Rajasthan Technical University, Kota

Scheme and Syllabus

of

MCA

(Effective from academic session: 2020-21)

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus of SODECA[Anandam] for MCA course from the academic session 2020-21

Guidelines for SODECA [Anandam] in 2 Year MCA Program

Maximum Marks 100; Credits: 08

The following activities are categorized as SODECA [Anandam]:

Part I: Discipline (25 marks)

Minimum 25 marks shall be awarded unless is involved in indiscipline.

The marks shall be deducted from this component for those who shall involve themselves in indiscipline/ undesirable activities/ Detained from departments or in case of penalty of marks imposed by Chief Proctor/ Standing Disciplinary Committee (SDC), such deduction should be preferably approved by Head of the Institution/Principal/Director and subject to a maximum of 25 marks.

Part II: Extra Curricular Activities (75 marks)

A. Games and Sports / Field Based Activities:
Sports Activities or any other field related activity.

B. **Cultural/ Literary Activities/ Social Outreach / Personality Development Based Activities:**
Activities under the banner of ESF, Celebration of recognized National Days/ Birth Anniversary of great personalities, Hostel Day/ Annual Day/ Fresher's Day or any other related activity. Contribution towards social up-gradation based activities, Activities by social organization like, Art of Living, Yoga etc., Blood donation, Awareness programs, personality development programs, activities under different clubs (if not covered under above heads) like, photography etc., NGO activities, Plantation/ cleanliness activities etc.

C. Academic/Technical/ Professional Development Activities:
Attending workshops, seminars, FDPs for reasonable duration/numbers. Attending/ paper presentation in conferences**.**

D. Research Contribution to Social Applications:
Student is desired to perform his research applications to social problems.

E. Anandam Program Activities:
The students are expected to perform the following activates:

- Do at least one act of individual service each day
- Record this act of service in a dedicated Register/Personal Diary (PD)
- Participate in a sharing and presentation on the group service in the discussion session held once a month

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Awarding Marks:

Effective contribution and active participation may be judged for awarding the marks. Additionally, following levels may be defined in Category A, B, C, D & E:

Category	Level wise Marks			
	Level-1	Level-2	Level-3	Level-4
A. Games and Sports / Field Based Activities	-	-	40	50
B. A. Cultural/ Literary Activities/ Social Outreach / Personality Development Based Activities	20	30	40	50
C. Academic/Technical/ Professional Development Activities	20	30	40	50
D. Research Contribution to Social Applications	30	40	50	60
E. Anandam Program Activities	30	40	50	60
Maximum Marks	100			

Level-1: (i) Active Participation in activities at College/City Level
(ii) Do at least one act of individual service each day in Category E

Level-2: (i). Active participation in multiple activities at Level-1
(ii). Participation at State level
(iii) Getting award/ recognition at District/State Level
(iv) Record this act of service in a dedicated Register/Personal Diary in Category E
(v) Providing technical solutions for the social problems at Institute level

Level-3: (i). Active participation in multiple activities at Level-2
(ii). Participation at National level
(iii) Getting award/ recognition at National Level
(iv) Participate in a sharing and presentation on the group service in the discussion session held once a month in Category E
(v) Providing technical solutions for the social problems at State level

Level-4: (i). Active participation in multiple activities at Level-3
(ii). Participation at International level
(iii) Getting award/ recognition at International Level
(iv) Providing technical solutions for the social problems at National level

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

CREDIT TEMPLATES

The guidelines for new Scheme for Postgraduate Programme

MCA (Master of Computer Applications)

1. Rajasthan Technical University, Kota has implemented the AICTE Model Curriculum for Postgraduate Degree Course in Computer Applications:

   (i) For students admitted in Session 2020-21 and onwards.
   (ii) The CGPA system shall be implemented for students admitted in session 2020-21 and onwards.

2 Definition of Credit:

Table: 2.1

1 Hr. Lecture (L) per week	1 credit
1 Hr. Practical (P) per week	0.5 credits
SODECA (Anandam)	02 credits

(i) Total 83 credits will be required to be earned by a student to be eligible to get Postgraduate Degree in Computer Applications (MCA).
(ii) The structure of the degree will be as follows:

Table: 2.2

Degree	Required Credits
MCA	83

3. Semester wise credit system:

Table:3.1

S.NO.	Semester	Credits		Total credits
		Courses	SODECA (Anandam)	
1.	I	21	02	23
2.	II	21	02	23
3	III	21	02	23
4.	IV	12	02	14
Total		75	08	83.00

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SODECA (Anandam): Social Outreach, Discipline & Extra Curriculum Activities

4. Mandatory Trainings:

Table: 4.1

S.No.	Duration of Training	Mode of Training	After	Exam Semester	Credits
1.	45 Days	In house/Industry	I Year(II SEM)	III SEM	1
				Total	01

NOTE:-Dates of trainings shall be notified in University Academic calendar.

5. Distribution of Number of Theory and Practical Courses in each semester.

I to III Semesters:

Table: 5.1

Category	Total Number of Papers
Theory	06
Practical	03

IV Semester:

Table: 5.2

Category	Total Number of Papers
Theory	02
Practical	01

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Bridge Course

1. Bridge Course [For students other than BCA / B.Sc. (CS/IT)]

It will be an audit course for Non Computer Graduates. No Marks will be added. But Student has to pass this Course; in order have basic knowledge of Computer Science.

2. Guidelines for Evaluation of Bridge Course

As per norms of AICTE APH 2020-21, students except BCA / B.Sc. (CS/IT) have to qualify a Bridge Course as per University norms.

a. Bridge course shall be an Audit Course whose award shall not be considered for overall MCA Course credit and percentage. However, the grades will be reflected in the mark sheet of the student.
b. Institutes/Colleges have to arrange classes as per RTU syllabus at their own level.
c. The examination for the bridge course will be conducted by University before the End term Examination (Both Odd and Even Semester) on the dates prescribed by the University.
d. Preferably the result of the bridge course should be declared before the End Term Examination.
e. The students have to clear the Bridge Course before the End Term Examination of third semester.
f. For a Pass, candidate must obtain at least grade E for each theory and practical.

3. Theory Question Paper pattern for Bridge Course Exam
Maximum Marks =100

a. Part-A will contain 10 questions, covering full syllabus of 2 marks each .Word limit for answer is 25 words.
b. Part-B will contain 5 questions (1from each unit) of 4 marks each. Word limit is 100 words.
c. Part-C will contain 3 out of 5 questions of 20 marks each .Questions will be based on Design/ Problem Solving skills.

4. Practical Question Paper pattern for Bridge Course Exam
Maximum Marks =100

a. Practical question paper will contain 4 practical questions of 15 marks each.
b. Practical Record will be of 20 marks.
c. Viva voce will be of 20 marks.

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YEAR-I

MCA Year 1 Semester I-BRIDGE COURSE						
Theory						
S.No.	**Course Code**	**Course Title**	**Hours**		**Marks**	
			L	**P**	**ETE**	**Total**
1	MCA-B00	Fundamentals of Computer Science	3		100	100
Practical						
2	MCA-B01	C Programming Lab		2	100	100
				Total	**200**	**200**

Bridge Course

L= Lecture, **P** = Practical, ETE = End Term Exam

1. I-Semester (First Year)

S No	Category	Credit
1	Theory	18
2	Practical	03
3	SODECA	02
	Total	**23**

MCA Year 1 - Semester I								
Theory								
S.No.	**Course Code**	**Course Title**	**Hours**		**Marks**			**Credits**
			L	**P**	**IA**	**ETE**	**Total**	
1	MCA-101	Mathematical Foundations in Computer Science	3		30	70	100	3
2	MCA-102	Object Oriented Programming with C++	3		30	70	100	3
3	MCA-103	Operating System	3		30	70	100	3
4	MCA-104	Computer Architecture	3		30	70	100	3
5	MCA-105	Database Systems	3		30	70	100	3
6	MCA-106	Web Technologies	3		30	70	100	3
Practical								

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1	MCA-151	Object Oriented Programming Lab		2	30	70	100	01
2	MCA-152	SQL-PL/SQL Lab		2	30	70	100	01
3	MCA-153	Web Technologies Lab		2	30	70	100	01
4		SODECA						02
				Total	**270**	**630**	**900**	**23**

L= Lecture, **P** = Practical, **IA** = Internal Assessment, **ETE** = End Term Exam

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2. II-Semester (First Year)

S No	Category	Credit
1	Theory	18
2	Practical	03
3	SODECA	02
	Total	**23**

MCA Year 1- Semester II								
Theory								
S.No.	**Course Code**	**Course Title**	**Hours**		**Marks**			**Credits**
			L	**P**	**IA**	**ETE**	**Total**	
1	MCA-201	Java Technologies	3		30	70	100	3
2	MCA-202	Computer Networks	3		30	70	100	3
3	MCA-203	Data Structures	3		30	70	100	3
4	MCA-204	Software Engineering & UML	3		30	70	100	3
5	MCA-205	Python Programming	3		30	70	100	3
6	MCA-206	Business Informatics	3		30	70	100	3
Practical								
1	MCA-251	Data Structures Lab		2	30	70	100	01
2	MCA-252	Java Technologies Lab		2	30	70	100	01
3	MCA-253	Python Programming Lab		2	30	70	100	01
4		SODECA						02
Total					**270**	**630**	**900**	**23**

L= Lecture, **P** = Practical, **IA** = Internal Assessment, **ETE** = End Term Exam

Note:
Mandatory Summer Training: 45 Working Days Summer Training during Semester Break, of
100 Marks. Evaluation will be done in Semester-III Examinations.

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YEAR-II

3. III-Semester (Second Year)

S No	Category	Credit
1	Theory	18
2	Practical	03
3	SODECA	02
	Total	**23**

III-Semester (Second Year) MCA Year 2 - Semester III								
Theory								
S.No.	**Course Code**	**Course Title**	**Hours**		**Marks**			**Credits**
			L	**P**	**IA**	**ETE**	**Total**	
1	MCA-301	Cloud Computing	3		30	70	100	3
2	MCA-302	Analysis and Design of Algorithm	3		30	70	100	3
3	MCA-303	Artificial Intelligence	3		30	70	100	3
4	MCA-304	Information Security	3		30	70	100	3
5	MCA-305	Mobile Application Development	3		30	70	100	3
6	MCA-306	Elective 1	3		30	70	100	3
Practical								
1	MCA-351	ADA Lab		2	30	70	100	01
2	MCA-352	Mobile Application Development Lab		2	30	70	100	01
3	MCA-353	Summer Industrial Training Presentation		2	30	70	100	01
4		SODECA						02
Total					**270**	**630**	**900**	**23**

L= Lecture, **P** = Practical, **IA** = Internal Assessment, **ETE** = End Term Exam

Elective -1:

a) Data Mining and Warehousing
b) Big Data Technologies
c) Soft Computing

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4. IV-Semester (Second Year)

S No	Category	Credit
1	Theory	06
2	Practical	06
3	SODECA	02
	Total	**14**

MCA Year 2 - Semester IV								
Theory								
S.No.	**Course Code**	**Course Title**	**Hours**		**Marks**			**Credits**
			L	**P**	**IA**	**ETE**	**Total**	
1	MCA-401	Software Project Management	3		30	70	100	3
2	MCA-402	Elective 2	3		30	70	100	3
Practical								
3	MCA-451	Industrial Project		12	30	70	100	06
4		SODECA						02
Total					**90**	**210**	**300**	**14**

L= Lecture, **P** = Practical, **IA** = Internal Assessment, **ETE** = End Term Exam

Note: The industrial project is part of the curriculum will be held in the institute as one of the laboratories. This may be in continuations to the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level).
The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by RTU.

