ACADEMIC (1-BOARD OF STUDIES) SECTION

संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील प्रथम वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९—२० पासून लागू करण्याबाबत.

प रि प त्र क

(संदर्भ : शैक्षणिक—१ / परिपत्रक / पदव्युत्तर—सीबीसीएस अभ्यासक्रम / २०१९—२० / ४६४, दि. ११.०७.२०१९.)

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

तथापि, त्यापैकी खालील पाच विषयांच्या अभ्यासक्रमांत काही सुधारणा करण्यात आल्या असून, त्या शैक्षणिक वर्ष २०१९—२० पासून लागू करण्यात येत आहेत.

1. Computer Management
2. Computer Science
3. Information Technology
4. Software Engineering
5. System Administration & Networking

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

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड — ४३१ ६०६.
जा.क्र.: शैक्षणिक—१ / परिपत्रक / पदव्युत्तर—सीबीसीएस
अभ्यासक्रम / २०१९—२० / १८१०

दिनांक : २६.१०.२०१९.

स्वाक्षरित / —
उपकुलसचिव
शैक्षणिक (१—अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सीनिअर प्रोग्रामर, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

Resolutions passed in the BoS in Computer Science and Application dated 16/09/2019

1. **Revised Credit arrangements for following programs - M.Sc. programs in Affiliated colleges including Computer Science, Software Engineering, System Administration and Networking, Computer Management, Information Technology**

New Resolution: There is no change in the total credits per semester or total credits per program. All above M.Sc. Degrees / programs in affiliated colleges would be of 100 Credits even now after changes. Total credits per semester are still 25. **However the credit pattern is changed in order to keep informality with other PG programs of other BoS in the faculty. These changes are as follows**

Earlier	Revised and effective from 16-09-2019
Each theory course has 04 credits which are split as 02 external credits and 02 internal credits. (50+ 50 pattern)	Each theory course has 04 credits which are split as 03 external credits and 01 internal credit. (75+25 pattern)
The university shall conduct the end semester examination for 02 external credits (50 marks).	The university shall conduct the end semester examination for 03 external credits (75 marks).
For theory internal credit, student has to appear for 02 class test (15 marks) and 01 assignment (20 marks).	For theory internal credit, student has to appear for 02 class test (10 marks each) and 01 assignment (05 marks).
Semester wise Practical / Lab examinations	**--- same --- no changes**
Every lab course has 02 credits which are split as 01 external credit and 01 internal credit.	**--- same --- no changes**
For lab internal credit, the student has to submit Laboratory Book (05 marks) and remaining 20 marks are for the Lab activities carried out by the student throughout the semester.	**--- same --- no changes**
For lab external credit, 20 marks are reserved for the examinational experiment and 05 marks are for the oral / viva examinations.	**--- same --- no changes**
For open elective **(also applicable to Open elective in professional UG programs also)**	The Open elective shall have 04 credits and its assessment shall be totally internally. Any University recognized MOOC courses can be availed for this. Such courses must be of minimum 16 weeks duration in order to claim 04 credits. The credit transfer policy shall be as per the rules and regulations of the University. The MOOC course coordinator of the college shall verify the contents, validity and time duration of the MOOC course chosen by the student and the semester duration. Failure of which, students must undergo in-house open elective. **More weightage for MOOC courses (above 08 credits) in campus and affiliated colleges is intentionally given by the BoS with a view that students will undergo skills based advanced courses in Computer science and allied subject discipline from reputed and recognized agencies. This will also help in wide range of elective subjects for students**
Credits for Major Project development activity in Last semester	Major Project development activity is one of the core subjects in fourth semester. There will be no theory examination conducted by the university for it. The external examiner shall conduct the examination for 04 credits. The 04 credits are together for actual project demonstration, project report and project viva

Resolutions passed in the BoS in Computer Science and Application dated 16/09/2019

Resolutions:

2. The end semester examination duration of these M.Sc. programs in the affiliated colleges, namely, Computer Science, Software Engineering, System Administration and Networking, Computer Management, Information Technology, shall be of 03 hours and a common question paper pattern shall be followed for all these PG programs. This pattern is attached below.

3. For this academic year, AY 2019-2020, for PG programs, while setting theory question papers or conducting practical examinations, related to first year, the new question paper pattern has to be followed.

4. For setting theory question papers or conducting practical examinations, related to current second year (third and fourth semesters) belonging to old syllabi and for backlog students, belonging to PG programs, the previous concerned question paper pattern for corresponding syllabi must be followed .

5. For M.Sc. programs being offered by Campus School and Latur Sub centre (namely Computer Science, Computer Application and Computer Network), there is no change in the credit pattern, total credits per semester, total credits per program and the question paper pattern.

6. For MCA programs, being offered by Campus School and affiliated colleges, there is no change in the credit pattern, total credits per semester, total credits per program and the question paper pattern.

