स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ
नांदेड– ४३१६०६ (महाराष्ट्र)
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY
NANDED-431606, MAHARASHTRA STATE, INDIA.
Established on 17th September 1994 - Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

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

प रि प त्र क

(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

Contd…

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. (Information Technology) (2 years)

(Revised CBCS pattern)

Introduced from Academic Year 2019-2020

M.Sc. Information Technology

M.Sc. Information Technology (2years) program / degree is a specialized program in Information Technology 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. Information Technology 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. Information Technology** 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 credit. 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. Information Technology** 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. Information Technology** 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.(IT)

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 Information Technology 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**	IT-101	Basics of IT and Networking	1	3	4
2		IT-102	Database Management System	1	3	4
3		IT-103	Foundation of Programming using C++	1	3	4
Choose any one from below elective subjects						
4	**Elective Subject**	IT-104 A	Operating System Concepts	1	3	4
		IT-104 B	Data Structures and Algorithms			
Practical /Lab						
5	**Lab / Practical**	IT-105	Lab-1: DBMS	1	1	2
		IT-106	Lab-2 : C++ Programming	1	1	2
6	**Open Elective**	IT-107A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		IT-107 B	Communication Skills-1			
7	**Skill based Activity**	IT-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 Subjects**	IT-201	Web Design and Development	1	3	4
2		IT-202	Relational DBMS	1	3	4
3		IT-203	Software Engineering	1	3	4
Choose any one from below elective subjects						
4	**Elective Subject**	IT-204 A	VB.NET	1	3	4
		IT-204 B	C#.NET			
		IT-204 C	ASP.NET			
Practical /Lab						
5	**Lab / Practical**	IT-205	Lab-3: Based on IT-201	1	1	2
		IT-206	Lab-4: Based on Elective Subjects	1	1	2
6	**Open Elective**	IT-207A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		IT-207 B	Communication Skills-2			
7	**Skill based Activity**	IT-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 Subjects**	IT-301	Information Security Management	1	3	4
2		IT-302	Programming in Java	1	3	4
3		IT-303	Software Testing	1	3	4
Choose any one from below elective subjects						
4	**Elective Subject**	IT-304 A	Computer Graphics	1	3	4
		IT-304 B	Digital Image Processing			
Practical /Lab						
5	**Lab / Practical**	IT-305	Lab-5: Java Programming	1	1	2
		IT-306	Lab-6: Based on Elective subjects	1	1	2
6	**Open Elective**	IT-307A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		IT-307 B	Logical Reasoning			
7	**Skill based Activity**	IT-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**	IT-401	Mobile Communications	1	3	4
2		IT-402	Introduction to Scripting Languages	1	3	4
3		IT-403	Major Project development Activity	0	4	4
Choose any one from below elective subjects						
4	**Elective Subject**	IT-404 A	Linux Administration	1	3	4
		IT-404 B	Mobile Application development			
Practical /Lab						
5	**Lab / Practical**	IT-405	Lab-7: Scripting Languages	1	1	2
		IT-406	Lab-8: Based on Elective subjects	1	1	2
6	**Open Elective**	IT-407A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		IT-407 B	Numerical Aptitude			
7	**Skill based Activity**	IT-408	SK-04	1	0	1
	Total credits					**25**

Course Code: IT-101
Course Title: Basics of IT & Networking

Course Objectives:

The **goal** is to provide all the program, date and hardware is available to everyone on the **network** without regard to the physical location of the resource and the users.

Course Outcomes:

Upon completion of this module, students will be able to:

1. Have a good understanding of the OSI Reference Model and in particular have a good knowledge of Layers 1-3.

2. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies;

UNIT-I:- Basic Computer Organization.

History, Characteristics, & Generations of Computer. Basic Computer Organization, Classification of Computer.