Elective 2:

a) Principles of Management and Information System
b) Machine Learning
c) Data Science with R

Examination Scheme: Total 83 Credits

There will be an internal assessment (IA) and End Term Examination (ETE) for all theory subjects:

Distribution of Marks:

Table: 1.1

S.No	Credit of Theory Paper	End Term Exam (Hours)	Internal Assessment (30%)	End Term Exam (70%)	Total Maximum Marks(x)
1	3	3 hours	30	70	100

Table: 1.2

Practical	Internal	External
	30%	70%

For all credit courses the internal assessment component shall be further divided as under:

Table: 1.3

S.No.	Component of Internal Assessment	Marks
1	I Mid Term Examination	10
2	II Mid Term Examination	10
3	III Mid Term Examination/ Surprise Class Test/ Assignments/Presentations	10
	Total	30

1. Pass Rules for MCA (2 Yr. Program):As per University rule

The result of a candidate will be worked out at the end of each Semester Examination. The absolute marks of a student (pi) shall be converted into relative marks (xi) on 100 point scale as below:

$$X_i = \frac{P_i}{P_{max}} q ,$$

where,

xi = Converted relative marks of an individual student in a particular ith subject/course (rounded off to next higher integer number).

Pi = Absolute percentage (%) of marks obtained by an individual student in the ith subject/course.

Pmax = It should be from range of highest absolute percentage of marks obtained in a subject, as per the following table:

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Table: 2.1

Range of highest absolute percentage (%) marks obtained in a subject/ paper exam by the student	P_{max} (%)
90-100	90
80-89	80
70-79	70
60-69	60
50-59	50
40-49	40
30-39	30

q =Highest equivalent relative marks taken for conversion purpose (as given in column 2 of the following table).

Table: 2.2

Absolute highest marks obtained in a subject *(Pabsolute max)*	Highest equivalent relative marks taken for conversation purpose (*q*) on 100 point scale
Column 1	Column 2
$Pabsolute\ max \geq 75\%$	100
$60\% \leq Pabsolute\ max < 75\%$	89
$30\% \leq Pabsolute\ max < 60\%$	79
$Pabsolute\ max < 30\%$	Not considered for conversion

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The Grade and Grade Point shall be awarded to an individual student as under:

Table:2.1

S.No.	Relative Marks (x_i)	Grade	Grade Points
1	$x_i \geq 90$	A++	10
2	$85 \leq x_i < 90$	A+	9.0
	$80 \leq x_i < 85$	A	8.5
4	$75 \leq x_i < 80$	B+	8.0
5	$70 \leq x_i < 75$	B	7.5
6	$65 \leq x_i < 70$	C+	7.0
7	$60 \leq x_i < 65$	C	6.5
8	$55 \leq x_i < 60$	D+	6.0
9	$50 \leq x_i < 55$	D	5.5
10	$45 \leq x_i < 50$	E+	5.0
11	$40 \leq x_i < 45$	E	4.0
12	$x_i < 40$	F	0

(i) For a Pass, candidate must obtain at least grade E for each theory and practical.

(ii) If a student remains "Absent" or obtains "Zero" marks in any of external component of theory or practical, he/she will be awarded "F" grade, respectively and will be required to appear in the subsequent back examinations. "F" grade student while applying for back paper exam., may opt either of the following options:-

i. Wish to carry forward the previous marks of internal assessment.

ii. Wish to improve the internal assessment too.

(iii) No grace shall be awarded.

(iv) Revaluation and copy view system will prevail as per existing examination regulations. However, change of grade point of individual candidate after the revaluation will be independent and shall not affect the grade point of other students.

(v) For a back examinee the grade and grade point of a particular subject/paper shall be calculated on the basis of its appearance in present (appearing) examination.

(vi) The result may include the absolute marks obtained a student in an individual subject with related grade. However, the mark-sheet will contain the Grade, SGPA and CGPA only along with the important related rules of CBCS system.

2. Semester wise SGPA:

$$SGPA = \frac{\sum_{i=1}^{n} c_i \times g_i}{\sum_{i=1}^{n} c_i}$$

Where,
c_i =Number of credits of the i^{th} course of a semester for which SGPA is to be calculated.
g_i =Grade points obtained in i^{th} course

$i = 1,2,\ldots,n$ represent the number of course in which a student is registered in the concerned semester.

3. Overall CGPA:

$$CGPA = \frac{\sum_{i=1}^{m} c_i \times g_i}{\sum_{i=1}^{m} c_i}$$

where,
c_i =Number of credits of the i^{th} course of a semester.
g_i = Grade points obtained in ith course. The Grade, lower than 'E' (i.e. grade point < 4.0) in a course shall not be taken into account.
$i = 1,2,\ldots,m$ represent the number of courses in which a student was registered and obtained a grade not lower than 'E' up to that semester for which CGPA is to be calculated.

(i) The SGPA/CGPA shall be awarded in each semester.
(ii) SGPA/CGPA shall be rounded off to two decimal digits on higher side.
(iii) Final course merit will be decided on the basis of absolute marks obtained by an individual student considering relevant merit ordinance of the university. Revaluation result will be taken into account for deciding the merit of the students.
(iv) Conversion of Percentage to CGPA

Equivalent Percentage= 10 x CGPA

(v) Award of Division: The division of the student shall be awarded in the following manner (subject to the passing of all the semester courses):

Table 4.1

1	CGPA ≥ 7	1st Division with Distinction
2	6≤ CGPA < 7	1st Division
3	5≤ CGPA <6	2nd Division
4	4≤CGPA <5	Pass

(vi) Maximum duration for the completion of course will be four (4) years.

4. End Term Exam Theory Paper Pattern: -

From the coming academic session 2020-21,the following single paper pattern is proposed for MCA course:

Table: 5.1

S.No.	Exam Time		End Term Exam Max. Marks(70)	
			70	
1	3 Hours	Part A	10/10	10 x 2 = 20
		Part B	5/5	5 x 4 = 20
		Part C	3/5	3 X 10 = 30

Part-A will contain 10 questions, covering full syllabus of 2 marks each .Word limit for answer is 25 words.

Part-B will contain 5 questions (1from each unit) of 4 marks each. Word limit is 100 words.

Part-C will contain 3 out of 5 questions of 10 marks each .Questions will be based on Design/ Problem Solving skills.

5. Industrial Project Guideline:

The industrial project is part of the curriculum will be held in the institute as one of the laboratories. This may be in continuations to the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level). The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by RTU.

RTU MCA SYLLABUS – YEAR-I (SEMESTER – I)

Bridge Course - Fundamentals of Computer Science [As per Choice Based Credit System (CBCS) Scheme) MCA Year 1 Semester I-BRIDGE COURSE			
Subject Code MCA-B00			
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**100**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**
Credits: 0			

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction to Computers: Characteristics of computers, Evolution of computers, generation of computers, classification of computers, applications of computers. **Input and Output Devices:** Keyboard, pointing devices, speech recognition, digital camera, scanners, optical scanners. Classification of output devices, Hard copy output devices- printers, plotters, computer output microfilm (COM), Classification of output devices, Soft copy output devices- monitors, audio output, projectors, and terminals. **Computer System:** Central processing unit (CPU), Memory, instruction format, instruction set.	
Unit-2	**08 Hours**
Primary and Secondary Memory: Memory hierarchy, Random access memory (RAM), types of RAM, Read only memory (ROM), types of ROM. Classification of secondary storage devices, magnetic tape, magnetic disk, optical disk. **Number Systems:** Introduction to number system, Binary, Octal, Hexadecimal, conversion between number bases, Alphanumeric- EBCDIC and ASCII, Sets Theory, Types of Sets, Multi Sets, Operations on Sets	
Unit-3	**08 Hours**
Computer Program: Introduction, developing a program, algorithm, flowchart, pseudo code. **Computer Languages:** Introduction, classification of programming languages, generations of programming languages, features of a good programming language. **Computer Software:** Software definition, relationship between software and hardware, software categories, system software, application software, utility software.	
Unit-4	**08 Hours**

Operating System: Introduction of operating system, types of operating system, functions of an operating system, modern operating systems. **Data Communication and Computer Network:** Introduction, data communication, transmission media, multiplexing, switching, computer network, network topologies, communication protocols, network devices. **Internet Basics:** Introduction, evolution of Internet, basic Internet terms, getting connected to Internet, Internet applications, electronic mail and other Internet Services, searching the web (search engines), languages of Internet, viruses. Use of Anti-Virus software.	
Unit-5	**08 Hours**
Office Management Tools **MS-Word:** Creating Saving documents, Entering, Editing, Page formatting, Finding and replacing text, Spell checking and Grammar checking, Indexing, Columns, Tables and feature there in, Inserting (Objects, picture, files etc.), Using Graphics, using Mail Merge, using Word Art, customizing MS Word. **MS Excel:** Spreadsheet terminology, organization of the worksheet area, editing cells using commands and functions, formatting worksheet, creating & editing charts, naming range and using statistical, mathematical and financial functions, multiple worksheets and Macros, working with objects, Worksheet printing options. **MS Power Point:** Anatomy of a power Point Presentation, Creating and Viewing a presentation, Managing Slide Shows, Using hyperlinks, advanced navigation with action setting and action buttons, organizing formats with Master Slides, adding graphics, multimedia and special effects, creating presentation for the web. **MS Access:** Planning a database (tables, queries, forms, reports), Creating and editing database, customizing tables, linking tables, designing and using forms, modifying database structure, maintaining database, Sorting and Indexing database, Querying a database and generating Reports, modifying a Report.	

Text Books:

1. Computer Fundamentals by P.K. Sinha, BPB Publication.
2. Fundamental of Computers Anita Goel, Pearson Education.
3. RajaramanV.– Fundamentals of Computers, Prentice Hall of India Pvt. Ltd.
4. MS-Office, Dr. S.S. Shrivastava, Published by Laxmi Publication.

Reference Books:

1. Computer Fundamentals and Programming in C, Reema Thareja, OXFORD University Press.
2. Introduction to Computer,Peter Norton's, Tata McGraw Hill Publication.
3. Office 2019:In Easy Steps,Michal Price ,BPB Publication.
4. Windows 8 & Office 2010, Andy Rathbone , Dummies

Bridge Course -C Programming Lab [As per Choice Based Credit System (CBCS) Scheme) MCA Year 1 Semester I-BRIDGE COURSE			
Subject Code MCA-B01			
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**100**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**
Credits: 0			
Lab Experiments			
1. Basic C Programming:-Data types, Tokens, Keywords, Operators 2. Control Statements:-Programs on if, if-else, ladder,Switch, iterative statements-for, while, do-while. 3. Functions: - Programs on Functions. 4. Arrays:-Programs on Arrays. 5. Pointer:- Programs on Pointer. 6. Structures and Union. 7. Dynamic Memory allocation Programs on File Handling.			

