

**Bharati Vidyapeeth**  
**(Deemed To Be University), Pune (India)**

\*Accredited 'A+' Grade (2017) By NAAC \*  
\*Category -I' University Status by UGC \*  
\* 'A' Grade University Status by MHRD Govt. of India \*  
\* Ranked '63rd' by NIRF-2020 under University Category \*

Faculty of Management Studies  
Board of Studies in Computer Applications

**Master of Computer Applications Programme**  
**(MCA)**

**(2022 Course)**

(Under Choice Based Credit System)

To be implemented from 2022-23

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**Bharati Vidyapeeth (Deemed To Be University), Pune India**  
**Faculty of Management Studies (Board of Studies in Computer Applications)**  
**Master of Computer Applications Programme (2022 Course)**  
**(Under Choice Based Credit System)**  
**To be effective from 2022-23 at Part I**

**I. INTRODUCTION:**

The MCA Program is a full time 108 credits programme offered by Bharati Vidyapeeth (Deemed to be University), Pune and is conducted in regular and distance mode at its Management Institutes in Pune, Karad, Kolhapur, Sangli, and Solapur. This programme is also conducted in online mode at CDOE under BV(DU). All the five institutes have excellent faculties, laboratories, library, and other facilities to provide proper learning environment. The University is reaccredited by NAAC with an 'A+' grade (3rd cycle). The expectations and requirements of the software industry, immediately and in the near future, are visualized while designing the MCA programme. This effort is reflected in the Vision and Mission statements of the MCA programme. Of course, the statements also embody the spirit of the vision of Late Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth Deemed to be University which is to usher in “Social Transformation through Dynamic Education.”

**II. VISION STATEMENT OF MCA PROGRAMME**

Achieve excellence in Computer Applications with respect to teaching, learning and research to meet the growing needs of the industry and society.

**III. MISSION STATEMENT OF MCA PROGRAMME**

- Promote outcome-based learning strategies in-order to meet global industry standards.
- Encourage innovations and problem-solving capabilities in students and faculty.
- Cultivate collaborative research in both, students and faculty members through industry interactions and collaborations.
- Enhance entrepreneurship skills among students.

**IV. PROGRAMME UNIQUE FEATURES**

Keeping the view of National Education Policy, MCA Programme is designed with following features

- MCA is 2 year masters programme with 114 credits.
- The structure of programme is common for all learning modes - Regular, Distance, Online
- Provision to acquire interdisciplinary knowledge through MOOCs covering total 12 credits.

- Interdisciplinary General Courses covering Human Ethical Values, Life Skills, Swachh Bharat, Environmental Studies to make students aware about environment concerns and human values.
- Students can choose any of the elective group through which he/she will be trained in specialized area for better career.
- Internship project provides a platform which gives acquaintance for solving IT problems.

## V. PROGRAMME OBJECTIVES

**1:** To build a strong foundation for students to become proficient in all academic concepts and technical skills necessary to become an IT Professional.

**2:** To provide a conducive environment for designing, implementing and testing various software applications through Software Development.

**3:** To keep the students and faculty abreast with the emerging technologies in the field of computer applications.

**4:** To bring professionalism amongst the students and promote holistic development.

**5:** To involve students in sustainable IT practices and community services.

## VI. PROGRAMME OUTCOMES (PO)

**PO1: Computational Knowledge:** Apply knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements.

**PO2: Problem Analysis:** Apply fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem.

**PO3: Design/Development of Solutions:** Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.

**PO4: Conduct research in Computing problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5: Modern Tool Usage:** Use of modern tools for delivering milestones like problem analysis, design, development, testing and deployment.

**PO6: Professional Ethics:** Learn and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.

**PO7: Lifelong Learning:** Acknowledge the need for continuous professional development and practice it through self-motivated, independent learning.

