definition

lists

UNIT-2: Links and Image: (10 period)

Linking documents (Links) : External document references, internal document references.

Introduction to frames: frameset and frame tag. Putting an Image on a Page ,Using Images as Links ,Putting an Image in the Background

UNIT-3: Tables and Forms: (10 period)

Creating a Table , Table Headers ,Captions, Spanning

Multiple Columns ,Styling Table .

Introduction to forms, form design and form tag.

UNIT-4: Introduction to DHTML   (10 period)

Overview of dynamic HTML. Cascading Style Sheets, font ,color ,background

UNIT-5: Tutorial and Assignment   (05 period)

References

1. Web Enabled commercial Application Development Using HTML, DHTML, JavaScript by -Ivon Bayross.
2. Complete reference HTML, Narosa Publication
3. Cassidy Williams, Camryn Williams Introduction to HTML and CSS, O'Reilly, 2015

Curriculum for Semester IV

Course Code: **CMP-411** Course Title: **DBMS with SQL** Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)

Objective: Students successfully completing this course should be able to:

1. To understand the different issues involved in the design and implementation of a database system.
2. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
3. To understand and use data manipulation language to query, update, and manage a database.
4. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

UNIT-1: Introduction: (10 period)

General introduction to database systems; Database -DBMS distinction, approaches for building a database, data models, database management system, three-schema architecture of a database, challenges in building a DBMS, various components of a DBMS

UNIT-2: Data Models: (10 period)

E/R Model - Conceptual data modeling - motivation,entities, entity types, various types of attributes, relationships, relationship types, E/R diagram notation, examples

UNIT-3: Structured Query Language (SQL): (10 period)

Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL - basic select-from-where block and its semantics, nested queries - correlated and uncorrelated, notion of aggregation, aggregation functions group by and having clauses, embedded SQL.

UNIT-4: Data Normalization   **(10 period)**

Dependencies and Normal forms - Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, definitions of 1NF, 2NF.

Data Storage, Indexes and Transactions: File organizations, primary, secondary index structures and various index structures.

UNIT-5: Tutorial and Assignment (05 period)

References

1. An Introduction to Database System By Bipin C Desai
2. H Garcia-Molina, JD Ullman and Widom, Database Systems: The Complete Book,2nd Ed., Prentice-Hall, 2008.
3. A Silberschatz, H Korth and S Sudarshan, Database System Concepts, 6th Ed., McGraw-Hill, 2010.
4. R Elmasri, S Navathe, Fundamentals of Database Systems, 6th edition, Addison-Wesley, 2010.
5. R Ramakrishnan, J Gehrke, Database Management Systems, 3rd Ed., McGraw-Hill,2002

Course Code: **CMP-412**
Course Title: **Object Oriented Programing using C++**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective: Students successfully completing this course should be able to:

1. To expose students to concept of object oriented programming using C++.

2. Student will elaborate the algorithmic thinking and problem solving and impart moderate skills in programming using C++ Language in an industry-standard.

3. Introduce students to learn basic features of C++ language, design and execute the C++ program dynamically.

UNIT-1: Introduction of OOP: (10 period)
Procedural Vs Object Oriented Programming, Basic concepts of Object Oriented Programming, Class, Object, Data Abstraction, Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing.
Benefits and applications of OOP.

UNIT-2: Introduction to C++: (10 period)
History and overview of C++, C++ program structure. Reference variables, Scope resolution operator, Member de-referencing operators, new and delete, cin and cout,

UNIT-3: Functions in C++: (SQL): (10 period)
Function prototype, Call by reference (using reference variable), Return by reference, Inline function, Default arguments, Const arguments.
Function overloading Different numbers and different kinds of arguments.