Mathematical Foundations in Computer Science
[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-I

Subject Code	**MCA-101**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Matrices: Introduction, Rank of Matrix, Solving System of Equations, Inverse of a Matrix, Set theory, Principle of inclusion and exclusion, partitions, Permutation and Combination, Relations, Properties of relations, Matrices of relations, Closure operations on relations, Functions- injective, subjective and objective functions.	
Unit-2	**08 Hours**
Probability: Probability Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' Theorem and independence problems. Introduction to Statistics- Population, Sample, Variable, Descriptive Statistics-Mean, Mode, Median, Measures of Spread-Range, Inter Quartile Range, Variance, Standard Deviation.	
Unit-3	**08 Hours**
Propositions & Propositional Calculus: Propositions and logical operators, Truth table, Propositions generated by a set, Equivalence and implication, Basic laws, Functionally complete set of connectives, Normal forms, Proofs in Propositional calculus, Predicate calculus.	
Unit-4	**08 Hours**
Data Representation: Data Representation - Floating point Arithmetic – Addition, Subtraction, Multiplication and Division operation. Pitfall of floating point representation, Errors in numerical computation Iterative Methods, Measurement of Accuracy by using Absolute Error and Relative Error.	
Unit-5	**08 Hours**
Graphs & Trees: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Spanning Trees	
Text Books:	

1. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill, 7th Edition, 2017.
2. Seymour Lipschutz, Marc Laras Lipson, Varsha H. Patil, " Discrete Mathematics (Schaum's Outlines) (SIE)", Revised 3rd Edition, 2017
3. Murray Spiegel John Schiller, R. AluSrinivasan, DebasreeGoswami, " Probability and Statistics", 3rd Edition, 2017
4. Salaria, R.S.: "Computer Oriented Numerical Methods", Khanna Book Publishing Co. (P.) Ltd., New Delhi. 5th Edition, 2012

Reference Books:

1. A.Tamilarasi&A.M.Natarajan, "Theory of Automata and Formal Languages", New Age International Pvt. Ltd Publishers, 2008.
2. David Makinson, "Sets, Logic and Maths for Computing", Springer Indian Reprint, 2011.
3. Edgar Goodaire ,"Discrete Mathematics with Graph Theory" Pearson Education
4. Bernard Kolman. Robert Busby. Sharon C. Ross," Discrete Mathematical Structures (Classic Version), 6th Edition", Pearson Education

Object Oriented Programming with C++ [As per Choice Based Credit System (CBCS) Scheme) SEMESTER-I			
Subject Code	**MCA-102**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**
Credits: 03			

CONTENTS	Teaching Hours
Unit-1	**08 Hours**
OOP Paradigm: Characteristics of OOP, Comparison between functional programming and OOP approach, characteristics of object oriented language - objects, classes, inheritance, reusability, user defined data types, polymorphism, overloading.	
Unit-2	**08 Hours**
Introduction to C++: Identifier and keywords, constants, C++ operators, type conversion, Variable declaration, statements, expressions, input and output, conditional expression loop statements, break control statements, Classes, member functions, objects, arrays of class objects, pointers and classes, nested classes, constructors, destructors Inline member functions, static class member, friend functions, and dynamic memory allocation.	
Unit-3	**08 Hours**
Polymorphism and Inheritance: Function overloading, operator overloading, polymorphism, early binding, polymorphism with pointers, virtual functions, late binding, pure virtual functions. Single inheritance, types of inheritance, types of base classes, types of derivations, multiple inheritances, container classes, member access control.	
Unit-4	**08 Hours**
Exceptions and Templates: Exception Syntax, Multiple Exceptions, Function Templates, Function Templates with multiple argument templates.	
Unit-5	**08 Hours**
File Handling in C++: C++ Streams, Console Stream Classes, Formatted And Unformatted Console I/O Operations, manipulators, File Streams, Classes File Modes, File Pointers and Manipulations File I/O	

Text Books:

1. K.R. Venugopal, Raj Kumar Buyya, “Mastering C++", McGraw-Hill, 2017.
2. Rajaram R, Object Oriented Programming and C++”, 2nd Edition, New Age International, 2013.
3. E Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill, 2006
4. Yahwant Kanetkar, ”C++ Programming”, BPB Publication

Reference Books:
1. Kamthane," Object Oriented Programming with ANSI and Turbo C++", Pearson Education, 2006.
2.Andrei Alexandrescu," Modern C++ Design: Generic Programming and Design Patterns Applied "
3. Robert Lafore," Object Oriented Programming in C++ ",4th Edition, 2002
4. Bjarne Stroustrup," C++ Programming Language", Addison-Wesley, 2013

Operating System
[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-I

Subject Code	**MCA-103**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction: Definition and types of operating systems, Batch Systems, multi programming, timesharing, parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, system boot. Process Management : Process concept, Process scheduling, Cooperating process, Threads, Interprocess communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling and Algorithm evaluation.	
Unit-2	**08 Hours**
Process Synchronization and Deadlocks: The Critical-Section problem, synchronization hardware, Semaphores , Classical problem of synchronization, Critical regions, Monitors, Deadlock-system model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling. **Storage Management**: Memory Management –Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing , Page Size and other considerations.	
Unit-3	**08 Hours**
Introduction to concept of Open Source Software: Introduction to Linux , Evolution of Linux, Linux vs. UNIX, Different Distributions of Linux, Installing Linux, Linux Architecture, Linux file system (inode, Super block, Mounting and Unmounting), Essential Linux Commands (Internal and External Commands), Kernel, Process Management in Linux, Signal Handling, System call, System call for Files, Processes and Signals.	
Unit-4	**08 Hours**
Shell Programming: Shell Programming – Introduction to Shell, Various Shell of Linux, Shell Commands, I/O Redirection and Piping, Vi and Emacs editor, Shell control statements, Variables, if-then-else, case-switch, While, Until, Find, Shell Meta characters, Shell Scripts, Shell keywords, Tips and Traps, Built in Commands, Handling documents, C language programming, Prototyping, Coding, Compiling, Testing and Debugging, Filters	

Unit-5	**08 Hours**
Linux System Administrations: File listings, Ownership and Access Permissions, File and Directory types, Managing Files, User and its Home Directory, Booting and Shutting down (Boot Loaders, LILO, GRUB, Bootstrapping, init Process, System services)	

Text Books:

1. Silberschatz and Galvin, "Operating System Concepts", 10th edition, Wiley India, 2018.
2. Andrew S. Tanenbaum, Albert S. Woodhull, "Operating Systems Design & implementation", 3rd edition, Pearson Education, 2006.
3. UNIX: Concepts and Applications, Sumitabha Das, McGraw-Hill, 4th Edition, 2008.

Reference Books:

1. Practical Guide to Linux Commands, Editors, and Shell Programming, Sobell, Pearson, 2nd Edition, 2010.
2. A Practical Guide to Fedora and Red Hat Enterprise Linux, Sobell, Pearson, 5th Edition, 2010.
3. Forouzan B. A., Gilberg R. R., "UNIX and Shell Programming", TMH, 2nd edition, 2008.

Computer Architecture
[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-I

Subject Code	**MCA-104**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Basic Building Blocks: Gates, Boolean Functions and Expressions Designing Gate Networks, K-map simplification, Useful Combinational Parts, Programmable Combinational Parts, Timing and Control, Latches, Flip-flops, Registers and Counters, Sequential Circuits. **Arithmetic/Logic Unit**: Numbers Representation, Arithmetic Operations, Floating-Point Arithmetic.	
Unit-2	**08 Hours**
Register Transfer Language and Micro-operations: Concept of bus, data movement among registers, a language to represent conditional data transfer, data movement from/ to memory. Design of Arithmetic & Logic Unit and Control Unit Control design hardwired control, micro programmed arithmetic and logical operations along with register transfer, timing in register.	
Unit-3	**08 Hours**
Instruction and Addressing: A simple computer organization and instruction set, instruction formats, addressing modes, instruction cycle, instruction execution in terms of microinstructions, interrupt cycle, concepts of interrupt and simple 1/O organization, Synchronous & Asynchronous data transfer, Data Transfer Mode: Program Controlled, Interrupt driven, DMA (Direct Memory Access). Implementation of processor using the building blocks.	
Unit-4	**08 Hours**
Memory System Design: Memory Origination, Memory Hierarchy, Main Memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache Memory, Virtual Memory. Assembly Language Programs, Assembler Directives, Pseudo Instructions, Macroinstructions, Linking and Loading.	
Unit-5	**08 Hours**
Vector and Array Processing: Shared-Memory, Multiprocessing, Distributed Mufti Computing. **Microprocessor Concepts**: Pin Diagram of 8085, Architecture of 8085, Addressing Mode of 8085, functional block diagram of 8085 assembly language, instruction set of 8085.	

Text Books:

1. M. Morris Mano "Computer System Architecture" Prentice Hall, 2017
2. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.

Reference Books:

1. William Stallings, Computer Organization and Architecture – Designing for Performance, 8th Edition, Pearson Education, 2010.
2. John P. Hayes, Computer Architecture and Organization, 3rd Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach‖, Morgan Kaufmann / Elsevier Publishers, 5th Edition, 2012.

Database Systems [As per Choice Based Credit System (CBCS) Scheme) SEMESTER-I			
Subject Code	**MCA-105**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**
Credits: 03			

CONTENTS	**Teaching Hours**
Unit-1	**06 Hours**
Introduction Overview of DBMS, Database System v/s File System, Architecture of DBMS, Data models**,** Entity Relationship Diagram, Types of Keys, Integrity Rules, Data Dictionary, Normalization (1NF, 2 NF, 3NF, BCNF, 4NF, 5NF), inclusion dependencies, loss less join decompositions, Codd's Rules	
Unit-2	**06 Hours**
Transaction Management Transactions: Concepts, ACID Properties, States Of Transaction, Serializaibility, Conflict & View Serializable Schedule, Checkpoints, Deadlock Handling	
Unit-3	**08 Hours**
Database Querying& Concurrency Control Relational Algebra, Set Operations, Relational Calculus, Steps In Query Processing, Algorithms For Selection, Sorting And Join Operations, Understanding Cost Issues In Queries, Query Optimization, Transformation Of Relational Expressions, Query Evaluation Plans Concurrency Control: Locks Based Protocols, Time Stamp Based Protocols, Validation Based Protocol, Multiple Granularity, Multi-version Schemes	
Unit-4	**08 Hours**
Recovery System & Security Failure Classifications, Recovery & Atomicity, Log Base Recovery, Recovery with Concurrent Transactions, Shadow Paging, Failure with Loss of Non-Volatile Storage, Recovery From Catastrophic Failure, Introduction to Security & Authorization, Introduction to emerging Databases-OODBMS, ORDBMS, Distributed database, Multimedia database ,Special database-limitations of conventional databases, advantages of emerging databases.	
Unit-5	**12 Hours**
SQL and PL/SQL Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators, Tables, views and indexes, Constraints, Group By and Having Clause, Order By Clause, Queries and sub queries, Functions, PL/SQL basics, blocks, architecture, variables, constants, attributes, character set, PL/SQL control structure, data types, conditional and	

sequential control statements, cursors, exceptions, triggers, functions, procedures and packages.	