Revised Credit pattern for M.Sc. programs in affiliated colleges (Computer Science, Software

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
		First Semester to Third Semester				
1.	**Core Subjects**	Same	Same	1	3	4
2		Same	Same	1	3	4
3		Same	Same	1	3	4
		Choose any one from below elective subjects				
4	**Elective Subject**	Same	Same	1	3	4
		Same	Same			
		Practical /Lab				
5	**Lab / Practical**	Same	Lab	1	1	2
		Same	Lab	1	1	2
6	**Open Elective**	Same	Same	4	0	4
		Same	Same			
7	**Skill based Activity**	Same	same	1	0	1
	Total credits			**11**	**14**	**25**

Engineering, System Administration and Networking, Computer Management, Information Technology)

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
		Fourth Semester				
1.	Core Subjects			1	3	4
2				1	3	4
3			Major Project development Activity	0	4	4
		Choose any one from below elective subjects				
4	Elective Subject			1	3	4
		Practical /Lab				
5	Lab / Practical		Lab-7	1	1	2
			Lab-8	1	1	2
6	Open Elective	A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		B				
7	Skill based Activity		same	1	0	1
			Total credits	10	15	25

Common Question paper pattern for M.Sc. programs (Not for Campus)

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology
Question Paper Pattern w.e.f Academic Year 2019-2020
M.Sc. (Computer Science /Computer Management/Information Technology/
Software Engineering/System Administration & Networking)
First Semester & Second Semester
(CBCS Pattern- Affiliated Colleges)

Time: 03 Hrs.   Max Marks = 75

Note:
    i)   All questions are Compulsory
    ii)   Assume your own data if necessary
    iii)   Draw well labeled diagram wherever necessary to illustrate your answers.

Q1. Attempt the Following questions.

    A.   15
                OR
    B.   7
    C.   8

Q2. Attempt the Following Questions.
    A.   15
                OR
    B.   7
    C.   8

Q3. Attempt the Following Questions.
    A.   15
                OR
    B.   7
    C.   8

Q4. Attempt any one of the following
    A.   15
                 OR
    B.   7
    C.   8

Q5. Write a Short note on following (any three)   15
    A.
    B.
    C.
    D.
    E.

NOTE: The Questions are based on the all units in the syllabus

Swami Ramanand Teerth Marathwada University, Nanded

(NAAC Re-accredited with 'A' Grade)
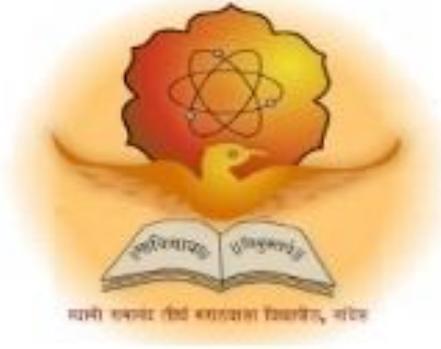
Syllabus of

M.Sc. (Computer Management) (2 years)

(Revised CBCS pattern)

Introduced from Academic Year 2019-2020

M.Sc. Computer Management

M.Sc. Computer Management (2years) program / degree is a specialized program in Computer Management and software development processes issues. It builds the student on higher studies and research awareness in overall designing and development of software so as to become competent in the current race and development of new computational sciences. The duration of the study is of four semesters, which is normally completed in two years.

CBCS pattern

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

Eligibility and Fees

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

Credit Pattern

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

Every semester has a combination of Theory (core or elective) courses and Lab courses. Each theory course has 04 credits which are split as 03 external credits and 01 internal credits. The university shall conduct the end semester examination for 03 external credits. For theory internal credit, student has to appear for 02 class test (10 marks each) and 01 assignment (05 marks). Every lab course has 02 credits which are split as 01 external credit and 01 internal credit. For lab internal credit, the student has to submit Laboratory Book (05 marks) and remaining 20 marks are for the Lab activities carried out by the student throughout the semester. For lab external credit, 20 marks are reserved for the examinational experiment and 05 marks are for the oral / viva examinations. There is a special skill based activity of 01 internal credits per semester which shall inculcate awareness regarding the domain of computers, IT, and ICT.

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

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

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

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

PEO, PO and CO Mappings

1. **Program Name** : M.Sc.(CM)

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

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

3. **Program Outcome(s):** Students / graduates will be able to

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

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

2. Mapping of PEO& PO and CO

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

The detailed syllabus is as below,

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
-First Semester						
1.	**Core Subjects**	CM-101	Computer Organization and Architecture	1	3	4
2		CM-102	Relational Database Management System	1	3	4
3		CM-103	Programming in Java	1	3	4
-Choose any one from below elective subjects						
4	**Elective Subject**	CM-104 A	Data Structure and Algorithms	1	3	4
		CM-104 B	Mathematical Foundations for Computer Science			
-Practical /Lab						
5	**Lab / Practical**	CM-105	Lab-1: Relational Database Management System	1	1	2
		CM-106	Lab-2: Programming in Java	1	1	2
6	**Open Elective**	CM-107A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		CM-107 B	Communication Skills-1			
7	**Skill based Activity**	CM-108	SK-01	1	0	1
	Total credits					**25**

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
Second Semester
1.	**Core**	CM-201	Operating Systems Concepts	1	3	4
2	**Subjects**	CM-202	Technical Help Desk	1	3	4
3		CM-203	Web Designing and Content Management	1	3	4
Choose any one from below elective subjects
4	**Elective Subject**	CM-204 A	Advanced Relational Database Management System	1	3	4
		CM-204 B	Computer Networks			
Practical /Lab
5	**Lab / Practical**	CM-205	Lab-3: CM-203	1	1	2
		CM-206	Lab-4: Based on Elective Subjects	1	1	2
6	**Open Elective**	CM-207A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		CM-207 B	Communication Skills-2			
7	**Skill based Activity**	CM-208	SK-02	1	0	1
	Total credits					**25**