UNIT-4: Objects and Classes   (10 period)
Specifying a class, private and public, Defining member functions, Nesting of member function, Object as data types, Memory allocation for objects, static data members and member functions. Array of objects, Objects as function argument, returning objects, Friend function and its characteristics

Constructors and Destructors
Introduction, default and parameterized constructors, Multiple constructors in a class, Copy Constructor, Destructors

UNIT-5: Tutorial and Assignment (05 period)

References

1. Object Oriented Programming with C++ E. Balagurusamy, Tata McGraw-Hill Publishing
2. Object Oriented Programming In C + + Robert Lafore, Galgotia
3. Let us C++ Yeshwant Kanetkar; bpb publication

Course Code: **CMP-421**
Course Title: **Lab course 5 (based on CMP-411)**
Total Credits: 1.5
Contact Hours: 03 Hours (Week)
Marks: 50

1. Creating a single table without constraints and firing queries.

2. Queries containing aggregate, string and date functions fired on a single table.

3. Creating single table with constraints and executing queries.

4. Updating tables, altering table structure and deleting table Creating and altering a single table and executing queries.

5. Joining tables and processing queries.

6. For given scenario draw E-R diagram and convert entities and relationships to table. Write relational algebra queries and convert to SQL queries on these tables.

7. Creating, dropping and maintaining indexes.

8. Create and manage views and process queries on views.

9. Creating stored procedures, executing procedures, deleting procedures.

10. Creating with or without enforcing data integrity through triggers, nested triggers, viewing, modifying and deleting triggers

Minimum three practical on each unit

Course Code: **CMP-422**
Course Title: **Lab course 6 (based on CMP-412)**
Total Credits: 1.5
Contact Hours: 03 Hours (Week)
Marks: 50

1. Write programs that illustrates the simple C++ concepts without classes.

2. Write C++ programs to illustrate the concepts pointers, functions and function overloading.

3. Write C++ programs to illustrate the concepts: classes, friend functions.

4. Write C++ programs to illustrate the concepts:constructors, constructor overloading and destructors.

5. Write C++ programs to illustrate the concepts: operator overloading (both Unary and Binary).

6. Write C++ programs to illustrate the concepts: Simple,Multiple, Multilevel inheritance.

7. Write C++ programs to illustrate the concepts: Polymorphism (Virtual functions, Pure Virtual functions).

8. Write programs to illustrate the file handling in C++.

9. Write programs to illustrate the templates in C++.

10. Write programs to illustrate the exceptions in C++.

Minimum three practical on each unit

Course Code: **CMP-413(A)** Course Title: **Digital Marketing** Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)

Objective:

1. To understand the fundamentals of digital marketing and its significance in today's business world.

2. To develop a comprehensive content marketing strategy that aligns with business goals.

3. To gain an in-depth understanding of search engine optimization techniques and how to optimize a website for search engines.

4. To learn how to create and execute effective social media marketing campaigns that reach and engage the target audience.

UNIT-1: Introduction to Digital Marketing: (10 period)
 Definition and Overview of Digital Marketing
 Types of Digital Marketing
 Digital Marketing vs Traditional Marketing
 The Importance of Digital Marketing in the Business World
 Digital Marketing Channels
 Digital Marketing Mix
 The Digital Marketing Ecosystem
 Understanding Target Audience

UNIT-2: Content Marketing: (10 period)
 Definition and Overview of Content Marketing
 Content Marketing Objectives
 Types of Content Marketing
 Creating a Content Marketing Plan
 Content Marketing Process
 Content Marketing Channels
 Measuring Content Marketing Success
 Content Marketing Best Practices

UNIT-3: Search Engine Optimization (SEO) (10 period)
 Definition and Overview of SEO
 The Importance of SEO in Digital Marketing
 Keyword Research and Analysis
 On-page and Off-page Optimization
 Technical SEO
 Link Building
 Local SEO

Mobile Optimization

UNIT-4: Social Media Marketing (10 period)
 Definition and Overview of Social Media Marketing
 Types of Social Media Channels
 Creating a Social Media Marketing Plan
 Measuring Social Media Marketing Success
 Social Media Marketing Objectives
 Social Media Marketing Channels
 Social Media Advertising
 Social Media Best Practices