UNIT-II:- Computer Peripherals & Memory Organization

Input Devices :- Keyboard, Mouse, trackball, Joystick, electronic pen, Touch Screen, Image Scanner, OCR, OMR, MICR, Bar code reader Digitizer, speech recognition devices.
Output Devices :- Monitors, Dot-matrix printer, Ink-jet printer Laser Printer, Plotter.
Modem and Projector , Bio-metric devices.
Computer Memory

a) Main Memory :- RAM, ROM, Types of ROM, Base Memory, Cache Memory.
b) Sequential & Direct Access Memory , Optical Storage & Flash Memory

UNIT-III:- Data Representation

BIT, BYTE, WORD ,ASCII, EBCDIC, BCD Code ,Introduction to Number system: Binary, Octal, Decimal and Hexadecimal ,Conversation from one number system to another number system.

UNIT-IV:- Operating System , Application and Software Packages

Introduction to Operating System , Functions of Operating System , Types of Operating System
Introduction to Applications and Software Packages

UNIT-V:- Data Communication and Internet

Introduction to Computer Network , Basic types of Networks, Topologies, Internet, Intranet, Data transmission modes , OSI Model , TCP/IP Model, Role of communication protocol , Wireless network technologies , E-mail, FTP, Web Browser and types of web browser

References Books:

1. Fundamental of Computer (5th& 6th Edition) - By P.K.Sinha - BPB Publication
2. Fundamental of Computers, E.Balagurusamy, Mc.Graw Hill Education
3. Fundamental of Computer - V. Rajaraman - PHI Publication
4. Computer Networks , Andrew S. Tanenbaum, Fourth Edition, Prentice Hall

Course Code: IT-102
Course Title: Database Management System

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:

Identify what students will know and be able to do if they master the material. At the end of this class, the successful student will: have a broad understanding of **database** concepts and **database management system** software. have a high-level understanding of major **DBMS** components and their function.

Unit-I Introduction to DBMS & File Organization

Introduction Physical / logical files, Special characters in files, fields & record organization (fixed variable length) types of file organization, File system Vs DBMS, Data Models, Levels of abstraction , data independence, Queries in DBMS (SQL : DDL, DML, DCL,TCL), Structure of DBMS, People who deal in DBMS, Advantages of DBMS

Unit-II Conceptual Design (E-R model)

Overview of DB design, ER data model (entities, attributes, entity sets, relations, relationship sets), Additional constraints (key constraints, participation constraints, weak entities, aggregation/generalization, conceptual design using ER (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER), Conceptual design for small to large enterprises,Casestudies.

Unit-III Relational data model & Relational algebra

Relations (concepts, definition), Conversion of ER to Relational model, integrity constraints (key, referential integrity, general constraints), Preliminaries, Relational algebra (selection, projection, set operations, renaming, joins, division)

Unit-IV SQL

DDL (create, drop, alter), forms of a basic SQL query (egs, expressions, strings in SQL), union / intersection/except, nested queries (introduction, correlated queries, set comparison operators), Aggregate operators (group by, having), aggrerate functions, Null values (comparison using NULL, logical connections (AND,OR,NOT) impact on SQL commands, outer joins, disallowing NULL), examples on SQL (case studies)

Unit-V Functional dependency

Introduction to schema refinement (problems caused by redundancy, use of ecomposition , problems related to decomposition, functional dependencies, egs motivating schema refinement (constraints on an entity set, constraints on relation set, identifying attributes of entities, identifying entity sets), reasoning about functional dependency (F+ , attribute closure), Normalization forms (1NF, 2NF, 3NF, BCNF), decomposition (lossless join, dependency preserving property), normalization (decomposition into BCNF, decomposition into 3NF), other kinds of decomposition (multivalued dependency)

References Books:

1. Database systems , By KORTH
2. Database systems By Nawathe
3. Postgresql , O'Reilly publications
4. Database systems , by Raghuramakrishnan

Course Code: IT-103
Course Title: Foundation of Programming using C++

Course Objective:
The focus of all **learning** activities **in** the **course** is to build students' conceptual and practical skills **in** building software projects **in** the **C++ programming** language to reasonably advanced level. This will involve analysis, design and implementation of solutions to **programming** problems.