**PO8: Management Domain:** Involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.

**PO9: Communication Efficacy:** Demonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.

**PO10: Innovation and Entrepreneurship:** Provide conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.

## **VII. PROGRAMME SPECIFIC OUTCOMES**

**PSO1:** Ability to learn the various programming languages with database concepts and development environment

**PSO2 :** Ability to apply theoretical and practical knowledge to solve business problems in effective software solution through data communication technology concepts.

**PSO3 :** Enrich the knowledge in the areas of Advanced technologies and business practices.

**PSO4 :** Foster analytical and critical thinking abilities for efficient programming

**PSO5 :** Flourish the innovation and research attitude to develop IT artefact.

**PSO6 :** Maintain the personality with environmental and social concerns

## **VIII. ELIGIBILITY FOR ADMISSION:**

Admission to the programme is open to any Graduate (10+2+3) of any recognized University satisfying the following conditions.

1. Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree. OR Passed B.Sc./ B.Com./ B.A. with additional bridge Courses (Bridge Course I/ Bridge Course II )as per the norms of the University.

OR

Passed any graduation degree (e.g. BE/ BTech/ BSc/BCom/BA/B.Voc/ etc) preferably with mathematics at 10+2 level or at Graduation Level

2. The candidate should have secured at least 50% marks (45% for SC/ST) in aggregate at graduate level university examination.
3. For students having no Mathematics background compulsory bridge course framed by the Bharati Vidyapeeth (Deemed to be University) and additional bridge course related to computer subjects should be completed
4. The candidate studying in final year of Bachelor's degree may also apply. Admission of such candidates will remain provisional until submission of final result certificates in original.
5. Subject to the above conditions, the final admission of final admission is based solely on –
  - a. The merit at All India Entrance Test conducted by Bharati Vidyapeeth (Deemed to be University), Pune.
  - b. Submission of Migration Certificate, Transfer Certificate, anti-ragging affidavit etc.

#### **IX. DURATION OF THE PROGRAMME**

The duration of this programme is two years divided into four semesters or a minimum of 114 credits whichever is later. The medium of instruction and examination will be only English.

#### **X. MOOC Policy :**

MOOCS stands for Massive Open Online Courses. The student will complete MOOCS courses prescribed by Institute from following sources in respective semesters.

Following are the sources from where Students/Learners can undertake MOOCs

1. [iimb.ac.in](http://iimb.ac.in)
2. [swayam.gov.in](http://swayam.gov.in)
3. [alison.com](http://alison.com)
4. [edx.org](http://edx.org)
5. [nptel.com](http://nptel.com) (technical courses)
6. Coursera

7. [harvardx.harvard.edu](http://harvardx.harvard.edu)
8. [udemy.com](http://udemy.com)
9. [futurelearn.com](http://futurelearn.com)
10. Indira Gandhi National Open University (IGNOU)
11. National Council of Educational Research and Training (NCERT)
12. National Institute of Open Schooling (NIOS)
13. National Programme on Technology Enhanced Learning

(NPTEL) Important Note:

- Students should complete the MOOCs during four semesters of the program.
- Students have to submit completion certificate of all MOOCs. Unless certificate of all MOOCs are not submitted the mark sheet of the final semester will not be issued.

**XI. SCHEME OF EXAMINATION:**

For some courses there is Internal Assessment (IA) conducted by the respective institutes as well as a University Examination (UE) at the End-of-the Term. UE will be conducted out of 60 marks and IA will be conducted for 40 marks then these are converted to grade points and grades as per the Table I. For courses having only Continuous Assessment (CA) the respective institutes will evaluate the students in varieties of ways during the term for a total of 100 marks. Then the marks will be converted to grade points and grades using the Table I.

**XII. STANDARD OF PASSING:**

For all courses, both UE and IA constitute separate heads of passing (HoP). In order to pass in such courses and to earn the assigned credits, the student/learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

If Student fails in IA, the learner passes in the course provided, he/she obtains a minimum 25% marks in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the learner passes at UE.