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
Third Semester
1.	**Core**	CM-301	Advanced Java Programming	1	3	4
2	**Subjects**	CM-302	Software Engineering	1	3	4
3		CM-303	Information Security and Audit	1	3	4
Choose any one from below elective subjects
4	**Elective Subject**	CM-304 A	System Administration and Server Integration	1	3	4
		CM-304 B	Server and Desktop Technologies			
Practical /Lab
5	**Lab / Practical**	CM-305	Lab-5: Based on CM-301	1	1	2
		CM-306	Lab-6: Based on Elective Subjects	1	1	2
6	**Open Elective**	CM-307A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		CM-307 B	Technical Writings			
7	**Skill based Activity**	CM-308	SK-03: Seminar Presentation Activity	1	0	1
	Total credits					**25**

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
			Fourth Semester			
1.	**Core Subjects**	CM-401	Software Testing	1	3	4
2		CM-402	ASP.NET using VB.NET	1	3	4
3		CM-403	Major Project development Activity	0	4	4
			Choose any one from below elective subjects			
4	**Elective Subject**	CM-404 A	Software Project Management	1	3	4
		CM-404 B	Mobile Application Development			
			Practical /Lab			
5	**Lab / Practical**	CM-405	Lab-7: Based on CM-402	1	1	2
		CM-406	Lab-8: Based on Elective Subjects	1	1	2
6	**Open Elective**	CM-407A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		CM-407 B	Information Communication Technology			
7	**Skill based Activity**	CM-408	SK-04	1	0	1
			Total credits			**25**

<div align="center">

Course Code: CM-101
Course Title: **Computer Organization and Architecture**

</div>

Course Objectives:
To understand the structure, function and characteristics of computer systems. To understand the design of the various functional units and components of digital computers. To identify the elements of modern instructions sets and explain their impact on processor design. To explain the function of each element of a memory hierarchy, identify and compare different methods for computer I/O. To compare simple computer architectures and organizations based on established performance metrics.

Course Outcomes:
On completion of the course, student will be able to demonstrate computer architecture concepts related to design of modern processors, memories and I/Os. Analyze the principles of computer architecture using examples drawn from commercially available computers. Evaluate various design alternatives in processor organization.

Unit I Computer Evolution and Performance

Computer Organization and Architecture, Structure and Function, Evolution (a brief history) of computers, Designing for Performance, Evolution of Intel processor architecture- 4 bit to 64 bit, performance assessment. A top level view of Computer function and interconnection Computer Components, Computer Function, Interconnection structure, bus interconnection, Computer Arithmetic- The Arithmetic and Logic Unit, addition and subtraction of signed numbers, design of adder and fast adder, carry look ahead addition, multiplication of positive numbers, signed operand multiplication, booths algorithm, fast multiplication, integer division.

Unit II Computer Memory System
Characteristics of memory system, The memory hierarchy. Cache Memory- Cache memory principles, Elements of cache design- cache address, size, mapping functions, replacement algorithms, write policy, line size, number of cache, one level and two level cache, performance characteristics of two level cache- locality & operations.

Unit III Input and Output System
External devices, I/O modules- Module function and I/O module structure, Programmed I/O overview, I/O commands, I/O instructions, Interrupt driven I/O- interrupt processing, design issues. Case Study- Study of Programmable Interrupt Controller Intel 82C59A in brief.

Unit IV Instruction Sets
Characteristics and Functions- machine instruction characteristics, types of operands, Case Study-Intel 8086, Types of operations- data transfer, arithmetic, logical, conversion, input-output, system control, and transfer of control, Case Study-Intel 8086 operation types.

Unit V Processor Organization

Processor organization, Register organization- user visible registers, control and status registers, Case Study- register organization of microprocessor 8086. Instruction Cycle- The machine cycle and Data flow. Instruction Pipelining- Pipelining Strategy, pipeline performance, pipeline hazards, dealing with branches.

References:

1. John P Hays, ―Computer Architecture and Organization‖, McGraw-Hill Publication, 1998, ISBN:978-1-25-902856-4, 3rd Edition.

2. Miles Murdocca and Vincent Heuring, ―Computer Architecture and Organization- an integrated approach, Wiley India Pvt. Ltd, ISBN:978-81-265-1198-3, 2nd Edition

3. A. Tanenbaum, ―Structured Computer Organization‖, Prentice Hall of India, 1991 ISBN: 81 − 203 − 1553 − 7, 4th Edition

Course Title: **Relational database Management System**

Course Objective:-

To teach fundamental concepts of RDBMS (MySQL) To teach principles of databases To teach database management operations   To teach data security and its importance To teach client server architecture

Course Outcome:

Able to Create database Tables, Able to design database

Unit I: MySQL

Creating a Database and Tables, Inserting, Selecting, Ordering, Limiting, Grouping, Analyzing and Manipulating Data, Changing, Deleting, Searching, Importing Data, Command Line Interface, Database and Table Schema Statements, Data Manipulation Statements and Functions, Table Statements and Functions, Replication Statements and Functions, Stored Routine Statements, Aggregate Clauses, Aggregate Functions, String Functions, Date and Time Functions, Mathematical Functions Unit