UNIT-5: Tutorial and Assignment (05 period)

References

1. Digital Marketing: An Hour a Day by Dave ChaffeyContent Marketing for Dummies by Stephanie Diamond

2. The Art of Social Media by Guy Kawasaki and Peg Fitzpatrick

3. The Science of Social Selling by Jill Konrath

4. The Art of SEO by Eric Enge, Jessie Stricchiola, and Rand Fishkin

Course Code: **CMP-413(B)**
Course Title: **PHP Programming**   Total Credits: 02
Contact Hours: 30 (Clock Hours)   Marks: 50
Periods: 45 (45 minutes each)

Objective:
- Upon successful completion of this course, student will understand the basic concept of PHP based web development.
- The student will elaborate their programming knowledge for web design and development.
- The PHP subject will support to student for designing and development of large scale websites for real time application.

UNIT-1: Introduction: (10 period)

PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.) ,PHP with other technologies, scope of PHP ,Basic Syntax, PHP variables and constants ,Types of data in PHP , Expressions, scopes of a variable (local, global) ,PHP Operators : Arithmetic, Assignment, Relational , Logical operators, Bitwise , ternary and MOD operator, PHP operator Precedence and associatively .

UNIT-2: HTML Form with PHP: (10 period)

Capturing Form Data ,GET and POST form methods ,Dealing with multi value fields, Redirecting a form after submission
Conditional events and Loops:
PHP IF Else conditional statements (Nested IF and Else) Switch case, while ,For and Do While Loop, Goto , Break ,Continue and exit

UNIT-3: Functions : (10 period)

Function, Need of Function , declaration and calling of a function ,PHP Function with arguments, Default Arguments in Function ,Function argument with call by value, call by reference, Scope of Function Global and Local

UNIT-4: String Manipulation and Regular Expression   (10 period)

Creating and accessing String , Searching & Replacing String ,Formatting, joining and splitting String , String Related Library functions
Use and advantage of regular
expression over inbuilt function ,Use of preg_match(), preg_replace(), preg_split() functions in regular expression

UNIT-5: Tutorial and Assignment (05 period)

References
1. Steven Holzner, "PHP: The Complete Reference Paperback", McGraw Hill Education (India),2007.
2. Timothy Boronczyk, Martin E. Psinas, "PHP and MYSQL (Create-Modify-Reuse)", Wiley India Private Limited, 2008.
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", 3rd Edition Paperback, O'reilly,2014

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY
CIRCULAR NO. SU/Sci./B.Sc. Syllabi/100/2016

It is hereby notified for information to all concerned that, on the recommendation of the Ad-hoc Board in Computer Science and I.T. the **Academic Council** at its meeting held on 01 & 02 June, 2016 has accepted the following revised syllabi as mentioned against their names under the Faculty of Science :-

Sr. No.	B.Sc. III Year Revised Syllabus		Semester
[1]	B.Sc. Computer Science	Degree Course	V & VI
[2]	B.Sc. Information Technology	Degree Course	V & VI
[3]	B.C.A. Science	Degree Course	V & VI
[4]	B.Sc. Animation	Degree Course	V & VI
[5]	B.Sc. Computer Science	Optional	V & VI
[6]	B.Sc. Information Technology	Optional	V & VI
[7]	B.C.A. Science	Optional	V & VI
[8]	B.Sc. Computer Maintenance	Optional	V & VI

This is effective from the **Academic Year 2016-2017** and onwards.

These **syllabi** are also available on the University Website www.bamu.ac.in

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.No.SU/B.Sc./2016/2389-639
A.C.M.A.I.No.10

Date:- 07-06-2016.

Director,
Board of College and University Development.