A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA he has to reappear only at IA as backlog candidate and clear the Head of Passing. to secure the GPA required for passing.

The 10 point Grades and Grade Points according to the following table

<b>Range of Marks (%)</b>	<b>Grade</b>	<b>Grade Point</b>
80≤Marks≤100	O	10
70≤Marks≤80	A+	9
60≤Marks≤70	A	8
55≤Marks≤60	B+	7
50≤Marks≤55	B	6
40≤Marks≤50	C	5



Marks < 40	D	0
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**Table I : Grade Points and Grades**

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 60% and 40% respectively.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

### Rules of ATKT

For course upto four semesters, a student is allowed to carry any number of Backlogs of a prescribed course in Sem-I, II, III to Sem-IV provided he appears and have backlogs

A student can appear for any four continuous semesters in an examination season including the regular semester, provided the student has appeared and have backlogs for other three semesters.

### Formula to calculate Grade Points (GP)

Suppose that “Max” is the maximum marks assigned for an examination or evaluation, based on which GP will be computed. In order to determine the GP, Set  $x = \text{Max}/10$  (since we have adopted 10 point system). Then GP is calculated by the following formulas

Range of Marks	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (M/x) +2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (M/x) +1

Two kinds of performance indicators, namely the Semester Grade Point

Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all the courses since his/her enrollment. The CGPA of learner when he /she completes the programme is the final result of the learner.

The SGPA is calculated by the formula

$$SGPA = \frac{\sum Ck * GPk}{\sum Ck}$$

where, Ck is the Credit value assigned to a course and GPk is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the Semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the following formula

$$CGPA = \frac{\sum C_k * GP_k}{\sum C_k}$$

where, Ck is the Credit value assigned to a course and GPk is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrollment and also during the semester for which CGPA is calculated. The CGPA shall be calculated up to two decimal place accuracy.

**The formula to compute equivalent percentage marks for specified CGPA: = (Final CGPA-0.5)\*10**

### **XIII. Award of Honors :**

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

<b>Range of CGPA</b>	<b>Final Grade</b>	<b>Performance Descriptor</b>	<b>Equivalent Range of Marks (%)</b>
$9.5 \leq \text{CGPA} \leq 10$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.0 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.0 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.0 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.0 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.0 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA below 5.0	F	Fail	Marks below 40

#### ***Important Note:***

- Student or Learner is expected to write Two Research Papers and publish it in Peer Reviewed Journals.
- A Student /Lerner can carry any number of backlog paper till Semester-IV provided his/her academic term(s) is/are granted

#### XIV.Question Paper Patterns for University Examination:

##### Question Paper Pattern for University Examinations (Common for Regular and Distance mode) [The marks will be converted to appropriate UE : IA ratio]

The pattern of *question paper* for the courses having University Examinations will be as follows:

**Title of the Course**

**Day:**

**Total Marks: 100**

**Date:**

**Time: 3 Hours**

**Instructions:**

a. Attempt any FIVE questions from Section I Each question carries 12 Marks.

b. Attempt any TWO questions from Section II Each question carries 20 Marks.

#### SECTION – I

<i>It should contain 06 questions covering the syllabus &amp; should test the conceptual knowledge of the students</i>	
<b>Question</b>	<b>Marks</b>
Q.1 .....	(12 marks)
Q.2 .....	(12 marks)
Q.3 .....	(12 marks)
Q.4 .....	(12 marks)
Q.5 .....	(12 marks)
Q.6 Write <b>Short Notes</b> on ANY TWO	(12 marks)
<b>SECTION – II</b>	
<i>It should contain 03 questions covering the entire syllabus &amp; should be based on application of the Concepts</i>	
Q.7.....	(20 marks)
Q.8.....	(20 marks)
Q.9.....	(20 marks)

## Question Paper Pattern for University Examinations (Online Mode)

The pattern of **question paper** for the courses having University Examinations will be as follows:

**Title of the Course**

**Day :**

**Total Marks: 70**

**Date:**

**Time: 03 Hours**

**Instructions: 50 Marks objective questions**

**Subjective 20 marks. Solve any FOUR, each carries 5 marks**

### SECTION-I

<b>Question 1</b>	<b>Marks(50)</b>
<b>25 Objective Questions carrying 2 Marks each</b>	

### SECTION – II

<i>It should contain 06 questions covering the syllabus &amp; should test the conceptual knowledge of the students</i>	
<b>Question</b>	<b>Marks</b>
Q.2 .....	(5 marks)
Q.3 .....	(5 marks)
Q.4 .....	(5 marks)
Q.5 .....	(5 marks)
Q.6 .....	(5 marks)
Q.7 .....	(5 marks)

### XV.SEMESTER WISE COURSE STRUCTURE

	Semester I	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
101	Applied Database Management Systems	4	3	1	-	40	60
102	Computer Networks	4	3	1	-	40	60
103	Java Programming	4	3	1	-	40	60
104	Computational Statistics	4	3	1	-	40	60
105	Management Concepts and Applications	4	3	1	-	40	60
106	Lab on Applied Database Management Systems	3	1	0	4	40	60
107	Lab on Java Programming	3	0	0	6	40	60
108	MOOCS-I *	4	-	-	-	00	00
109	Open Course-I **	2	2			50	00
		<b>32</b>	<b>18</b>	<b>05</b>	<b>10</b>	<b>330</b>	<b>420</b>

\*Student has to complete MOOCS compulsory [Please refer MOOCS guidelines as per pointno. X]

**\*\* Student can select any one of the following courses as Open Course - I in consultation with HOD/Coordinator**

Sr. No.	(109) Open course – I
1	Universal Human Values (UHV)
2	Cyber Security
3	Soft Skills

	Semester II	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
201	Object Oriented Software Engineering	4	3	1	-	40	60
202	Cloud Computing Concepts	4	3	1	-	40	60
203	Data structures using Python	4	3	1	-	40	60
204	Data Warehousing and Data Mining	4	3	1	-	40	60
205	Web Supporting Technologies	4	2	1	4	40	60
206	Lab on Data Structures using Python	3	0	0	6	40	60
207	Minor Project – 1	3	3	-	-	00	100
208		4		-	-	-	00
	MOOCS-II *	4	-				
209	Open Course-II**	2	2			50	
		<b>32</b>	<b>19</b>	<b>05</b>	<b>10</b>	<b>290</b>	<b>460</b>

\*Student has to complete MOOCS II compulsory [Please refer MOOCS guidelines as per pointno. X]

**\*\* Student can select any one of the following courses as Open Course- II in consultation with HOD/Coordinator**

Sr. No.	(209) Open course – II
1	Foreign Language
2	Digital Technology
3	Human Psychology at Workplace

	Semester III	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
301	Software Design Patterns	4	3	1	-	40	60
302	Artificial Intelligence	4	3	1	-	40	60
303	Information Security	4	3	1	-	40	60
304	EL-GRP-1 (A)	3	2	1	-	100	-
305	EL-GRP-2 (A)	3	2	1	-	100	-
306	Lab on Software Testing	3	1	0	4	40	60
307	Minor Project – 2	3	3	-	-	00	100
308	MOOCS-III *	4	-	-	-	-	00
309	Open Course-III **	2	2	-	-	50	00
		<b>30</b>	<b>19</b>	<b>05</b>	<b>04</b>	<b>410</b>	<b>340</b>

\*Student has to complete MOOCS II compulsory [Please refer MOOCS guidelines as per pointno. X ]

**\*\* Student can select any one of the following courses as Open Course- III in consultation with HOD/Coordinator**

Sr. No.	(309) Open course – III
1	Social Change in Technology
2	Water Management
3	Economics for IT Industry

	Semester IV	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
401	Seminar on Recent Trends in IT <sup>#</sup>	4	-	-	-		100
402	EI-GRP - 1 (B)	3	2	1	-	100	-
403	EI-GRP –2 (B)	3	2	1	-	100	-
404	Major Internship Project	10	-	-	-	-	100
		<b>20</b>	<b>07</b>	<b>07</b>	<b>-</b>	<b>200</b>	<b>200</b>



**Practical Examinations:**

For courses 106, 107, 205, 206 and 306 University Practical Examination will be held and marks will be reported to the University.