Text Books:

1. Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley, 6th Edition, 2011
2. Korth, Silberschatz, Sudarshan, "Database Concepts", McGraw Hill, 6thEdition, 2010

Reference Books:

1. Thomas Connolly, Carolyan Begg,, "Database Systems,: A Practical Approach to Design, Implementation and Management, Addison Wesley, 2014
2. Simon AR, "Strategic Database Technology: Management for the year 2000", Morgan Kaufmann, 1995
3. Gray J and Reuter A, "Transaction Processing: Concepts and Techniques", Morgan Kaufmann, 1993.
4. S.K.Singh," Database System: Concept ,Design and Application" PEARSON,2006
5. Raghu Ramkrishnan, Johannes Gehrke , "Database Management Systems", McGraw Hill International, 2007
6. C.J.Date, Longman, "An Introduction to Database System", Pearson Education, 2003

Web Technologies
[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-I

Subject Code	**MCA-106**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction to HTML The internet: history of the World Wide Web, hardware and software trend, object technology – java script object, scripting for the web-browser portability. Introduction of HTML: introduction, markup language, editing HTML : common tags, headers, text styles, linking, images, formatting text, horizontal rules and more line breaks, unordered lists, nested and ordered lists, basic HTML tables : intermediate HTML tables and formatting : basic HTML forms, more complex HTML forms, HTML5: Input Types & Attributes, internal linking, creating and using image maps	
Unit-2	**08 Hours**
Java Script Introduction to scripting: introduction- memory concepts- arithmetic- decision making. Java script control structures, Java script functions: introduction – program Units in java script - function definitions, duration of identifiers, scope rules, recursion, java script global functions. Java script arrays: introduction, array-declaring and allocating arrays, references and reference parameters – passing arrays to functions, multiple subscripted arrays. Java script objects: introduction, math, string, date, Boolean and number objects.	
Unit-3	**08 Hours**
Dynamic HTML CSS: introduction – inline styles, creating style sheets with the style element, conflicting styles, linking external style sheets, positioning elements, backgrounds, element dimensions, text flow and the CSS box model, user style sheets, Filter and Transitions, HTML DOM, Browser BOM Event model : introduction, event ON CLICK, event ON LOAD – error handling with ON ERROR, tracking the mouse with event, more DHTML events.	
Unit-4	**08 Hours**
Introduction to PHP &Web Server Architecture Overview of PHP Capabilities, PHP HTML embedding tags & syntax, Simple script examples, PHP & HTTP Environment variables. PHP Language Core-Variables, Constants, Data Types, PHP: Operators, Flow Control & Loops, Arrays, String, Functions Include & require statements, Simple File & Directory Access Operations,	

Unit-5	**08 Hours**
Error handling, Processing HTML form using GET, POST, REQUEST, SESSION, COOKIE variables, Sending E-mail, Database Operations with PHP, Connecting to My-SQL (or any other database), Selecting a db, building & Sending Query, retrieving, updating & inserting data, CMS: Wordpress. Note: XAMMP is used for PHP	

Text Books:

1. Jennifer Robbins , "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web graphics",O'reilly, 2018
2. Adrian W. West ," Practical Web Design for Absolute Beginners", 2016
3. Harvey M. Dietel, Paul Dietel& Tem R. Nieto, ", Internet& World Wide Web How to Program", Pearson, 2011
4. Ivan Bayross. "Web enabled commercial application development using HTML, DHTML, JavaScript, PERL-CGI", BPB Publications, 2010

Reference Books:

1. Hofstetter, Fred, "Internet Technology at work", Osborne, 2004
2. Steven Holzner, "PHP: The Complete Reference", McGrawHill, 2008
3. Elizabeth Naramore, Jason Gerner, Jeremy Stolz, and Timothy Boronczyk Beginning PHP, Apache, MySql web development.Wrox Publication, 2009
4. Ivan Bayross, Sharanam Shah, Shroff ,"PHP 5.1 for Professionals", Publishers and Distributers Pvt. Ltd., 2007

Object Orientated Programming Lab
[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-I

Subject Code	**MCA-151**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**
Credits: 01			

Lab Experiments

1. Basic Commands of Linux.
2. Basic Shell Programming.
3. Accessing help options, File names and Wild Card, Types of Files, Directory Hierarchy, Operations.
4. Introduction of vi and gedit Editor, File Permissions and Simple Filter Commands
5. Control Statements:-Programs on if-else ladder, iterative statements, Functions and recursions, predefined functions.
6. Pointer and Dynamic Memory:-Programs on Arrays, sorting (Bubble, selection, insertion) Searching (linear, Binary), 2D Array (Matrix operations), Pointers, Structures, union, enum, Dynamic Memory allocation Programs on File Handling, Programs on Command Line Arguments.
7. Objects, Functions and Constructor:- Programs on classes and objects constructors, functions , inline functions, Friend function.
8. Polymorphism:-Programs on Function Overloading, overriding, Operator overloading, programs on different type of inheritances, virtual function.
9. Exception Handling and File Handling: - Programs on input/output Streams, Exception Handling, File Handling,and Template Classes.

SQL-PL/SQL Lab
[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-I

Subject Code	**MCA-152**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 01

Lab Experiments

1. SQL data types, Operators, Literals, Constraints
2. Assignment on Queries: Select / From / Where/ Group By/Having Clause/ Order By Clause/ SQL Operators/ Joins/ Built-in Functions
3. PL/SQL Block Structure
4. Conditional Statements
5. Iterations: Simple Loops, For Loop, While Loop, Nested Loops
6. Exception Handling
7. Database Programming with Record Variables
8. Database Programming with Cursors, Cursor-For Loop
9. Procedures & Functions
10. Triggers
11. Packages

Web Technologies Lab
[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-I

Subject Code	**MCA-153**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 01

Lab Experiments

HTML:

- Basics Elements & Attributes, HTML Formatting tags, Links,
- Images, Tables, Forms Elements
- HTML5 Audio and Video, HTML5 Input Types & Attributes
- CSS Syntax, CSS Attribute Selectors
- CSS properties: Fonts, Background, Colors, Links, Lists,
- CSS Box Model, Display, Opacity, Float, Clear
- CSS Layout, CSS Navigation Bar,
- CSS Rounded Corners, CSS Border Images, CSS Animations

JavaScript:

- Displaying Output, Declaring Variables, Operators, Arithmetic, Data Types, Assignment
- JavaScript Functions, Booleans, Comparisons, Conditional ,
- JavaScript Switch, Loops, Break, Type,
- JavaScript Objects, Scope,
- Strings and String Methods
- Numbers and Number Methods, Math, JavaScript Dates: Formats and Methods
- JavaScript Events, JavaScript, JavaScript Forms (API and Validation), Objects,
- JavaScript Functions, JavaScript DOM, JavaScript Validation, Browser BOM

PHP:

- Installing XAMMP
- Variables, Data Types, Constants, Operators, Programming Loops,
- PHP Functions,
- Arrays
- Strings Functions
- PHP Form Handling, Require & Include
- PHP with MySQL

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

RTU MCA SYLLABUS – YEAR-I (SEMESTER – II)

Java Technologies [As per Choice Based Credit System (CBCS) Scheme) SEMESTER-II			
Subject Code	**MCA-201**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**
Credits: 03			

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction to Java OOP in Java, Characteristics of Java, Fundamental Programming Structures in Java, Abstract Class, Interfaces, Defining Methods, Inheritance, Overloading, Overriding, Packages, Exception Handling, Threads, Thread Life-Cycle	
Unit-2	**08 Hours**
J2EE Overview Need of J2EE, J2EE Architecture, J2EE APIs, J2EE Containers. Web Application Basics, Architecture and Challenges of Web Application, Servlet Life Cycle, Developing and Deploying Servlets, Exploring Deployment Descriptor (web.xml), Handling Request and Response, Initializing a Servlet. Servlet Chaining, Session Tracking and Management	
Unit-3	**08 Hours**
JDBC The JDBC Connectivity Model, Types of JDBC Drivers., Basic steps to JDBC, setting up a connection to database, Creating and executing SQL statements, ResultSet and ResultSet Metadata Object,Accessing Database.	
Unit-4	**08 Hours**
Java Server Pages Basic JSP Architecture, Life Cycle of JSP, JSP Tags & Expressions, JSP Implicit Objects, JSP Directives, Tag Libraries ,Using JDBC with JSP , Accessing a Database, Adding a Form, Updating the Database.	
Unit-5	**08 Hours**
Introduction to Spring Overview of Spring Framework- Inversion of Control / Dependency Injection Concepts, Aspect Oriented Programming - concept ,Spring MVC Architecture , Bean Factory and Application Context, Attaching and Populating beans, Injecting data through setters and constructors , Listening on events, Publishing events, Spring MVC Layering, Dispatcher Servlet, Writing a Controller, DAO, Models, Services, Spring Configuration File, Error handling Strategy.	

Text Books:

1. Herbert Schildt, "Java: The Complete Reference", 10th Edition, McGraw-Hill, 2017.
2. Marty Hall and Larry Brown, "Core Servlets and Java Server Pages", 2nd Edition, 2003.
3. MertCaliskan, KenanSevindik, Rod Johnson, Jurgen Holler, "Beginning Spring", Wrox publication, Feb 2015.