Course Outcome:
To practically students able to do programs in object oriented using C++.

UNIT I : Introduction and basic concepts of C++
Procedure Oriented Programming, Object Oriented Programming Paradigm, Basic concepts of OOP's, Benefits and Applications, Structure of C++ program.

UNIT II : Tokens, Operators and Functions in C++
Keywords, Identifiers, Data-types, Operators in C++, Operator precedence and associatively, Control structures, branching and looping statements, Function, function prototype, default arguments, Reference variable, call by reference, return by reference, Inline function, function overloading .

UNIT III : Class and object
Specifying a class and object, Nesting of member function, Memory allocation for objects, Static data member, static function, Friend function.
Constructor and destructor: Introduction to Constructor, Types of constructor, Destructor

UNIT IV : Inheritance and polymorphism
Types of inheritance, Virtual base class, Operator overloading (Unary and binary), Virtual function and there rules, Pure virtual function, Abstract class, Pointer to object, This pointer.

UNIT V : Input / Output Operation
Console I/O operation, formatted I/O, unformatted I/O, C++ classes for console I/O, C++ stream classes for file I/O, Opening and closing file, sequential and random access, Error handling during a file operation, command line arguments, Introduction to Templates.

Reference Books:
1) Object-Oriented Programming with C++ -E-Balgurusamy
2) Programming with C++, D Ravichandran, TMH
3) Let us C++ -Yashwant kanetkar

Course Code: IT-104 A
Course Title: Operating System Concepts

Course Objective:
To learn the fundamentals of **Operating Systems** - To gain knowledge on Distributed **operating system concepts** that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols - To gain insight on to the distributed resource management components viz.

Course Outcome:
A student understands of design issues associated with operating systems. Masters various process management concepts including scheduling, synchronization, deadlock. Be familiar with multithreading

UNIT-I : Introduction
What Operating Systems Do, Computer System Organization, Computer System architecture, Operating System Structure & Operations, Process, memory & storage management, Protection & Security

UNIT- II : System structures
Operating system services, User Operating system interface, system call, Types of System Calls, System Programs, Operating System Design & Implementation.

UNIT- III: Process Concept
Process concept, Process Scheduling, Operations on a Process , Inter process Communication, Overview of multithreading programming, multithreading models, Process Scheduling Criteria & Algorithms, Introduction deadlocks, Methods for handling deadlocks, Dead Prevention & Avoidance.

UNIT IV : **Memory Management**
Single Contiguous, Partition Allocation, Relocatable Partitioned, Page Memory Management, Introduction to Demand Paged & segmented Memory Management

UNIT IV : Storage Management & Protection.
File concept, Access Methods, File system Structure, Overview of File system Implementation , Overview of Mass storage structure, Disk structure, Disk Management, Goals, Principles & Domain of protection. Access Problem

Reference Books:

1.Operating Systems Concepts, Abrahm Silberschatz, Peter Galvin, Greg Gagne,8th edition,Wiley India Edition.
2.Operating Systems D.M. Dhamdhere Tata McGraw Hill 2nd edition.
3. Operating System By Stuart .E. Madnick & John. J. Donovon
4.Understanding Operating System: Flynn & Mctloes 4th edition,thomson.

Course Code: IT-104 B (Elective)
Course Title : Data Structures and Algorithm

Students have to select any one from IT-104 A, IT-104 B

Course Objective:

To assess how the choice of **data structures and algorithm** design methods impacts the performance of programs. ... To solve problems using **data structures** such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.

Course Outcome:

Students develop knowledge of applications of **data structures** including the ability to implement **algorithms** for the creation, insertion, deletion, searching.

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.