**Project Guidelines:****Minor Project I (207) and Minor Project II(307)**

Students are expected to choose a problem which will provide software solutions. The project should be based on the courses student students studied in the previous semester. The projects can be completed as individual project or if the scope of the project is comprehensive then project can be divided into modules by the project guide and a group of students can work on it. The number of students in the group can be decided by project guide and it should not be less than 2 and more than 4. Every student or group must have meeting about progress of project with their project guide regularly as specified in time table or if required at a communicated by guide.

The project dissertation/document is expected to be created and it should have the following contents.

- a. SRS – Problem Statement, BRD- Business Requirement Document
- b. General Requirement
- c. Requirement as per user Role
- d. System design (RED/Class Diagrams, DFD/Activity diagrams)
- e. User screen design and client side validation
- f. Database Design
- g. User interface design /user manual
- h. Test cases
- i. Scope and limitation
- j. Conclusion
- k. Bibliography

### **Major Internship Project (404)**

The student is expected to get exposure of industry through ‘Major Internship Project’. Guidelines about project are as bellow.

1. Student must undergo 60 Days Industrial Internship.
2. Every project will be evaluated by University appointed panel at the end of the semester.
3. Student must report about the progress of project to the internal project guide regularly as specified in time table or if required at a time given by guide.

### **Seminar on Recent Trends in IT: (401)**

Student will select any topic of interest and study it thoroughly throughout the semester. At the end of the semester, student will give a presentation on the topic before the panel appointed by the University and submit the seminar report.

### **XVI. List of Elective Groups:**

<b>Elective Code</b>	<b>Elective Group</b>	<b>Subject Code</b>	<b>Subjects</b>
01	Cloud Computing	A	Virtualization
		B	AWS
02	Data Science	A	Statistical Programming in R
		B	Introduction to Data Science
03	Linux	A	Linux Desktop Environment, Shell Programming and System Administration
		B	Linux Internals and Network Administration
04	Open Source Technologies	A	Perl Scripting
		B	Ruby
05	Mobile Computing	A	Java Script
		B	Android
06		A	C# Programming and Applications

	Dot Net Technologies	B	ASP Dot Net with MVC
07	Net Centric Technologies	A	HTML 5
		B	AJAX Programming
08	Information Systems	A	Recommender System
		B	Knowledge Management
09	IOT	A	IoT Architecture Sensors and Fundamentals with Hands-on lab
		B	Internet Of Things: Sensing And Actuator Devices and Smart city use case
10	Big Data	A	Introduction to Big Data
		B	Business Intelligence Tools With Hadoop
11	Cyber Security	A	Introduction to Information Security
		B	Information Security Threats and Mitigation Strategies
12	Data Management	A	Data Management Environment
		B	Industrial Data Management and Security

### **XVII. Bridge Course I:**

This course is designed and compulsory for the students from Non-IT background. The course can be conducted concurrently with semester I courses. The evaluation of this course will be at institute level for 100 marks.

The student must score minimum 40 marks to pass this course. There will be no credits assigned to this Bridge Course.