Reference Books:

1. Bruce Eckel, "Thinking in Java", 4th Edition, Prentice Hall, 2006.
2. Cay S. Horstmann, "Core Java, Volume I: Fundamentals", 9th Edition, Pearson Education, 2014.
3. Santosh Kumar K, "JDBC, Servlet, and JSP: Black Book", Kogent Solutions Inc., 2008.
4. MadhusudhanKonda, "Just Spring", 1st edition, O'Reilly, 2011.
5. E. Balagurusamy, "Programming with Java: A Primer", Tata McGraw-Hill, 2010.
6. Bryan Basham, Kathy Sierra & Bert Bates , "Head First Servlets and JSP" Paperback, 2008

Computer Networks
[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-II

Subject Code	**MCA-202**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Networking Fundamentals Introduction, Data & Information, Data Communication-Characteristics of Data Communication, Components of Data Communication, Data Representation, Data Flow- Simplex, Half Duplex, Full Duplex, Computer Network- Categories of a network, Protocol- Elements of a Protocol, Networking Standards, Reference Models- OSI Model, TCP/IP Model, Comparison of OSI and TCP/IP Model	
Unit-2	**08 Hours**
The Physical Layer Transmission Media- Guided & Unguided, PSTN: Structure of the Telephone System, Data & Signals Data types, Signal types- Analog & Digital, Modulation Techniques, Modem, Cable Modem, Protocols: DSL, ISDN. **The Data Link Layer Design Issues** Framing, Error Control-Error Detection and Correction, Flow Control, Protocols: FDDI, CDDI, Frame Relay, ATM, 802.11, PPP, HDLC.	
Unit-3	**08 Hours**
The Medium Access Sub-Layer Multiple Access Protocols: ALOHA, CSMA, Ethernet: Switched Ethernet, Fast Ethernet, Gigabit Ethernet, DLL Switching: Internetworking, Repeaters, Hubs, Bridges, Switches, Routers, Gateways, Virtual LANs.	
Unit-4	**08 Hours**
The Network Layer Design Issues, Routing Algorithms: Link State Routing, Distance Vector Routing, Flooding, Routing Protocols: RIP, IGRP, EIGRP, OSPF, Internetworking: Tunneling, Fragmentation, IPV4, IPV6 Basics, BGP. The Transport Layer Protocols: UDP, TCP, Headers	
Unit-5	**08 Hours**
The Application Layer DNS: The DNS Name Space, Name Servers-Mail: SMTP, POP3, HTTP, FTP, Telnet, Network Management: SNMP. **Network Security** Cryptography: Encryption, Decryption, Private/Public Key, Digital Signatures,	

SSL, Firewalls, PGP, S/MIME.	

Text Books:

1. Andrew S.Tanenbaum, "Computer Networks", Prentice Hall, 5th Edition, January, 2013.
2. A. BehrouzForouzan, "Data Comm. & Netw.5e Global Ed (English)" , McGraw Hill Education (India) Private Limited, 5thEdition, 2013.

Reference Books:

1. Andrew S.Tanenbaum, "Computer Networks ", Prentice Hall, 5thEdition (Paperback) January 2013
2. Douglas E.Comer& M. S. Narayana, "Computer Networks and Internets with Internet Applications", Pearson Education, 4th Edition, 2009.
3. Fred Halsall, "Data Communications, Computer Networks and Open Systems", Addison Wesley, 4th Edition, 2001.
4. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education, 5thEdition, 2011.

Data Structures [As per Choice Based Credit System (CBCS) Scheme) SEMESTER-II			
Subject Code	**MCA-203**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**
Credits: 03			

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction Basic data structures such as arrays, linked list, stack, trees and queues and theirapplications, linked and sequential representation Basic Terminology, Elementary Data organization, Data Structure operations. Preliminaries of algorithm, Algorithm analysis and complexity. **Stack** Implementation of stack, operations on stack. Applications of stack: Conversion of infix-expressions to prefix and postfix expressions, evaluation of postfix expression.	
Unit-2	**08 Hours**
Queues Implementation of queues, Operations on Queue, Types of Queues - Circular queue, Dequeue and Priority Queue. **Linked List** Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, insertion and deletion to/from Linked Lists, insertion and deletion Algorithms, Doubly linked list, Header lists, circular lists, sorted lists.	
Unit-3	**08 Hours**
Trees Basic terminology and definitions. Array and Linked Representation of Binary trees, Traversing Binary trees. Binary Search Trees: Binary Search Tree (BST), Traversal, Insertion and Deletion in BST, and Introduction to balanced BST (AVL Trees)	
Unit-4	**08 Hours**
Searching: Sequential search, binary search, comparison and analysis. **Sorting** Insertion Sort, Bubble Sort, Quick Sort, Two-Way-Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for internal Sorting.	
Unit-5	**08 Hours**

Graphs Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees	

Text Books:

1. A. Tannenbaum, "Data Structure Using C", Pearson Education, 2019.
2. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
3. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Course Private Limited, 2012.

Reference Books:

1. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009.
2. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
3. D.S Malik, "Data Structures using C++", Cengage Learning, 2nd edition, 2009
4. E. Horowitz &Sahni, "Fundamental Data Structure", Galgotia Book Source, 2007.

Software Engineering & UML [As per Choice Based Credit System (CBCS) Scheme) SEMESTER-II			
Subject Code	**MCA-204**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**
Credits: 03			

CONTENTS	Teaching Hours
Unit-1	**08 Hours**
Software Engineering Fundamentals Software Engineering - A layered Technology, The importance of software, software myths, software engineering paradigms, Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model Evolutionary Software Process Models: Incremental Model, Spiral Model Component Assembly Model, Formal Methods, Fourth-Generation Techniques.	
Unit-2	**08 Hours**
Analysis Concepts and Principles Analysis Concepts and Principles, the Elements of the Analysis Model Data Modifying, Functional Modeling and Information Flow and Behavior Modeling, Mechanics of Structured Analysis, Data Dictionary. Requirement analysis, tasks, analyst, software prototyping, specification principles, representation and the software requirements specification.	
Unit-3	**08 Hours**
Software Project Planning Software Project Planning, Size Estimation, Cost Estimation, Models, Static, single variable models, Static, Multivariable Models, COCOMO, The Putnam Resource Allocation Model, Risk Identification and Projection: RMMM, Project scheduling and Tracking. Software Design Process, Design Principles, and Design Concepts: Effective ModularDesign, Design Heuristics, Design Documentation, Design Methods: Data Design, Architectural Design, Interface Design, Human Computer Interface Design, Procedural Design. Case Study for Design of any Application Project.	
Unit-4	**08 Hours**
Software Testing S/W Testing Fundamentals, White Box Testing, Black Box Testing, software testing strategies, verification and Validation, System Testing, Unit testing, Integration testing and Debugging. Software Maintenance Maintainability – maintenance Tasks, Characteristics of a good quality software. Case Study for Testing Techniques	
Unit-5	**08 Hours**

Unified Modeling Language (UML) Unified Modeling Language, Basic structures and modeling classes, common modeling techniques, relationships, common mechanism, class diagrams. Advanced structured modeling, advanced classes and relationships, interfaces, types and roles, instances and object diagram. Basic idea of behavioral modeling. State diagrams, Interaction diagrams, Use case diagrams Object- oriented concepts and principles. Identifying the elements of an object model. Object oriented projects metrics and estimation	

Text Books:

1. Roger S Pressman, Bruce R Maxim, "Software Engineering: A Practitioner's Approach", 8th Edition, 2019.
2. Ian Sommerville," Software engineering", Addison Wesley Longman, 9th Edition, 2017.

Reference Books:

1. Grady Booch, James Rumbaugh, IvarJacobson.," The Unified Modeling Language User Guide", 2nd Edition, 2017.
2. James Rumbaugh. MichealBlaha "Object oriented Modeling and Design with UML", 2011.
3. Ali Behforooz, Hudson, "Software Engineering Fundamentals", Oxford, 2009.
4. Charles Ritcher, "Designing Flexible Object Oriented systems with UML", TechMedia , 2008.

Python Programming
[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-II

Subject Code	**MCA-205**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction and Overview Introduction, What is Python, Origin, Comparison, Comments, Variables and Assignment, Identifiers, Basic Style Guidelines, Python Objects, Standard Types, Other Built-in Types, Internal Types, Operators, Built-in Functions, Numbers and Strings. Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Sequences: Strings, Sequences, Strings, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings, Memory Management, Python Application Examples.	
Unit-2	**08 Hours**
Lists and Dictionaries Built-in Functions, List type built in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples, Introduction to Dictionaries, Built-in Functions, Built-in Methods, Dictionary Keys, Conditionals and Loops: if statement, else Statement, elif Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement	
Unit-3	**08 Hours**
Object, Classes and Files Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, Class variables, Inheritance, Polymorphism, Type Identification, File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Units.	
Unit-4	**08 Hours**
Regular Expression and Exception Handling Regular Expression: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python. What Are Exceptions? Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions	
Unit-5	**08 Hours**

Database Interaction SQL Database Connection using Python, Creating and Searching Tables, Reading and storing config information on database, Programming using database connections, Python Multithreading: Understanding threads, Forking threads, synchronizing the threads, Programming using multithreading	

Text Books:

1. R. NageswaraRao, "Core Python Programming", Dreamtech Press, 2nd Edition, 2018
2. Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, "Python Programming" , Notion Press, 1stEdition, 2020
3. Martin C. Brown, "The Complete Reference Python", McGraw Hill Education, 4thEdition, 2018

Reference Books:

1. Allen B. Downey, "Think Python", O'Reilly Media, 2016
2. Amit Ashok Kamthane, Ashok NamdevKamthane, " Programming and Problem Solving with Python" , McGraw Hill HED, 1st Edition, 2017
3. SakisKasampalis, Quan Nguyen, Dr Gabriele Lanaro, Ingram, "Advanced Python Programming", short title, 2019

Business Informatics
[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-II

Subject Code	**MCA-206**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Business Environment and Dependence on IT Introduction to Business Informatics, Organizational Structure and Design, Dependence on Technology, Integrating Technology with Business Environment, IT and Corporate Strategy, Sustaining a Competitive Edge through application of IT in Management Functions.	
Unit-2	**08 Hours**
E-Commerce Definition, Objectives, Components, Advantages and disadvantages, Scope, E-Commerce Models, E-Commerce Opportunities for Industries, Growth of E-Commerce, e-Commerce Applications- E-Marketing, E-Customer Relationship Management, E-Supply Chain Management, E-Governance, E-Buying, E-Selling, E-Banking, E-Retailing.	
Unit-3	**08 Hours**
E-Payments and Security issues in E-Commerce Introductions, Special features, Types of E-Payment Systems (EFT, E-Cash, E-Cheque, Credit/Debit Card, Smart Card, Digital Tokens and Electronic Purses/ Wallets), Security risk of E-Commerce, Types of threats, Security Tools, Cyber Laws, Business Ethics	
Unit-4	**08 Hours**
ERP Introduction, Needs and Evolution of ERP Systems, ERP Domain, ERP Benefits, ERP and Related Technologies, Relevance to Data Warehousing and Data Mining, ERP Drivers, Evaluation Criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement Phases, ERP Units, ERP Success & Failure Factors	
Unit-5	**08 Hours**
Information Systems Introduction, Categories of System: Open, Closed, Physical, Abstract, Dynamic, Static etc., Types of Information Systems: TPS, MIS, DSS, OLAP, OLTP, Expert System, Internet Based Systems, Learning Management Systems, Business Process	

Re-Engineering.	

Text Books:

1. Ravi Kalakota, “Electronic Commerce: A Manager's Guide”, Addison-Wesley Professional, Edition 2012.
2. Henry C. Lucas, Information Technology for Management, McGraw Hill, International Edition, July 2001.
3. Kenneth C. Laudon& Jane P. Laudon, Management Information System, Global Edition, Pearson Education, 2009.
4. ERP: A Managerial Perspective Book Description, Sadagopan S, Tata McGraw Hill, 2013

Reference Books:

1. Dr. K Abirami Devi & Dr. M Alagammai, “E-Commerce Essentials”, Margham Publication, 2012.
2. Kenneth C. Laudon, Karol Traver, “E-Commerce 2014”, Prentice Hall Publication, 2013.
3. Enterprise Resource Planning Systems System, Lifecycle, Electronic Commerce and Risk by Daniel E.O. Leary, 2011
4. WamanJawadekar, Management Information System: Text and Cases, Tata McGraw Hill, June 2009.