Unit II: Transaction Concepts

Describe a transaction, properties of transaction, state of the transaction. Executing transactions concurrently associated problem in concurrent execution. Schedules, types of schedules, concept of serializability, precedence graph for Serializability. Ensuring Serializability by locks, different lock modes, 2PL and its variations. Basic timestamp method for concurrency, Thomas Write Rule. Locks with multiple granularity, dynamic database concurrency (Phantom Problem), Timestamps versus locking. Deadlock handling methods

Unit III: Database Security Concepts

Introduction to database security concepts , Methods for database security, Discretionary access control method, Mandatory access control and role base access control for multilevel security, Use of views in security enforcement, Overview of encryption technique for security, Statistical db security.

Unit IV: Crash Recovery

Failure classification, Recovery concepts, Log base recovery techniques (Deferred and Immediate update) Checkpoints, Recovery with concurrent transactions (Rollback, checkpoints, commit), Database backup and recovery from catastrophic failure, Client-Server Technology

Unit V: Describe client-server computing

Evolution of Client - Server information systems. Client – Server Architecture benefits, Client Server Architecture - Components, Principles, Client Components - Communication middleware components - Database middleware components - Client Server Databases

References:-

1. Fundamentals of Database Systems (4th Ed) By: Elmasri and Navathe

2. Database System Concepts (4th Ed) By: Korth, Sudarshan, Silberschatz

3. MySQL The Complete Reference By Vikram Vaswani

4. Learning MySQL by O'reilly 5. MySQL in Nut Shell by Dyer 2nd Edition

Objective:
1. Core java introduces object oriented concepts like abstraction, inheritance, polymorphism
2. Better utilization Classes and objects, Function prototyping, Array of objects, Constructors, Operator overloading, Inheritance, Templates, Streams
3. Also covers RMI, database connectivity and web based application development

Outcome:
1. Students will be able to use concepts of Object Oriented Programming using java
2. Students will be able to establish the connectivity between database and Java program

Unit I: Introduction to Core Java

Class and Object, Object Oriented concepts with respect to Java, Interfaces, Packages and Exception Handling, Applets

Unit II: Abstract Window Toolkit and Swing

Components and Graphics, Containers, Frames and Panels, Layout Managers   Border layout, Flow layout Grid layout, Card layout, AWT all components, Swing & Its Features ,JApplet ,Icons & Labels Button & Label, Text Field & Toggle Buttons, checkboxes , Radio buttons ,Combo Box & Lists ,Scroll panes ,Trees ,Tables ,Menu Bars & Menus ,Tool Bars ,Dialog Boxes, File Dialog , Progress Bar, Choosers

Unit III: Multithreading and I/O

Multithreading concepts, Thread Life cycle, Creating multithreaded application, Thread priorities, Thread synchronization. Java Input Output: Java IO package, Byte/Character Stream, Buffered reader / writer, File reader / writer, Print writer, File Sequential / Random

Unit IV: JDBC

Java Database Connectivity (JDBC)**:** Introduction to JDBC, Types of JDBC Connectivity, Types of statement objects (Statement, PreparedStatement and CallableStatement), Types of resultset, ResultSetMetadata, Inserting and updating records, JDBC and AWT Connection pooling.

Unit V: RMI and Servlet

Introduction & Architecture of RMI, Java rmi classes and interfaces, Writing simple RMI application, Parameter passing in remote methods (marshalling and unmarshalling).
Servlet Overview & Architecture, Setting up Apache Tomcat Server, Handling HTTP Get Request, Handling HTTP Get Request Containing Data Handling HTTP Post Request

Reference Books:

1. Herbert Schildt, Java "The Complete Reference", Tata McGraw-Hill
2. John Zukouski , "Mastering Java2 J2SE1.4", PBP Publication
3. H.M Deitel, P.J. Deitel , "Java^{TM} How to Program", sixth Edition
4. E. Balagurusamy, "Programming With JAVA A Primer" 3nd Edition , TH.

Course Code: CM-104 A (Elective)
Course Title: Data Structure and Algorithms

Course Objective:

Master the implementation of linked data structures such as linked lists and binary trees. Be familiar with advanced data structures such as balanced search trees, hash tables, priority queues and the disjoint set union/find data structure.

Course Outcome:

Data structures include: arrays, linked lists, binary trees, heaps, and hash tables. Students develop knowledge of applications of data structures including the ability to implement algorithms for the creation, insertion, deletion, searching, and sorting of each data structure.

Unit I: Data Structure Concepts

Definition of Data Structure, precondition, Examples of data structures. Kinds of data structures, logical Implementation and Application levels of data structures. Node and Representative node of data structure, Empty data structure. Mathematical Structure, hardware Structure and Storage structure. Abstract Data Type (ADT)

Unit II: Algorithm Concepts

Algorithm, Concept of a well posed problem, Definition of Algorithm. Recursive and iterative algorithms, Objectives of algorithms. Quality of an algorithm, Space complexity and Time complexity of algorithm, Frequency Analysis and Problem complexity.