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 Introduction to Arrays, Characteristics of an array. Define and declaring 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.

Unit V: Queues Introduction to Queue. Relationship component (FIFO) Queue. Representative nodes Classification of queue as Linear Queue, Circular Queue, Priority Queue, ANSI ‘C’ Implementations of algorithms for Adding a node in queue, Deleting a Node form queue Finding size of queue and 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.

Course Code: IT-105
Course Title: Lab-1: DBMS

- Study of DBMS – Study of Various SQL Queries covered in paper No-IT-102.

Course Code: IT-106
Course Title: Lab-2: C++ Programming

- Programming in C++ : At least 15 Logical programs covering all concepts of OOP

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

OR

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

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.
4. Group Discussion for Admissions & Jobs by – Anand Ganguly

Code: IT-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: IT-201
Course Title: Web Design and Development

Course Objective:

Develop skills in analyzing the usability of a web site. Understand how to plan and conduct user research related to web usability. Learn the language of the web: HTML and CSS. Learn techniques of responsive web design, including media queries.

Course Outcome:

This course will introduce you to the realm of web design website development, reflective report, collaborative website development, website

Unit-I: Basics of Web Design
Internet, The Important of the Internet, World Wide Web, URLs, Web Browsers, Web Server, Internet Services, The web flow, objectives of the website, basic interface design, developing a store board for the website, navigation and links within the site, checklist for designing.

Unit–II : Basic of HTML
HTML, Basic elements, Lists, Linking HTML pages, Linking to URLs, Text formatting, Text Alignment, Character Styles, Fonts and Font Sizes, Using Colors for the Web, Preformatted text, Horizontal lines, Line break, displaying special characters, Images in HTML Pages, Tables in HTML, Frames, Creating Frames, frame attribute linking, complex framesets, Inline frames, Image map

Unit-III: Form Designing
Form designing, Additional Layout features, CGI Scripting, Active Server Pages, Introduction to Embedding Multimedia and Java Applets, Inserting sound/Audio into Web Pages, Video file formats, Creating Marquee. Javascript and Dynamic HTML, Javascript, Structure of Javascript, Basic Commands in Javascript.

Unit-IV: Extensible Markup Language (XML)
Introduction- using user-defined tags in web pages; displaying XML contents; XML DTDs; use of XSL.

Unit-V: Introduction to Client/Server Computing
client-server computing basics; types of Client/Server systems; middleware; N-tired systems: 2-tier/3-tier/4-tier systems; Fat Clients versus Fat Servers. Web Servers: Web services and web server functionality; web server composition; registration; HTTP, IP address, DNS & ports; conceptual architecture of some typical web servers.

References Books:

1. Web Publication by Mnica D'Souza, Jude D'Souza, TMH Publication.
2. The Complete Reference HTML & CSS by T.A.Powell , TMH Publication.
3. HTML, DHTML, JavaScript, Perl CGI by IVAN Bayroos, BPB Publication

Course Code: IT-202
Course Title: Relational DBMS

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:

At the end of this class, the successful student will: have a broad understanding of database concepts and database management system software. have a high-level understanding of major DBMS components and their function.

Unit-I: Review of DBMS & RDBMS Basics
Structure of DBMS, Users of DBMS Database Models Hierarchical Data Model, Network Data Model, Relational Data Model, E R Data Model, Tuples, Relations and their schemes

Unit-II: SQL Statements &Working with tables
DDL, DML, Procedural DML, Non Procedural DML, DQL, DCL, Transaction Control Commands Data types in SQL Creating & Managing Tables Manipulating Data Retrieving data using SELEC T Command WHERE Clause DISTINCT Clause Using Column Aliases Working with Views Creating View on Tables Creating View on Views Updating Views Altering Views.