<b>Subject Name</b>	Bridge Course I
<b>No. of Credits</b>	00
<b>Pre Requisite</b>	Basic Mathematics and MSCIT course
<b>Cognitive Abilities</b>	<b>Course Outcome as per Blooms Taxonomy</b>
<b>Remembering</b>	Basic formula for finding areas, volumes, graphical representation of data is to be remembered.
<b>Understanding</b>	Do calculations by using formulas, algorithm, C program structure are to be understood
<b>Applying</b>	Apply basic knowledge of mathematics and computers to write programming codes.
<b>Analyzing</b>	Analyze the problem to represent in proper format such as graphs, trees for effective working
<b>Evaluating</b>	Evaluate the programs or problems for algorithms, logic
<b>Creating</b>	Creating proper program logic so as to reduce lines of codes is expected
<b>Unit</b>	<b>Content</b>
1.	Algorithm ,flow charts, integers, division, relations, relations and their types, representation of relation in computer memory, number conversion systems
2.	Trees, applications of trees, tree traversal algorithms, minimum spanning trees
3.	Fundamentals of C programming, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Declaration of variables as constant, Operators, Types of operators, Input and Output functions - printf(), scanf(), getchar(), putchar(), Formatted input and formatted output.
4.	Control Statements- Sequential, Selection, Iteration Statements, Branching structure- if statement, if-else statement, Nested if-else statement, else if Ladder, Conditional operator, switch statement, Loop control structures- while loop, do-while loop, for loop, Nested for loop, Jump statements-break, continue, goto statements

5.	Function call, return statement, Function parameters, Types of functions, Arrays and functions
6.	Introduction to OOP concepts.
<b>Text Books</b>	1.Discrete Structures by Kenneth Rosen 2.C programming by Yashwant Kanetkar 4.Object Oriented Programming by Balguruswamy
<b>Reference Books</b>	C Programming language by Brain W. Kernighan

### Bridge Course II :

This course is designed and compulsory for the students from Non-Mathematics background and who have not completed mathematics in their 12<sup>th</sup> or graduation course. The course can be conducted concurrently with semester I courses. The evaluation of this course will be at institute level for 100 marks. The student must score minimum 40 marks to pass this course. There will be no credits assigned to this Bridge Course.

<b>Subject Name</b>	Bridge Course II
<b>No. of Credits</b>	00
<b>Course Objective</b>	To prepare background of the student to study courses in MCA
<b>Cognitive Abilities</b>	<b>Course Outcome as per Blooms Taxonomy</b>
<b>Remembering</b>	Remembering basic concepts and their representations
<b>Understanding</b>	Understanding applications of various discrete structures like sets, relations, graphs etc.
<b>Applying</b>	Applying various structures to represent problem data.
<b>Analyzing</b>	Learn to analyze the data for the given problem for representing it using proper structure.
<b>Evaluating</b>	Evaluate the problem for proper discrete structures.
<b>Creating</b>	Design new structures based on basic discrete structures to represent data..
<b>Text Books</b>	Discrete Structures by Kenneth Rosen
<b>Course Plan</b>	
<b>Unit</b>	<b>Content</b>
1.	<b>Set Theory :</b> Definition of a set, Representation of elements of sets, Methods of representing sets , types of sets, operations on sets , cardinality of a set, Principle of Inclusion and Exclusion , Venn Diagram , Proof by using Venn diagram
2.	<b>Functions and Relations :</b> Definition of Function, Types of Functions ,Composite Function, Relation definition, representation of relations
3.	<b>Logic:</b> Propositions, Logic Operations-Negation, Disjunction, Conjunction, Conditional and Biconditional, Truth Tables of compound propositions, Translating English sentences in to logical statements and vice versa, Logic gates and circuits

4.	<b>Matrices:</b> Matrix Definition, General Form, Representation of matrix in computers, Types of matrices, Operations on matrices: Addition, Subtraction and Multiplication, transpose , row / column transformations , Inverse of the matrix by Co-factor and Adjoint method, solutions to three variable problems by using matrices, application problems of matrices
5.	<b>Graphs -</b> Graph terminologies, types of graphs , representation of graph in computers, Paths, Euler and Hamilton graphs, graph colorings.