Unit III: Arrays

Characteristics of an array. Definition of an Array, Positional value of a member, Base address of array, indexing of an array, Index variable, Index type. Implementation of 1-D arrays, Row and Column Major Implementations of 2-D, 3-D and n-D arrays. Simple examples illustrating address computations. Feature restricting the number of array implementations to two.

Unit-IV: Stacks

Stack as a data structure, Relationship component (LIFO) in stacks. Representative node for stack, uses of stack. Static and Dynamic stack. PUSH and POP operations for stack. ANSI 'C' implementations of PUSH and POP operations for stacks implemented as array and linked list. Algorithm for comparing static and dynamic stacks. Polish and reverse Polish notations. ANSI 'C' implantations of PUSH and POP operations for stacks implemented as array and linked list. Algorithm for comparing static and dynamic stacks.

Unit V: Queues

Queue as data structure, Relationship component (FIFO) Queue. Representative nodes Classification of queue as Linear Queue, (b) Circular Queue (c) Priority Queue. ANSI 'C' Implementations of algorithms for (a) Adding a node in queue, (b) Deleting a Node form queue Finding size of queue and (d) printing a queue, for linear And circular queues expressed as array and list.

Reference Books:

1. Data Structures Using "C" by Tanenbaum.

2. Data Structures and Program Design in "C" by Robert L. Kruse.

3. Fundamentals of Data Structures by Horowitz and Sahani.

4. Data Structures : An Advanced Appraoch Using 'C' by Esakov and Weises.

5. Data Structures and 'C' Programming by Cristopher J. Vanwyk.

<center>**Course Code: CM-104 B (Elective)**

Course Title: Mathematical Foundations for Computer Science</center>

Course Objectives:
To introduce the concepts of mathematical logic. To introduce the concepts of sets, relations, and functions. To perform the operations associated with sets, functions, and relations. To relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context. To introduce generating functions and recurrence relations. To use Graph Theory for solving problems.

Course Outcomes:
Ability to apply mathematical logic to solve problems. Understand sets, relations, functions, and discrete structures. Able to use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, and functions. Able to formulate problems and solve recurrence relations. Able to model and solve real-world problems using graphs and trees.

Unit I: Mathematical logic:
Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

Unit II: Set theory:
Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions. Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Groups, Lattices as Partially Ordered Sets, Boolean algebra.

Unit III: Elementary Combinatorics:
Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems, The Principle of Inclusion Exclusion.

Unit IV: Recurrence Relations:
Generating Functions of Sequences, Calculating Coefficients of generating functions, Recurrence relations, Solving recurrence relations by substitution and Generating functions, The method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations.

Unit V: Graphs:
Basic Concepts, Isomorphisms and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

Reference Books

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay, R. Manohar, McGraw Hill education (India) Private Limited. (UNITS – I ,II)
2. Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th Edition, McGraw Hill education (India) Private Limited.

3. Discrete Mathematics, D.S. Malik & M.K. Sen, Revised edition Cengage Learning.

4. Elements of Discrete Mathematics, C. L. Liu and D.P.Mohapatra,4th edition, McGraw Hill education(India) Private Limited.

5. Discrete Mathematics with Applications, Thomas Koshy, Elsevier.

6. Discrete and Combinatorial Mathematics, R. P. Grimaldi, Pearson.

Course Code: CM-105

Lab-1: Relational Database Management System

Practical's Based on RDBMS

Course Code: CM-106

Lab-2: Programming in Java

Practical's Based on Java Programming

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

OR

<div align="center">

Course Code: CM-107 B
Course Title: Communication Skills- I

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Objectives of the Course:
1. To make a comprehensive use of English in day-to-day life.
2. To help Students develop the ability to learn and contribute critically.

Course outcome:
   By the end of this course students should be able to:
1. Understand and demonstrate Basic English usages for their different purposes.
2. Clear entrance examination and aptitude tests.

Unit One: Basic English Grammar,
1. Word classes: Open Word Classes & Close Word Classes
2. Word Formation Process; Word analysis
3. Phrases: NP, VP, AdjP, AdvP, PrepP
4. Clauses: Clause Elements, Basic Structure
5. Sentences: Complex & Compound

Unit Two: Grammar- it's Usage
1. Tenses: Present, Past, Future
2. Voice: Active & Passive
3. Speech: Direct & Indirect
4. Common Errors in English
5. Transformation of Sentences

Unit Two: Communication Skill & Soft Skills
1. Communication Skills: Definition & Concept
2. Process /cycle of Communication,
3. Types/Methods of Communication,
4. Barriers of Communication
5. Soft Skills: Concept, Negotiation skills, Empathy, Manners & Etiquettes.

Unit Three: Language Skills
1. Language: Definition & its Characteristics.
2. Listening Skill: Process and types.
3. Speaking Skill: Process, style.
4. Reading skill : Process , Reading comprehension passage.
5. Writing Skill : Process & importance

Unit Four: Presentation skills
1. Seminars
2. Conference
3. Anchoring & Vote of Thanks
4. Narrating Incidents

References:-

1. Practical English Grammar by – A.J. Thomson
2. Mac Millan Foundation English by - R. K. Dwivedi, A. Kumar.
3. Soft Skills by - K Alex.