Data Structures Lab [As per Choice Based Credit System (CBCS) Scheme) SEMESTER-II			
Subject Code	**MCA-251**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**
Credits: 01			

Lab Experiments

1. Array implementation of Stack and Queue
2. Linked list implementation of List, Stack Queue
3. Array implementation of QUEUE
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues.
9. Graph representation and Traversal algorithms
10. Applications of Graphs
11. Implementation of searching and sorting algorithms

Java Technologies Lab
[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-II

Subject Code	**MCA-252**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 01

Lab Experiments

1. Simple java applications for understanding references to an instant of a class
2. Handling strings in JAVA
3. Package creation
4. Developing user defined packages in java
5. Use of Interfaces
6. Threads, Multithreading
7. Exception Handling
8. Dynamic HTML using Servlet
9. Use of get() and Post() methods
10. Cookies in Servlet
11. Session tracking and Management
12. JDBC
13. JSP Actions elements
14. Directives elements in JSP
15. JSP Tags
16. Implement JDBC with JSP
17. Implement JDBC with Servlet
18. Applications using Spring Web MVC

Python Programming Lab [As per Choice Based Credit System (CBCS) Scheme) SEMESTER-II			
Subject Code	**MCA-253**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**
Credits: 01			

Lab Experiments

1. Implement a sequential search
2. Create a calculator program
3. Explore String Functions
4. Implement Selection Sort
5. Implement Stack
6. Read and Write into a file
7. Demonstrate usage of basic regular expression
8. Demonstrate use of advanced regular expressions for data validation
9. Demonstrate use of List
10. Demonstrate use of Dictionaries
11. Create Comma separate files(CSV), Load CSV files into internal data structure
12. Write script to work like a SQL SELECT statement for internal data structure

MCA (Master of Computer Applications)

MCA SYALLABUS YEAR-II SESSION 2021-22
YEAR-II

1. III-Semester (Second Year)

S No	Category	Credit
1	Theory	18
2	Practical	03
3	SODECA	02
	Total	**23**

III-Semester (Second Year) MCA Year 2 - Semester III								
Theory								
S. No.	**Course Code**	**Course Title**	**Hours**		**Marks**			**Credits**
			L	**P**	**IA**	**ETE**	**Total**	
1	MCA-301	Cloud Computing	3		30	70	100	3
2	MCA-302	Analysis and Design of Algorithm	3		30	70	100	3
3	MCA-303	Artificial Intelligence	3		30	70	100	3
4	MCA-304	Information Security	3		30	70	100	3
5	MCA-305	Mobile Application Development	3		30	70	100	3
6	MCA-306	Elective 1	3		30	70	100	3
Practical								
1	MCA-351	ADA Lab		2	30	70	100	01
2	MCA-352	Mobile Application Development Lab		2	30	70	100	01
3	MCA-353	Summer Industrial Training Presentation		2	30	70	100	01
4		SODECA						02
Total					**270**	**630**	**900**	**23**

L= Lecture, **P** = Practical, **IA** = Internal Assessment, **ETE** = End Term Exam

Elective -1:

a) Data Mining and Warehousing
b) Big Data Technologies
c) Soft Computing

2. IV-Semester (Second Year)

S No	Category	Credit
1	Theory	06
2	Practical	06
3	SODECA	02
	Total	**14**

MCA Year 2 - Semester IV								
Theory								
S. No.	**CourseCode**	**Course Title**	**Hours**		**Marks**			**Credits**
			L	**P**	**IA**	**ETE**	**Total**	
1	MCA-401	Software Project Management	3		30	70	100	3
2	MCA-402	Elective 2	3		30	70	100	3
Practical								
3	MCA-451	Industrial Project		12	30	70	100	06
4		SODECA						02
Total					**90**	**210**	**300**	**14**

L= Lecture, **P** = Practical, **IA** = Internal Assessment, **ETE** = End Term Exam

Note: The industrial project is part of the curriculum will be held in the institute as one of the laboratories. This may be in continuations to the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level).
The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by RTU.

Elective 2:

a) Principles of Management and Information System
b) Machine Learning
c) Data Science with R

Cloud Computing

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	**MCA 301**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction to Cloud: Cloud Computing at a Glance, Vision of Cloud Computing, Defining a Cloud, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments, Risks and Approaches of Migration into Cloud ,Types of Clouds, Services models, Cloud Reference Model.	
Unit-2	**08 Hours**
Cloud Architecture: cloud architecture, features and benefits of Servive Models: Software as a Service (SaaS),Platform as a Service (PaaS), Infrastructure as a Service (IaaS), Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.	
Unit-3	**08 Hours**
Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V. Virtualization of CPU, Memory, I/O Devices, Virtual Cluster ,datacenterand Resources Management.	
Unit-4	**08 Hours**
Securing the Cloud: Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture. Legal issues in cloud Computing. **Data Security in Cloud**: Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management	
Unit-5	**08 Hours**
Defining the Clouds for Enterprise: Storage as a service, Database as a service, Process as a service, Information as a service, Integration as a service and Testing as a service. **Disaster Management in Cloud:** Disasters in the Cloud, Disaster Recovery Planning.	

Text Books:

- San Murugesan, Irena Bojanova, "Encyclopedia of Cloud Computing", Wiley , 2016
- Kai Hawang , GeofreyC.Fox, Jack J. Dongarra, "Distributed and Cloud Computing: From Parallel Processing to the Internet of Things", Morgan Kaufmann, 2013
- RajkumarBuyya, JemesBroberg, A. Goscinski, "Cloud Computing : Principal and Paradigms", Wiley, 2011

References:

- Krutz , Vines, "Cloud Security " , Wiley Pub, 2014
- Velte, "Cloud Computing- A Practical Approach" ,TMH Pub, 2015

Analysis and Design of Algorithm

[As per Choice Based Credit System (CBCS) Scheme]
SEMESTER-III

Subject Code	**MCA-302**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction - Algorithm definition and specification – Design of Algorithms, and Analysis of Algorithms, Asymptotic Notations, Growth of function: Asymptotic notations Performance Analysis Space complexity, Time complexity, Divide and conquer- General method, applications – Binary search, Merge sort, Quick sort	
Unit-2	**08 Hours**
The Greedy method General method – knapsack problem – minimum cost spanning tree (Prims and Kruskal algorithm) – single source shortest path-DijkastraAlgorithm .	
Unit-3	**08 Hours**
Dynamic Programming – general method – multistage graphs – all pair shortest path – 0/1 Knapsack – traveling salesman problem – flow shop scheduling.	
Unit-4	**08 Hours**
Backtracking: General method – 8-Queens problem – sum of subsets – graph coloring – Hamiltonian cycles– knapsack problem. Branch and bound:- The Method – 0/1 Knapsack problem – traveling sales person.	
Unit-5	**08 Hours**
Parallel models Basic concepts, performance Measures, Parallel Algorithms: Parallel complexity, Analysis ofParallel Addition, Parallel Multiplication and division, parallel Evaluation of GeneralArithmetic Expressions, First-Order Linear recurrence. **NP-hard and NP-complete problems:** Basic Concepts, non-deterministic algorithms, Np-hard graph problems and scheduling problems.	

Text Books:

- AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
- Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

References:

- Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education,2009.
- Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.

Artificial Intelligence

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	**MCA-303**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 3

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
General Issues and overview of AI Concept of AI, AI technique, Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving, Production systems, and Control strategies, forward and backward chaining Exhaustive searches: Depth first and Breadth first search.	
Unit-2	**08 Hours**
Heuristic Search Techniques Hill climbing, Branch and Bound technique, Best first search and A* algorithm, AND/OR Graphs,Problem reduction and AO* algorithm, Constraint Satisfaction problems, Game Playing Min Max Search procedure.	
Unit-3	**08 Hours**
Knowledge Representation First Order Predicate Calculus, Resolution Principle and Unification, Inference Mechanisms Horn'sClauses, Semantic Networks, Frame Systems , Scripts, ConceptualDependency AI Programming Languages.	
Unit-4	**08 Hours**
Natural Language Processing: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – RegularExpressions, Finite-State Automata – English Morphology, Tokenization, Part-of-Speech Tagging, Issues in Part-of-Speech tagging.Semantics and pragmatics-Requirements for representation, Syntax-Driven Semantic analysis, Introduction to syntactic analysis.	
Unit-5	**08 Hours**
Expert Systems Introduction to Expert Systems, Architecture of Expert Systems, Expert System Shells, Knowledge Acquisition, Case Studies of Expert System. **Learning**: Concept of learning, Types of learning.	

Text Books:

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 3 rd edition, 2009.
2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India, 1 st edition, 1997.
3. Winston, Patrick, Henry, "Artificial Intelligence", Pearson Education, 3 rd edition, 2004
4. SubhasreeBhattacharjee, "Artificial Intelligence for Student" Shroff Publishers and Distributors Pvt.LTD., 1 st Edition, 2016

ReferenceBooks:

1. Nils J. Nilsson, "Principles of Artificial Intelligence (Symbolic Computation / Artificial Intelligence)", reprint edition, 2014.
2. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 3 rd edition, 2010.
3. Daniel Jurafsky, James H. Martin Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

Information Security

[As per Choice Based Credit System (CBCS) Scheme]
SEMESTER-III

Subject Code	**MCA 304**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction to Information Security : Attacks, Vulnerability, Security Goals, Security Services and mechanisms. Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography. Classical Encryption Techniques.	
Unit-2	**08 Hours**
Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms. Hash Functions Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS), Proof Of Digital Signature Algorithm.	
Unit-3	**08 Hours**
Program Security : Nonmalicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels.	
Unit-4	**10 Hours**
Security in Networks : Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP,S/MIME	
Unit-5	**06 Hours**
Administering Security: Security Planning, Risk Analysis, Organizational Security policies. Legal Privacy and Ethical Issues in Computer Security: Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Ethical issues in Computer Security, case studies of Ethics.	

Text Books:

- William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
- Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
- William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall,4th edition, 2010.

References:

- Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of AppliedCryptography, CRC Press, 2011.