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- 2 -

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Copy forwarded with compliments to :-

1] **The Principals, affiliated concerned Colleges,
   Dr. Babasaheb Ambedkar Marathwada University.**

Copy to :-

1] The Controller of Examinations,

2] The Section Officer, [B.Sc. Unit],

3] The Section Officer, [B.C.S. Unit],

4] The Programmer [Computer Unit-1] Examinations,

5] The Programmer [Computer Unit-2] Examinations,

6] The In-Charge, E-Suvidha Kendra, [Professional Unit], Rajarshi
   Shahu Maharaj Pariksha Bhavan, Dr. Babasaheb Ambedkar
   Marathwada University,

7] The Record Keeper,
   Dr. Babasaheb Ambedkar Marathwada University.

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Revised Syllabus of

B.Sc. Computer Science

(Optional)

Semester – V and VI

Effective from 2016-17

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Curriculum Structure and Scheme of Evaluation: B.Sc. Computer Science (Optional)

Sr. No.	Course Code	Name of the Subject	Scheme of Teaching			Scheme of Evaluation(Marks)			
			T Hrs/ Week	P Hrs/ Week	Total Hrs/ Week	University Theory Exam.	University Practical Exam.	Duration	Total Marks
Semester V									
1	CSO15	Software Engineering	3		3	50	-	2	50
2	CSO16*	Web Designing	3		3	50	-	2	50
3	CSO16*	VB.Net	3		3	50	-	2	50
4	CSO17	Case Study	-	3	3	-	50	3	50
5	CSO18	Pr. Based on CSO16	-	3	3	-	50	3	50
Total of Semester – V			6	3	9	100	100		200

Semester VI									
1	CSO19	Data Communication and Networking	3		3	50	-	2	50
2	CSO20*	Ethics and Cyber Low	3		3	50	-	2	50
3	CSO20*	E-Commerce	3		3	50	-	2	50
4	CSO21	Seminar	-	3	3	-	20	3	50
5	CSO22	Project		3	3		80		
Total of Semester – VI			6	3	9	100	100		200

* Indicate optional paper (any one from 2 and 3)

- 6 -

Semester V

- 7 -

Paper No.: CSO15   **Comp. Sci. (Gen.) Semester : V**
Paper title: Software Engineering

Unit –I
Software and Software Engineering What is Software, Characteristics of software, categories of Software, attributes of WebApps, software Engineering, Software Process, Essence Software Engineering Practice, General Principles, Software Myths
Unit –II
Software Process and Process Models Software process Model Process Flow, Process Models, Waterfall model, Incremental Process Model, Evolutionary Process Models, Concurrent Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Product and Process **Agile** Introduction to Agility, Agility and the Cost of Change, Agile Process, Agility Principles, Human Factors, Extreme Programming (XP), XP Values, XP Process, Industrial, Critics of XP
Unit –III
Principles That Guide Practice Principles That Guide Process, Principles That Guide Practice, Communication Principles, Planning Principles, Modeling Principles, Construction Principles, Deployment Principles

Books:

1) Software Engineering a Practitioner's Approach By Roger S. Pressman (Seventh Edition) McGraw Hill.
1) An Integrated Approach to Software Engineering, Pankaj Jalote, Narosa

Paper No.: CSO16*   **Comp. Sci. (Gen.) Semester : V**
Paper title: Web Designing

Unit –I
Introducing HTML5 Understanding HTML, XHTML, and HTML5, Introducing semantic markup, Syntax, Attributes, Working with elements, Creating an HTML document Embedding content, Embedding HTML by using inline frames, Working with hyperlinks, Adding images to your HTML document, Embedding plug-in content **Advances of HTML5** HTML5 Layout container Format using <div> element Working with Tables: creating regular and irregular tables, heading, columns and rows, captions, header, footer.
Unit –II
Introducing JavaScript Basic of JavaScript JavaScript Variables, Operators & Its Precedence, Special Values, Predefined Built-Infunctions, Functions Declaration & Call String Functions Conditions and looping structure, Inline JavaScript & External JavaScript **Advances in JavaScript** Object in JavaScript, Concept of array, how to use it in JavaScript, types of an array, array methods DOM Concept in JavaScript, DOM Objects, DOM Search Methods Event handling in JavaScript: Capturing & Bubbling, Subscribing, Unsubscribing and Cancelling Event, Windows Event, Keyboard and Mouse Events.
Unit –III
Cascading Style Sheet Introduction to CSS3 Defining and Applying a Style, Inline, Embedded and External Style Sheet. Selectors: element, id and class selector, grouping selector, attribute, Specificity and cascading CSS properties: Color, box Model, border, padding, margin, float, clear