Unit-III : Sorting, grouping Data & Functions in SQL
Using Order By Clause, Using Group By &Having clause, Substitution Variables, Using &, && Using DEFINE Using VERIFY Single Row Functions Character Functions Case Manipulation Character Manipulation Number Functions Date Functions Conversion Functions General Functions Multiple Row Functions) Using Comparison Operators BETWEEN IN LIKE IS NULL 5.2 Logical Operators AND OR NOT

Unit-IV: Joining Tables & Working with Sub queries
What is Join? Natural Join/Inner Join/Equijoin Joining With „USING" Clause Joining With „ON" Clause Self Join Cross Join/ Cartesian Product Outer Join Left Outer Join Right Outer Join Full Outer Join What is Sub query? Single Row Sub query, Multiple Row Sub query

Unit-V : Security& PL / SQL
Creating User Privileges System Level Privileges Object Level Privileges Granting Privileges Revoking Privileges Roles Study of default roles Creating roles Granting and Revoking roles An Introduction to PL/SQL, PL/SQL Overview, Declaration section, Executable Commands section, Condition logic, Loops, Exception Handlings, Triggers Syntax, Types of triggers, Enabling and Disabling Triggers Replacing and Dropping Triggers Working Cursor % TYPE

Variable % TYPE Variable

References Books:

1. Oracle Database 10g SQL (Osborne ORACLE Press Series)by Jason price, McGrawHill
2. Oracle Database 10g PL/SQL Programming by Scott Urman , Ron HARDMAN, MichaleMc Laughlin, Oracle Press, TMH.
3. Oracle Database 10g The Complete Reference By Kevin Loney, Bob Bryla Oracle Press (TATA McGraw Hill Edition)
4.Database systems , By KORTH

Course Code: IT-203
Course Title: Software Engineering

Course Objective:
Understanding on quality control and how to ensure good quality software. Learning Outcomes: . Basic knowledge and understanding of the analysis and design of complex systems. Ability to develop maintains and evaluates large-scale software systems.

Course Outcome:
Basic knowledge and understanding of the analysis and design of complex systems. Ability to apply software engineering principles and techniques.

UNIT- I : Introduction To Software Engineering
The Nature of Software -Defining Software, Software Application Domains, Legacy Software , The Changing Nature of Software – WebApps, Mobile Applications, Cloud Computing Product Line Software ,Defining the Discipline. The Software Process - The Process Framework , Umbrella Activities Process Adaptation. Software Engineering Practice - The Essence of Practice , General Principles. Characteristics of a Software Engineer, The Software Team, Team Structures

UNIT- II : Software Process Structure & Models
A Generic Process Model, Defining a Framework Activity, Identifying a Task Set , Process Patterns, The Waterfall Model, Incremental Process Models, Prototyping ,Spiral Model, Component-Based Development.

UNIT- III :Agile Development
What Is Agility? , Agility and the Cost of Change , What Is an Agile Process? ,Extreme Programming , Scrum, Dynamic Systems Development Method ,Agile Modeling, Agile Unified Process, A Tool Set for the Agile Process.

UNIT- IV :Requirements Modeling
Requirements Engineering, Building the Analysis Model, Requirements Analysis, Scenario-Based Modeling, Requirements Modeling for Web and Mobile Apps.

UNIT- V :Design Concepts
Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture. User Interface Analysis and Design:- Interface Analysis and Design Models, The Process. WebApp and Mobile Interface Design:- Interface Design Principles and Guidelines, Interface Design Workflow for Web and Mobile Apps.

Reference Book:

1. Software Engineering A Practitioner's Approach By Roger. S. Pressman 8th edition.

Course Code: IT-204 A (Elective)
Course Title: VB.NET

Students have to select any one from IT-204 A, IT-204 B, IT-204 C

Course Objective:

Apply fundamental programming concepts, using an object oriented programming language, to solve substantial problems. Understand basic types and the benefits of static typing for object oriented programs. Understand the basics of event-driven programming, and its use in constructing GUI applications. Programming approaches that avoid common coding errors

Course Outcome:

Understand basic Structure of the C-PROGRAMMING, declaration and usage of variables. Programming languages draw their foundations from mathematical logic. To familiarize the students with language environment. To implement various concepts related to language.