Mobile Application Development

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	**MCA-305**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
INTRODUCTION Introduction to mobile applications, Market and business drivers for mobile applications, Difficulties in Mobile Development, Mobile Myths, When to Create an App, Types of Mobile App. Design Constraints for mobile applications, both hardware and software related, Architecting mobile applications, user interfaces for mobile applications, touch events and gestures.	
Unit-2	**08 Hours**
ADVANCED DESIGN Designing applications with multimedia and web access capabilities. Integration with GPS and social media networking applications, Accessing applications hosted in a cloud computing environment, Design patterns for mobile applications, Understanding Application users, Information Design, Achieving quality constraints.	
Unit-3	**08 Hours**
TECHNOLOGY I ANDROID Establishing the development environment Android architecture Android Application Structure, Emulator, Android virtual device, UI design, Fragments, Activity, Services, broadcast receiver, Intents/Filters, Content provider-SQLite Programming, SQLITE open, Helper, SQlite Database, Interaction with server side applications	
Unit-4	**08 Hours**
Advanced ANDROID Using Google Maps, GPS and Wi-Fi Integration, Android Notification, Audio Manager, Bluetooth, Camera and Sensor Integration, Sending SMS, Phone Calls, Publishing Android Application.Introduction to KOTLIN	
Unit-5	**08 Hours**
TECHNOLOGY II IOS Introduction to Objective C iOS features UI implementation Touch frameworks Data persistence using Core Data and SQLite, Action and Outlets, Delegates and Storyboard, Location aware applications using Core Location and Map Kit, Integrating calendar and address book with social media application Using Wifi iPhone marketplace.	

Text Books:

RetoMeier , “Professional Android app development”, Wiley, 2019.
Matt Neuburg, “IOS 13 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa Basics”, O’Reilly, 2019.
Michael Dippery, ”Professional Swift”, Wiley, 2015.
Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012.

Reference Books:

Reto Meier, Ian Lake,”Professional Android, 4th Edition”, Wiley, 2018.
Neil Smyth “Android studio 2.2 Development Essentials 7th Edition” Payload Media 2017.
Murat Yener, OnurDundar, ”Expert Android Studio”, Wiley, 2016.
Jerome Dimarzio “Beginning Android Programming with Android Studio” Wiley Publication, 2016.
David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.
James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012.
Paul Deitel, Harvey Deitel, Abbey Deitel and Michel Morgano, “Android for Programmers an App-Driven Approach”, Pearson, 2012.

Data Mining and Data Warehousing

Elective I(a)

As per Choice Based Credit System CBCS)Scheme)

SEMESTER-III

Subject Code	**MCA-306-I(a)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Data Warehousing: Introduction to Data Warehouse and OLAP ,Data Warehouse and DBMS Multidimensional data model ,OLAP operations. Data preprocessing ,Data cleaning ,Data transformation ,Data reduction ,Discretization and generating concept hierarchies.	
Unit-2	**08 Hours**
Data Mining: Introduction, Definition, KDD vs. DM, DBMS vs. DM, DM Techniques, Issues and Challenges in DM, DM Applications. DM algorithms: Classification and Prediction - Parametric and non-parametric technology: Bayesian classification, two class and generalized class classification, classification error.	
Unit-3	**08 Hours**
Association rules:Association Rules: Apriori Algorithm, Partition, FP-tree growth algorithms, Generalized association rule. Motivation and terminology,Correlation analysis. **Clustering:** Basic issues in clustering ,Partitioning methods: k-means, K-MEDOID Algorithm ,Hierarchical methods: distance-based agglomerative and divisible clustering , non-hierarchical techniques.	
Unit-4	**08 Hours**
Decision Trees: Decision tree introduction, Tree pruning, Extracting classification rules from decision trees, Decision tree construction algorithms, Decision tree construction with presorting.	
Unit-5	**08 Hours**
Techniques for Data mining: Data Mining software and applications: Introduction to Text mining: extracting attributes (keywords), structural approaches (parsing, soft parsing). Introduction to Web mining: classifying web pages, extracting knowledge from the web Data Mining software and applications.	

Text Books:

1. Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining and OLAP, McGrawHill, 2014
2. D. Hand, H. Mannila, and P. Smyth, Principles of Data Mining, MIT Press, 2011
3. Jiawei Han, MichelineKamber, Data Mining: Concepts and Techniques, Harcourt India Pvt., 2011

References:

1. W. H. Innmon, Building the Data Warehouse, Wiley Computer Publishing, 2005

Big Data Technologies

MCA_306_Elective I(b)

As per Choice Based Credit System (CBCS) Scheme)

SEMESTER-II

Subject Code	**MCA-306-I(b)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENT	**Teaching Hours**
Unit-1	**08 Hours**
Understanding Big Data: Introduction, Need, Importance of Big data, Classification of Digital Data, Four Vs, Drivers for Big data, Big data Terminology, Industry examples and Top Challenges Facing Big Data, Responsibilities of data scientists, Technology Challenges for Big data, Convergence of key trends, Big data Architecture. **Big data Applications:** Healthcare, Finance, Advertising, Marketing, Transportation, Education, Government, Cyber Security etc.	
Unit-2	**08 Hours**
Web Analytics: Big data and Marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, Open source technologies, cloud and big data, Crowd Sourcing Analytics, inter and trans firewall analytics.	
Unit-3	**08 Hours**
Hadoop Ecosystem: Introduction to Hadoop, Features of Hadoop, Hadoop Versions, Hadoop Architecture, Introduction to Data Management and Data Access tools: Data Management using Flume, Oozie, Zookeeper; Hive, Pig, Avro, SQOOP for data access. Introduction to Data Processing and Data Storage tools: MapReduce, YARN, HDFS, HBase.	
Unit-4	**08 Hours**
HDFS: HDFS concepts, NameNode, Design working of Hadoop distributed file system (HDFS). **MapReduce:** Introduction, MapReduce workflows, Split, map, combine, scheduling, shuffle and sort YARN. Problems & examples in MapReduce.	
Unit-5	**08 Hours**
NO SQL Data Management: Problem with Relational Database Systems. Introduction to NOSQL, Advantages of NOSQL, SQL versus NOSQL. Aggregate data models, key-value and document data models, relationships, graph databases, schemaless databases.	

Text Books:

- Michele Chambers, Michael Minelli, AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013
- Anil Maheshwari, " Big Data", McGraw-Hill; Second edition, 2019
- SubhashiniChellappanSeemaAcharya, "Big Data and Analytics", Wiley, 2019

References:

- ArshdeepBahga, Vijay Madisetti, "Big Data Analytics: A Hands-On Approach", VPT, 2018
- NandhiniAbirami R, SeifedineKadry, Amir H. Gandomi, BalamuruganBalusamy, "Big Data: Concepts, Technology, and Architecture", Wiley, 1st edition 2021
- EMC Education Services, " Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", 2015

Soft Computing

Elective I(c)

As per Choice Based Credit System (CBCS) Scheme)

SEMESTER-III

Subject Code	**MCA-306-I(c)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 3

CONTENT	Teaching Hours
Unit-1	**08 Hours**
Introduction to Soft Computing Introduction of Hard and Soft Computing, Unique features of Soft computing, Components of Soft computing, Fuzzy Computing, Evolutionary Computation, Genetic Algorithm, Swarm Intelligence, Ant Colony Optimizations, Neural Network, Machine Learning , Associative Memory, Adaptive Resonance Theory, Introduction to Deep Learning.	
Unit-2	**08 Hours**
Neural Networks Introduction and Architecture: Neuron, Nerve structure and synapse, Artificial Neuron and its model, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Back propagation networks architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, back propagation algorithm, applications.	
Unit-3	**08 Hours**
Fuzzy Logic Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion, Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Inference Systems, applications.	
Unit-4	**08 Hours**
Genetic Algorithms Traditional optimization and search techniques, Genetic Algorithms: Basic concepts of GA, working principle, procedures of GA, Process flow of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.	
Unit-5	**08 Hours**
Hybrid Systems Integration of neural networks, fuzzy logic and genetic algorithms. GA Based Back Propagation Networks, Fuzzy Back Propagation Networks, Fuzzy Associative Memories, Simplified Fuzzy ARTMAP.	

Text Books:

1. S. Rajasekaran and G.A.VijaylakshmiPai.. Neural Networks Fuzzy Logic, and Genetic Algorithms, Prentice Hall of India 2007.
2. K.H.Lee.. First Course on Fuzzy Theory and Applications, Springer-Verlag.
3. D. K. Pratihar, Soft Computing, Narosa, 2008.
4. J.-S. R. Jang, C.-T. Sun, and E. Mizutani,Neuro-Fuzzy and soft Computing, PHI Learning, 2009.

ReferenceBooks:

1. J. Yen and R. Langari.. Fuzzy Logic, Intelligence, Control and Information, Pearson Education.
2. N.P.Padhy,"Artificial Intelligence and Intelligent Systems" Oxford University Press.
3. Melanie Mitchell, An Introduction to Genetic Algorithms, MIT Press, 2000.
4. Simon Haykin, Neural Networks and Learning Machines, (3rd Edn.), PHI Learning, 2011.

ADA Lab

As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-III

Subject Code	**MCA-351**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 01

Objective: The course is designed to develop skills to design and analyze various algorithms. It aims to strengthen the ability of the students to identify and apply suitable concepts of Analysis and Design of algorithms for the given real world problems. It enables them to gain knowledge in practical applications of various algorithms.

Contents

1. Linear search & binary search, Sorting Techniques
2. Single source shortest path-Dijkastra Algorithm
3. Greedy method:-knapsack problem
4. Greedy method minimum cost spanning tree
5. Traveling salesman problem – flow shop scheduling.
6. Dynamic Programming – 0/1 Knapsack
7. Dynamic Programming – traveling salesman problem
8. Backtracking 8-Queens problem
9. Backtracking Sum of Subsets
10. Backtracking – graph coloring – Hamiltonian cycles– knapsack problem

Mobile Application Development Lab

As per Choice Based Credit System (CBCS) Scheme

SEMESTER-III

Subject Code	**MCA-352**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 01

Lab Experiments

1. Develop an application that uses GUI components, Font and Colours.
2. Write an android program to implement activity life cycle using toast messageswith proper positioning
3. Develop an application that uses Layout Managers and event listeners.
4. Write an application that draws basic graphical primitives on the screen.
5. Write an application that basic graphical primitives and animations.
6. Develop an application that makes use of databases.
7. Develop an application that makes use of Notification Manager.
8. Develop a native application that uses GPS location information.
9. Implement an application that creates an alert upon receiving a message
10. Write a mobile application that makes use of feed.
11. Develop a mobile application to send an email.
12. Mini Project using Android Studio

Summer Industrial Training Presentation

As per Choice Based Credit System (CBCS) Scheme)

SEMESTER-III

Subject Code	**MCA-353**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 01

Mandatory Summer Training: **45 Working Days Summer Training** during Semester Break, of 100 Marks. Evaluation will be done in Semester-III Examinations.