Group Discussion for Admissions & Jobs by – Anand Ganguly

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

Course Code: CM 201
Course Title: Operating Systems Concepts

Course Objectives:
To learn and understand the Concepts of operating system. To Learn and understand operating system services. The core structure, functions and design principles of operating system

Course Outcome:
Students will be having understanding of following concepts of Operating System Process Management, Memory Management File & I/O Management.

Unit I: Introduction
Architecture, Goals & Structures of O.S, Basic functions, Interaction of O. S.& hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real-time O.S.

Unit II: Process Management Process

Concept, Process states, Process control, Threads, Uni-processor Scheduling: Types of scheduling: Preemptive, Non preemptive, Scheduling algorithms: FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls like ps, fork, join, exec family, wait.

Unit III: Concurrency control

Concurrency: Principles of Concurrency, Mutual Exclusion: S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors, Classical Problems of Synchronization: Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal, kill

Unit IV: Memory Management

Memory Management requirements, Memory partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping, and Paging. Segmentation, Demand paging Virtual Memory: Concepts, management of VM, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing

Unit V: I/O management &Disk scheduling:

I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN,C-SCAN, SSTF), RAID, Disk Cache.

Reference Books:

1. Operating SystemConcepts, 9th editionPeter B. Galvin,Greg Gagne, Abraham Silberschatz, John Wiley & Sons, Inc.
2. Modern Operating Systems-By Andrew S. Tanenbaum (PHI)
3. Operating Systems 5th Edition,William Stallings, Pearson Education India

Course Code: CM 202
Course Title: Technical Help Desk

Course Objectives:

Students are prepared for entry-level employment in a variety of positions including Computer Repair/Support Technicians, Desktop Support Technicians, Help Desk Technicians, and Networking Support. Demonstrate expertise in the resolution of end user incident requests involving troubleshooting and configuration of hardware, software and network settings. Graduates can communicate effectively, either independently or in a team, to solve problems using computers and computer repair principles.

Course Outcome: Upon Competition of this course, the student can, Define the role of help desk and customer service in an organization I. Introduction to Help Desk Service Tools, technology, and Techniques. Evaluate help desk technology, tools and techniques.

Unit I: Introduction to Computer User Support

Identify how changes in computer technology over time have affected computer use. Classify end users. Identify resources computer users need and major categories of end-user software. Identify common problems encountered by users. Identify job market demand for user support workers. List common ways to organize and provide support services. Identify typical position descriptions for user support staff. Identify knowledge, skills, and abilities required for an entry-level support position. Identify career paths for user support workers.

Unit II: Customer Service Skills for User Support Agents

Name important communication and interpersonal skills and customer service relationships for support agents. Specify reasons support agents must listen and read carefully. Demonstrate how agents build and communicate understanding. Identify important aspects of effective speaking and nonverbal communication. List how support agents develop a personal communication style. Identify strategies support agents use for telephone communications. Identify how support agents develop an incident management strategy. Identify how developing an understanding of different personality types and work styles can help an agent. Formulate strategies support agents use to handle difficult clients.

Unit III: Skills for Troubleshooting Computer Problems

Identify the troubleshooting process and the thinking skills required for successful troubleshooting. Identify communication skills for troubleshooting. Identify information resources to help solve computer problems. Identify diagnostic and repair tools used to

troubleshoot computer problems. Formulate strategies for troubleshooting. Identify how to develop your own approach to problem solving.

Unit IV: Help Desk Operation

Identify Help desk operational procedures. Analyze a multilevel support model. Describe the incident management process. Describe best practices in help desk operation. Describe the physical layout of help desk work areas. List types of job stress in help desk work. Identify hardware and software tools used by support agents, managers, and end users. Describe help desk industry trends.

Unit V: Product Evaluation Strategies and Support Standards

Describe how product and support standards emerged. Identify common tools and methods for evaluating and selecting computer products. Identify information resources and decision-making tools for evaluating and selecting computer products. Describe typical product support standards. How organizations develop and implement support standards.

Reference Books:

1. Computer User Support for Help Desk and Support Specialists, 6th Edition. ISBN-10: 1-285-85268-0ISBN-13: 978-1-285-85268-3 Author: Fred Beisse Publisher:Cengage Learning Copyright: 2015, 2013, 2010

Course Code: CM-203

Course Title: Web Designing and Content Management

Course Objective:

Web Design course, students will use a variety of design software to organize, create, publish, and manage a web site. Course content includes creating a variety of graphic elements including video, animations, rollover effects, backgrounds, and page images.

Course Outcome:

The course activities will encourage you to practice and be used to assess your success in achieving these outcomes. Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites. Recognize the various tools to plan, design, code, and share projects/documents. Understanding key terms about semantic web, knowledge management and content management technologies

Unit I: Web Design Principles

Basic principles involved in developing a web site. Planning process. Five Golden rules of web designing. Designing navigation bar, Page design, Home Page Layout, Design Concept.

Unit II: Basics in Web Design

Brief History of Internet, What is World Wide Web, Why create a web site, Web Standards, Audience requirement.

Unit III: Introduction to HTML

What is HTML, HTML Documents, Basic structure of an HTML document, creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags. Introduction to elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia

Unit IV: Introduction to Web Publishing or Hosting

Creating the Web Site, Saving the site, Working on the web site, Creating web site structure, Creating Titles for web pages , Themes-Publishing web sites.