Books and References:

1) Programming in HTML5 with Javascript and CSS3 , Glenn Johnson (http://www.daoudisamir.com/references/vs_ebooks/html5_css3.pdf)
2) Beginning HTML5 andCSS3 By Richard Clark, OliStudholme,Christopher Murphy and DivyaManian.(http://www.alvinisd.net/cms/lib03/TX01001897/Centricity/Domain/1077/beginning_html5_and_css3.pdf)
3) A Definitive Guide to HTML5 , By Adam Freemans

Paper No.: CSO16*   **Comp. Sci. (Gen.) Semester : V**
Paper title: VB.NET

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Unit –I	
	Introduction: Introduction to .NET and .NET Framework, Difference between CUI & GUI, Event Driven Programming, the VB IDE, Operators, Conditional statements and looping statements. Sub Procedure, functions and exception handling
Unit –II	
	Windows Forms : General Properties, Events handling events like mouse, keyboard, Types of forms MDI, adding removing controls at run time.
	Controls : The control class, Text Box, Rich Text Box, Label, Buttons, Checkbox, Radio Button, Panels, Group Boxes, List Box, Combo Box, Picture Box, Scroll Bars, Splitters, Track Bars, Pickers, Timer.
Unit –III	
	Object-Oriented Programming : Class and Object, Class Vs. Object Members, Creating Classes, Objects, Structures, Modules, Constructors, Data Members, Methods, Properties, Event

Books and References:

1) Visual Basic .NET Programming Black Book" by Steven Holzner, Dreamtech Press
2) "Mastering in Visual Basic .NET" by Evangelos Petroutsos, Sybex Publication.

Paper No.: CSO17   **Comp. Sci. (Gen.) Semester : V**
Paper title: Software Engineering Case Study

Using any Software engineering model case study on development of a software.

Paper No.: CSO18   **Comp. Sci. (Gen.) Semester : V**

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Paper title: Web Designing if Selected

1. Create a simple website by using Visual Studio Express
2. Create additional pages
3. Embedding Content
4. Create a webpage using <table> and <div> elements
5. Create a webpages using conditional and looping statements.
6. Create a calculator webpage
7. Create a Webpage to introduce National Bird/Animal/Emblem/Flower
8. Learn more about positioning by adding more <div> elements to the webpage to define a header and footer for the page. Use CSS style rules to set the position.
9. Learn more about CSS selectors by adding more elements to the page and try setting the format by selecting the elements without using an id.
10. Learn more about colors by changing the color scheme, using RGB values.

Paper No.: CSO18   **Comp. Sci. (Gen.) Semester : V**
Paper title: VB.NET if Selected

Minimum 12 Practical to be performed as per the guidelines of teaching Faculty depending upon all theory units of concerned subject.

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Semester VI

Paper No.: CSO19   **Comp. Sci. (Gen.) Semester : VI**
Paper title: Data Communication and Networking

Unit –I
Introduction
Communication System, Components of communication system, Computer network Advantage and applications of computer n/w. point-to-point and multipoint line configuration, LAN, MAN and WAN. Analog and Digital signals, Data Transmission: Parallel and Serial, Synchronous and Asynchronous transmission, Transmission Mode: Simplex, half-duplex and full-duplex.
Network Topologies
Mesh, Star, Tree, Bus and Ring and Hybrid Topology (Advantages and disadvantages of each)

Unit –II
Transmission media
Guided and unguided media, Twisted-pair, UTP and STP cable, coaxial cable, Optical Fiber cable, Radio waves, Microwaves, Satellite Communication (*Transmission characteristics and advantages of each type*)
Modulation & Multiplexing
Concept of modulation and demodulation, Digital-to-analog conversion, Amplitude Shift Keying (ASK)/AM, Frequency Shift Keying (FSK)/FM, Phase Shift keying (PSK)/PM.