UNIT-I: Getting Started
The integrated Development Environment, The Start Page, Project types, The IDE Components **N**et framework classes, Common Language Runtime, Building Console Application, Variables ,Constants, Arrays, Flow Control Statements

UNIT-II: Writing And using procedure
Subroutine, Function, Arguments passing Mechanisms, Event handler Arguments, Passing an unknown number of Arguments, Overloading function

UNIT-III: Forms &Controls
The Appearance of the Form, Properties of the form, Anchoring & Docking, The Form Events, Loading *&* Showing Forms, Controlling one Form from within another, Designing Menus Building Dynamic Form at Run Time, Creating Event handler At Run Time, The Text Box. Control, The ListBox, Checked ListBox, *&* Combo Box Control, The Scrollbar & Trackbar Control The Common Dialog Control, The Rich Text Control, Print Documents, PrintDialog, PageSetupDialog, PrintPreviewDialog Controls printer & Page Properties, Image List Control The TreeView Control, The ListView Control.

UNIT-IV: Building Custom Class *&* Windows Control
Building *&* using Custom class, Properties in custom class, Inheritance, Polymorphism,MyBase & MyClass Keywords, Building & using Custom Control, designing Irregular Shaped Control, Deigning Owner Drawn Menus, The Char & String Class, The DateTime Class,Directory, File,

Directory Info, fileInfo & Path Classes, File Stream, StreamReader, Stream Writer Objects.

UNIT-V: Exceptions, MDI & Working with Database

Types of Error, Exception & Structured Exception handling,Debugging Building MDl Application, Built In capabilities of MDl Application, Accessing Child Forms The ARCHITECTURE of ADO.NET, Creating Dataset, DataGrid Control, Data binding, DataAdapter Object, The Command & DataReader Objects ,The Structure of Dataset, The DataForm Wizard.

Reference Books:

1. Mastering Visual Basic.Net By Evangelos Patroutsos (BPB Publication)
2.Visual Basic. Net Programming By Billy Hollis, Rockford Thotlog (Wrox Publication)
3.Visual Basic.Net Programming Black Book By Steven Holzner
4. Beginning VB.Net (2nd Edition)

Course Code: IT-204 B (Elective)

Course Title: C#.NET

Course Objective:

Apply fundamental programming concepts, using an object oriented programming language, to solve substantial problems. Understand basic types and the benefits of static typing for object oriented programs. Understand the basics of event-driven programming, and its use in constructing GUI applications. Programming approaches that avoid common coding errors

Course Outcome:

Understand basic Structure of the C-PROGRAMMING, declaration and usage of variables. Programming languages draw their foundations from mathematical logic. To familiarize the students with language environment. To implement various concepts related to language.

Unit I : Introducing C#

What is c#, Why C# & Evolution of C#, Character tics of C#, How C# differs from C++ & Java, Introduction to .Net Technology & Framework, Visual Studio .Net & .Net languages Features in Visual Studio.net Integrated Development environment, Start page, Solution explorer window, Class view window, Object browser, Code window, Intellisense, Code Debugging, Project types.

Unit II : Arrays, String, Operators Properties, Indexers, Delegates & Events

Jagged Arrays, Array &ArrayList class, string class, Boxing & Unboxing variable, Short circuiting operators Properties, Indexers, Delegates & Events Properties, Indexers, Delegates, Multicast Delegates, Events.