Unit V: Content Management Systems

Introduction to CMS, advantages using CMS, CMS development tools: Word press, Drupal, Joomla. Wordpress: content and conversion, directory, file structure, local working, component administration, core, loop, data management, Wordpress as CMS, Wordpress in enterprise.

Website Deployment: Domain registration, Domain hosting, parking websites, uploading data using FTP, email configuration. AJAX

Reference book:

1. Joomla! 3: Beginner's Guide (2013). Eric Tiggeler. Packt Publishing, ISBN-13: 978-1-78216-434-0
2. (SPHT) SharePoint 2013 How To (2013). Ishai Sagi. Sams, ISBN-13: 978-0-672-33447-3.
3. (SPIO) Microsoft SharePoint 2013 Inside Out (2013). Shadravan D., Coventry P., Resing T., Wheeler C. Microsoft Press, ISBN-13: 978-0-7356-6699-3.
4. Ivan Bayross, "Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP", 4th Edition, BPB Publications.
5. Jason Hunter, "Java Servlet Programming", 2nd Edition, O'reilly Publications

<p style="text-align:center">Course Code: CM-204 A (Elective)</p>

<p style="text-align:center">Course Title: Advanced Relational Database Management System</p>

Course Objective:

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Course Outcome:

Describe the fundamental elements of relational database management systems Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL. Design ER-models to represent simple database application scenarios

Unit-1: Comparison between different databases:
Significance of Databases, Database System Applications, Advantages and Disadvantages of different Database Management systems, Comparison between DBMS, RDBMS, Distributed and Centralized DB.

Unit-2: RDBMS and SQL:
Relational Query Languages, The SQL Query Language, Querying Multiple Relations, Creating Relations in SQL, Destroying and Altering Relations, Adding and Deleting Tuples, Integrity Constraints (ICs), Primary and Candidate Keys in SQL, Foreign Keys, Referential Integrity in SQL, Enforcing Referential Integrity, Categories of SQL Commands, Data Definition, Data Manipulation Statements: SELECT - The Basic Form Subqueries, Functions, GROUP BY Feature, Updating the Database, Data Definition Facilities, Views, Embedded SQL *, Declaring Variables and Exceptions, Embedding SQL Statements, Transaction Processing, Consistency and Isolation, Atomicity and Durability, Dynamic SQL.

Unit-3: Normalization:
Functional Dependency, Anomalies in a Database, The normalization process: Conversion to first normal form, Conversion to second normal form, Conversion to third normal form, The boyce-code normal form(BCNF), Fourth Normal form and fifth normal form, normalization and database design, Denormalization

Unit-4: Query Optimization:
Algorithm for Executing Query Operations: External sorting, Select operation, Join operation, PROJECT and set operation, Aggregate operations, Outer join, Heuristics in Query Optimization, Semantic Query Optimization, Converting Query Tree to Query Evaluation Plan, multiquery optimization and application, Efficient and extensible algorithms for multi-query optimization, execution strategies for SQL sub queries, Query Processing for SQL Updates

Unit-5: Query Execution:

Introduction to Physical-Query-Plan Operators, One-Pass Algorithms for Database, Operations, Nested-Loop Joins, Two-Pass Algorithms Based on Sorting, Two-Pass, Algorithms Based on Hashing, Index-Based Algorithms, Buffer Management, Parallel Algorithms for Relational Operations, Using Heuristics in Query Optimization, Basic Algorithms for Executing Query Operations.

Reference Books:

1. Database Systems Concepts, design and ApplicationsSingh, S. K. PearsonEducation, New Delhi, 2012.
2. Sql/ Pl/SQL Bayross, Ivan BPB.
3. An Introduction to Database SystemsDate, C. J. PearsonEducation, New Delhi,2012

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Course Code: CM-204 B (Elective)

Course Title: Computer Networks

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Course Objective

To educate concepts, vocabulary and techniques currently used in the area of computer networks. To master the terminology and concepts of the OSI model and the TCP/IP model. To be familiar with wireless networking concepts. To be familiar with contemporary issues in networking technologies.

Course Outcome

To understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks. To apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission. To design a network routing for IP networks. To explain how a collision occurs and how to solve it. To demonstrate proper placement of different layers of ISO model and illuminate its function. To learn Internet structure and can see how standard problems are solved in that context. To determine proper usage of the IP address.

Unit I: Introduction To Computer Networks:

Introduction: Definition of a Computer Network; What is a Network?, Components of a computer network: Use of Computer networks; Networks for companies, Networks for people, Social Issues: Classification of networks; Based on transmission technology, Based on the their scale, Local area networks, Metropolitan area networks, Wide area networks, Wireless networks:

Unit II: Network Software & Network Standardization:

Introduction: Networks Software; Protocol hierarchy, Design issues for the layers, Merits and De-merits of Layered Architecture, Service Primitives: Reference models; The OSI Reference Model, The TCP/IP Reference Model, Comparison of the OSI & the TCP/IP Reference Models: Network standardization; Who's who in the telecommunication world?, Who's who in the standards world, Who's who in the Internet standards world?:

Unit III: Data Communications:

Introduction: Theoretical basis for communication; Fourier analysis, Band limited signals, Maximum data rate of a channel: Transmission impairments; Attenuation distortion, Delay distortion, Dispersion, Noise: Data transmission modes; Serial & Parallel, Simplex, Half duplex & full duplex, Synchronous & Asynchronous transmission:

Unit IV: Physical Layer:

Introduction: Network topologies; Linear Bus Topology, Ring Topology, Star Topology, Hierarchical or Tree Topology, Topology Comparison, Considerations when choosing a Topology: Switching; Circuit switching, Message switching, Packet switching, Implementation of packet switching, Relationship between Packet Size and Transmission time, Comparison of switching techniques: Multiplexing; FDM – Frequency division multiplexing, WDM – Wavelength division multiplexing, TDM – Time division multiplexing:

Unit V: Transmission Medium:

Introduction: Transmission medium; Guided & Unguided Transmission medium, Twisted pair, Coaxial cable, Optical fiber, Comparison of fiber optics and copper wire: Wireless transmission; Electromagnetic spectrum, Radio transmission, Microwave transmission:

Reference Book:

1. Computer Networking- A Top-Down approach, 5th edition, Kurose and Ross, Pearson
2. Computer Networks- A Top-Down approach, Behrouz Forouzan, McGraw Hill
3. Computer Networks (4th edition), Andrew Tanenbaum, Prentice Hall
4. Computer Networking and the Internet (5th edition),Fred Halsall, Addison Wesley
5. Data Communications and Networking (4th edition), Behrouz Forouzan, McGraw Hill 6. TCP/IP Protocol Suite (3rd edition), Behrouz Forouzan, McGraw Hill

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Course Code: CM-205

Course Title: Lab-3: Web Design and Content Management

Practical's based on Web Design and content Management

Course Code: CM-206

Course Title: Lab-4: Based on Elective Subjects

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

OR

Course Code: CM-207 B
Course Title: Communication Skills-2

Objectives of the Course:
1. A comprehensive use of English in day-to-day life.
2. To help Students develop the ability to learn and contribute critically.

Course outcome:
By the end of this course students should be able to:
1. Understand and demonstrate Basic English usages for their different purposes.
2. Clear entrance examination and aptitude tests. life.

Unit one: Phonetics: Study of Speech Sounds
1. Phonemes: Consonants (24) Vowels (20),
2. Stress; Three Term Label,
3. Intonation,
4. Word Transcription,
5. Sentence Transcription.

Unit two: Soft Skills
1. Soft Skills: Leadership Skills,
2. Soft Skills: Time management,
3. Soft Skills: Stress management,
4. Conflict Management,
5. Meditation.

Unit Three : Career Skills
1. Group Discussion,
2. Personal Employment Interview,
3. Telephonic Etiquettes & Interview,
4. Report Writing: Formal & Informal Report Writing,
5. Meetings.

Unit Four: Creative Writing & Situational English
1. Creative writing: Narrating a situation,
2. Situational English: Greetings, Introducing, Inviting, Thanking, Enquiring, Complimenting, Complaining etc.
3. Note Making & Note Taking ,
4. Dialogue writing,
5. Formal Letters Writing: Job Application, Curriculum Vitae, Supply Orders, Complaint letters.

Reference Books:

1. Mac Millan Foundation English by - R. K. Dwivedi, A. Kumar.
2. Developing communication Skills by - Krishna Mohan, Meera Banerji
3. Soft Skills by - K Alex.
4. Spoken English- Level one by - G Radhakrishana Pillai, K Rajeevan
5. Personality Development & Communicative English by - Dr. T. Bharti

Course Code: CM-208

Course Title: SK-02

Code: CM- 208	Second semester	**Skill based Activity** **SK-02: Network Essentials**	Credits: 01
Scope : Networking Essentials deals with knowing what is a network, how to install, configure, and troubleshoot a computer network It includes knowledge of the fundamental building blocks that form a modern network, such as various cables, switches, routers, connectors, LAN-NIC cards and network operating systems. It then provides in-depth coverage of the most important concepts in contemporary networking like connecting computers/ peripherals, servers and clients, Wi-Fi connectivity, etc. Students are expected to have the skills to build a network / LAN from scratch and maintain, upgrade, and troubleshoot an existing network. Technology like 4G, 5G etc			

The question paper pattern is as below

Common Question paper pattern for M.Sc. programs (Not for Campus)

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology
Question Paper Pattern w.e.f Academic Year 2019-2020
M.Sc. (Computer Science /Computer Management/Information Technology/
Software Engineering/System Administration & Networking)
First Semester & Second Semester
(CBCS Pattern- Affiliated Colleges)

Time: 03 Hrs.   Max Marks = 75

Note:
- i)   All questions are Compulsory
- ii)   Assume your own data if necessary
- iii)   Draw well labeled diagram wherever necessary to illustrate your answers.

Q1. Attempt the Following questions.

    A.   15
               OR
    B.   7
    C.   8

Q2. Attempt the Following Questions.
    A.   15
               OR
    B.   7
    C.   8

Q3. Attempt the Following Questions.
    A.   15
               OR
    B.   7
    C.   8

Q4. Attempt any one of the following
    A.   15
            OR
    B.   7
    C.   8

Q5. Write a Short note on following (any three)   15
    A.
    B.
    C.
    D.
    E.

NOTE: The Questions are based on the all units in the syllabus