Unit –III
The Mobile Telephone System:
First Generation(1G), Second Generation(2G), Third Generation(3G), Internet over cable, Spectrum Allocation, cable Modem, ADSL Versus Cable.

Books:

1) Introduction to Digital and Data Communications, Michal A Miller, JAICO, publishing.

2) Data Communication and Networking: C.S.V. Murthy, Himalaya Publishing House

3) Data Communication and Networking :: Behrouz A. Forouzan; Mc-Graw Hill Pub.

4) Computer Networks by A. S. TANENBAUM, DAVID J. WETHERALL PRENTICE HALL PublicationSoftware

Paper No.: CSO20*   **Comp. Sci. (Gen.) Semester : VI**
Paper title: Ethics and Cyber Law

Unit –I

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Basic Concepts of Technology and Law, Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence. Law of Digital Contracts The Essence of Digital Contracts.
Unit –II
The System of Digital Signatures. The Role and Function of Certifying Authorities. The Science of Cryptography, E-Governance, Cyber Crimes and Cyber Laws. Introduction to Intellectual Property.
Unit –III
Information Technology Act 2000 Cyber Law Issues in E-Business Management. Major issues in Cyber Evidence Management, Cyber Law Compliancy Audit, The Ethics of Computer Security. Relevant Rules Notifications, Information Technology (Amendment) Act, 2008.

Books and References:

1) Godbole,"Information Systems Security", Willey

2) Merkov, Breithaupt,"Information Security", Pearson Education

3) Yadav, "Foundations of Information Technology", New Age, Delhi

4) Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill

5) Sood,"Cyber Laws Simplified", Mc Graw Hill

6) Furnell, "Computer Insecurity", SpringerA Definitive Guide to HTML5 , By Adam Freemans

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Paper No.: CSO20*   **Comp. Sci. (Gen.) Semester : VI**
Paper title: E-Commerce

Unit –I
Introduction, IT and business, E-commerce: Concepts Electronic Communication, PCs and Networking, E-mail, Internet and intranets. EDI to E-commerce, EDI, UN/EDIFACT
Unit –II
Concerns for E-commerce Growth, Internet bandwidth, Technical issues, Security issues. India E-commerce Readiness, Legal issues, Getting started. Security Technologies: Encryption, Symmetric key Encryption, Public key encryption, Public key encryption using digital Signatures. Hashing techniques, Certification and key Distribution, Cryptographic.
Unit –III
The elements of E-commerce. SSL-Secure Socket Layer, SET-Secure Electronic Transaction Protocol for Credit card payment, E-Cash, E-check, Smart cards. Electronic Payment System: Digital Cash, Digital Wallets, Digital checking payment systems, Electronic Billing, Wireless payment systems. Software Package: PGP e-mail encryption software

Books and References:

1) E-Commerce: The Cutting Edge of Business, Kamlesh K. Bajaj & Debjani Nag, Tata McGraw Hill.

2) E- Commerce Strategy , Technologies and Applications, David Whiteley, McGraw Hill Edition

3) E- Security, Electronic Authentication and Information Systems Security Sundeep Oberoi, TMG

4) E-Commerce Concepts, Models , Strategies by - G.S.V Murthy

5) E-Commerce- Kenneth C.Laudon and Carol Guercio Traver

6) Internet marketing and E-commerce-Ward Hanson and Kirthi Kalyanam

Paper No.: CSO21   **Comp. Sci. (Gen.) Semester : VI**
Paper title: Seminar

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Student should prepare and present a seminar on any latest topic should be related to Computer Science.

Paper No.: CSO22   **Comp. Sci. (Gen.) Semester : VI**
Paper title: Major Project

Students group (maximum 3 students) should design and develop a project.

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