Unit III : Namespace, interface ,Exception handling and Multithreading

Creating & using Name space(DLL library), Creating & using interface, Exception handling.
Multithreading**:** Understanding System.Threading Namespace, Creating & starting Thread, Threading synchronization & Pooling

Unit IV : Windows Application

Event Driven Programming Model, Important classes used in windows application, TextBox & Label Control, Button, CheckBox, RadioButton & GroupBox Control, ListBox&ComboBox control, Month Calendar Control, Docking Control, Tree View Control, Menu & Toolbar control, Dialog Boxes

Unit V : Database Connectivity, XML & Web Services

Advantages of ADO.NET, Managed Data providers, Developing a Simple ADO.NET Based Application, Retrieving & Updating Data From Tables., Disconnected Data Access Through Dataset Objects Working with XML**:** Support for XML in .NET, System.Xml namespace, XPath XSLT in .NET, Using XML with ADO.NET .Web Services**:** Introduction to web services, Simple object access protocol, UDDI.

Reference Books :

1. Programming in C# A Primer - Second Edition By - E Balagurusamy
2. Visual C#.Net By – C Muthu
3. C# 2005 Programming Black Book By Matt Telles&Kogenet Solution Inc.

Course Code: IT-204 C (Elective)

Course Title: ASP.NET

Course Objective:

Apply fundamental programming concepts, using an object oriented programming language, to solve substantial problems. Understand basic types and the benefits of static typing for object oriented programs. Understand the basics of event-driven programming, and its use in constructing GUI applications. Programming approaches that avoid common coding errors

Course Outcome:

Understand basic Structure of the C-PROGRAMMING, declaration and usage of variables. Programming languages draw their foundations from mathematical logic. To familiarize the students with language environment. To implement various concepts related to language.

UNIT – I: Introduction to .NET

What is .NET, overview of .NET framework and platform, Common Language Runtime, XML as the .NET "Meta Language", overview of Visual Studio IDE, New Object capabilities in Visual Basic, Modern Language capabilities added to Visual Basic, fitting Visual Basic into framework. CTS (Common type System), BCL(Base Class Library), CLS(Common Language Specification).

UNIT-II : Overview of ASP.NET framework

Understanding ASP.NET, Controls, Applications Web servers, installation of IIS. Web forms, web form controls, server controls, client controls, web forms & HTML, Adding controls to a web form, Buttons, Text Box, Labels, Checkbox, Radio Buttons, List Box, image controls, data controls, file uploading & downloading, multi view,master page etc. Running a web Application, creating a multiform web project.

UNIT-III : Form Validation

Form Validation: Client side validation, server Side validation,Validation Controls: Required Field, Comparison, Range, Regular expression, custom validation and validation summary. Calendar control, Ad rotator Control, Internet Explorer Control. State management- View state, Session state, Application state.

UNIT-IV: ADO.NET

Architecture of ADO.NET, Connected and Disconnected Database, Create Connection using ADO.NET Object Model, Connection Class, Command Class, Data Adapter Class, Dataset Class. Display data on data bound Controls and Data Grid. Database Accessing on web applications: Data Binding concept with web, creating data grid, Binding standard web server controls. Display data on web form using Data bound controls. Use MS-Access as backend.

UNIT-V : Writing datasets to XML, Reading datasets with XML. Web services
Introduction, remote method call using XML, SOAP, web service description language, concept of producer and consumer. building & consuming a web service & web user control, Web Application deployment.

Reference Books:

1. Pankaj Agrawal – Principal of .Net Framwork – Vaya
2. Kogent - .NET Programming Black Book – Wiley
3. VB.NET Black Book by Steven Holzner –Dreamtech
4. VB.NET –Wrox Publication
5. ASP.NET Unleashed

Course Code: IT-205
Course Title: Lab-3: Based on IT-201

Practical's Based on Web Design and Development

Course Code: IT-206
Course Title: Lab-4: Based on Elective Subjects

At least 20 Logical programs covering all concepts of Elective adapted by the students.

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

OR

Course Code: IT-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.
3. To develop the writing skills of the students.

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.
3. Write various letters, reports required for professional 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 & Dr. M. Hariprasad

Course Code: IT-208

Course Title: SK-02

Code: IT- 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