GENERAL INSTRUCTIONS FOR PREPRATION OF SUMMER INDUSTRIAL TRAINNING PRESENTATION/ REPORT

(i) Cover Page
(ii) Title Page
(iii) Certificate
(iv) Acknowledgement
(v) Table of Contents

1. Introduction

2. Project Specifications
- 2.1 Project Need
- 2.2 Project Overview

3. Specific Requirements
- 3.1 External Interface Requirements
- 3.2 Hardware Interfaces
- 3.3 Software Interfaces
- 3.4 Communications Protocols (Networking Protocols)
- 3.5 Security / Maintainability / Performance

4. Software Product Features
- 4.1 System Architecture
- 4.2 Database Requirements
- 4.3 ER Diagram
- 4.4 Data Flow Diagram
- 4.5 Use Case Diagrams
- 4.6 User Interfaces (Input Forms / Processing Forms/ Search Forms/ Output Forms)
- 4.7 Report Formats

5. Drawbacks and Limitations
6. Proposed Enhancements
7. Conclusion
8. Bibliography
9. Annexure:
- 9.1 User Interface Screens (Optional)
- 9.2 Output Reports with Data (if any)
- 9.3 Sample Program Code

Software Project Management

As per Choice Based Credit System (CBCS) Scheme)

SEMESTER-IV

Subject Code	**MCA-401**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	Teaching Hours
Unit-1	**08 Hours**
Project Management: The management spectrum, the people, the product, the process, the project, critical practices Metrics for Process and Project: Metrics in the process and project Domains, software measurements, metrics for software quality, integrating metrics within software process, metrics for small organizations, establishing a software metrics program. Introduction of Project Management tool: Trello, Jira, Asana, Zoho, Wrike.	
Unit-2	**08 Hours**
Estimation: Project planning Process, software scope and feasibility, resources, software project estimation, empirical estimation models, estimation for object oriented projects, estimation for Agile development and web engineering projects, the make/buy decision.	
Unit-3	**08 Hours**
Project Scheduling: Basic concepts, project scheduling, defining a task set and task network, scheduling, earned value analysis. Risk Management: Reactive V/S proactive Risk Strategies, software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management, the RMMM plan Quality Planning: Quality Concepts, Procedural Approach to Quality Management, Quantitative Approaches to Quality Management, Quantitative Quality Management Planning, Setting the Quality Goal, Quality Process Planning, Defect Prevention Planning.	
Unit-4	**08 Hours**
Quality Management: Quality Concepts, Software Quality assurances, software reviews, formal technical reviews, Formal approaches to SQA, Statistical Software Quality assurances, Change Management: software Configuration Management, The SCM repository, SCM Process, Configuration Management for Web Engineering	
Unit-5	**08 Hours**
Project Execution And Closure: Reviews. The Review Process, Planning, Overview and Preparation, Group Review Meeting, Rework and Follow-up, One-Person Review, Guidelines for Reviews in Projects, Project Closure: Project Closure Analysis, The Role of Closure Analysis, Performing Closure Analysis. **Project Monitoring and Control:** Project Tracking, Activities Tracking, Defect Tracking, Issues Tracking, Status Reports, Milestone Analysis, Actual Versus Estimated Analysis of Effort and Schedule, Monitoring Quality.	

Text Books:

- Bob Hughes , Mike Cotterell and Rajib Mall "Software Project Management", 6th Edition, McGraw Hill Edition, 2017.
- PankajJalote, "Software Project Management in practice", 5th Edition, Pearson Education, 2017.
- Murali K. Chemuturi ,Thomas M. Cagley Jr." Mastering Software Project Management: Best Practices, Tools and Techniques", J. Ross Publishing, 2010
- Sanjay Mohapatra, " Software Project Management" , Cengage Learning, 2011

References:

- Dr. P. Rizwan Ahmed, " Software Project Management", 1st Edition, Margham Publications, 2016
- Walker Royce, "Software Project Management, A Unified Framework", 1st Edition, 2006.
- Joel Henry, "Software Project Management", 1st Edition, Pearson Education, 2006.
- PradeepPai, "Project Management",, First Edition, Pearson, 2019

Principles of Management and Information System [Elective-2(a)]

As per Choice Based Credit System (CBCS) Scheme)

SEMESTER-IV

Subject Code	**MCA-402-2(a)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	Teaching Hours
Unit-1	**08 Hours**
Management:An Overview Definition, Concept, Functions, Process, Scope and Significance of Management. Nature of Management, Managerial Roles, Managerial Skills and Activities, Difference between Management and Administration. Significance of Values and Ethics in Management.	
Unit-2	**08 Hours**
Planning & Organizing: Nature and purpose of planning, Significance of Planning, Elements and Steps of Planning, Types of planning, Objectives and Policies Decision Making, Organizing Principles, Span of Control, Departmentalization, Line and Staff Authority &Relationship, Authority, Delegation and Decentralization. Formal and Informal Organizations	
Unit-3	**08 Hours**
Directing & Controlling: Effective Directing, Supervision, motivation theories, motivational techniques, Job Satisfaction, Job Enrichment, Leadership-Concept, Styles and Theories System and Process of Controlling, Concept, Types and Process, Techniques of Controlling, Coordination-Concept, Importance, Principles and Techniques of Coordination, use of computers and IT in Management control	
Unit-4	**08 Hours**
Information System: Data vs. Information vs. Knowledge, Information Systemsmeaning, functions and dimensionsand need. Categorization of Organizational InformationSystems –hierarchical and functional perspective, Interdependence between organization and IS, IS strategies for competitive advantageusing Porter's Five Forces Model and Value Chain Model	
Unit-5	**08 Hours**
Information Systems Management: Planning the Use of IT, Managing the Computing Infrastructure, Enterprise Applications, Developing Business/IT Solutions, Outsourcing, User Rights and Responsibilities, Implementation and Controlling of Information System.	

Text Books:

1. Kenneth Laudon, JaneLaudonEssentials ofManagement Information Systems, PHI Publication, 10th Edition
2. Terry and Franklin, Principles of Management, AITBS Publishers & Distributors, Delhi, Eighth Edition.
3. Joseph L Massie "Essentials of Management", Prentice Hall of India, Fourth Edition, 2003.
4. W.S. Jawadekar, "Management Information Systems", TMH Publication, Latest Edition

Reference Books:

1. PC Tripathi and PN Reddy, "Principles of Management", Tata McGraw-Hill, Fourth Edition 2008.
2. Koontz. Essentials for Management: An International Perspective. Tata McGraw-Hill.
3. Peter Ferdinand Drucker, The Practice of Management, HarperCollins Publishers, 2010.

Machine Learning [Elective-2(b)]

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	**MCA-402-2(b)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 3

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction Machine Learning – Machine Learning Foundations,Overview,Applications, Types of Machine Learning – Basic Concepts in Machine Learning – Examples of Machine Learning, Perspectives/Issues in Machine Learning, AI vs. Machine Learning.	
Unit-2	**08 Hours**
Supervised Learning Introduction, Linear Models of Classification – Linear Regression – Logistic Regression – Bayesian Logistic Regression – Probabilistic Models Neural Network-Feed Forward Network Functions – Error Back Propagation – Regularization - Bayesian Neural Networks – Radial Basis Function Networks, Ensemble Methods – Random Forest – Bagging – Boosting.	
Unit-3	**08 Hours**
Unsupervised Learning Clustering – K-Means Clustering – EM (Expectation Maximization) – Mixtures of Gaussians – EM algorithm in General – The Curse of Dimensionality – Dimensionality Reduction – Factor Analysis – Principal Component Analysis – Probabilistic PCA – Independent Component Analysis.	
Unit-4	**08 Hours**
Probabilistic Graphical Models Directed Graphical Models – Bayesian Networks – Exploiting Independence Properties – From Distributions to Graphs – Examples – Markov Random Fields – Inference In Graphical Models – Learning - Naïve Bayes Classifiers – Markov Models – Hidden Markov Models. Undirected graphical Models – Conditional Independence Properties.	
Unit-5	**08 Hours**
Advanced Learning Basic Sampling Method – Monte Carlo, Reinforcement Learning-Introduction-The Learning Task, and Elements of Reinforcement Learning. Computer Vision: Applications of Computer Vision Using Machine Learning: Speech Processing, Natural Language Processing.	

Text Books:

1. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer 2006
2. EthemAlpaydin, “Introduction to Machine Learning”, Prentice Hall of India, 2005
3. Joel Grus, “Data Science from Scratch- First Principles with Python”, O’Reilly, 2015
4. Tom Mitchell, “ Machine Learning”, McGraw-Hill, 1997

ReferenceBooks:

1. Stephen MarsLand, “Machine Learning-An Algorithmic Perspective”, CRC Press, 2009
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012
3. M. Gopal, “Applied MACHINE LEARNING”, McGraw-Hill, 2018
4. Mark Summerfield, “Programming in Python 3: A Complete Introduction to the Python Language”, Addison Wesley, 2010

Data Science with R [Elective-2(c)]

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	**MCA-402-2(c)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	Teaching Hours
Unit-1	**08 Hours**
Introduction R: Concept, Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get started: installed.packages(), package Description(), help(), find.package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.	
Unit-2	**08 Hours**
R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R – Variables, Data types of Variable, R Operators,R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.	
Unit-3	**08 Hours**
R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower() - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting - R List - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector - R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division- R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements - R Factors –creating factors, generating factor levels gl().	
Unit-4	**08 Hours**
Data Frames –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, Expand Data Frame: Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast(). Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.	
Unit-5	**08 Hours**
Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median - Mode - Standard Deviation – Correlation - Data Visualization: visually Checking Distributions for a single Variable - R – Pie Charts: Pie Chart title and Colors – Slice Percentages and Chart Legend, 3D Pie Chart – R Histograms – Density Plot - R – Bar Charts: Bar Chart Labels, Title and Colors.	
Text Books: • SandipRakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5. • SeemaAcharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.	

Reference Books: • Foster Provost & Tom Fawcett, " Data Science for Business", O' Reilly, 2013 • James Warren and Nathan Marz, "Big Data: Principles and Best Practices of Scalable Realtime Data Systems", Manning Publications, 2015 • Anil Maheshwari, " Data Analytics", McGrawHill Publications, 2017	

Industrial Project

[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-IV

Subject Code	**MCA-451**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**12**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 06

The industrial project as part of the curriculum will be held in the institute as one of the laboratories. This may be in continuationto the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level).

The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by RTU.

Guidelines for Submission of Industrial Project

All the candidates of MCA are required to submit a **Final Project Report** based on the work done by him/her during the project period.

THE GUIDE

The Guide for MCA would be a person having MCA with 3 years' experience in academic/Industry.

PROJECT TIME
The MCA Major Projects would be at list 12 Weeks and carries a total of 100 marks. The Project topics should be based on syllabus or as per the requirement of specific industry in sync with the course. Every student has to prepare and submit the project work in a group or separately (Max two students). Plagiarism would not be accepted under any circumstances.

Project Report should compulsorily include the software development/ soft copy should also be submitted in CD along with Hard Bound Project report.

Project Evaluation Guidelines.

The project is evaluated on the basis of following aspects:

Presentation & Software execution: 40% of total marks.

Project report (documentation): 30% of total marks.

Viva-Voce: 30% of total marks.

SUMMARY/ABSTRACT
All students must submit a summary/abstract separately with the project report. Summary, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up must adhere to the guidelines and should include the following :

- Name / Title of the Project and about the Problems
- Why is the particular topic chosen?
- Objective and scope of the Project
- Methodology (including a summary of the project)
- Hardware & Software to be used
- Testing Technologies used
- What contribution would the project make?

TOPIC OF THE PROJECT- This should be explicitly mentioned at the beginning of the Synopsis. This being the overall impression on the future work, the topic should be able to corroborate the work.

OBJECTIVE AND SCOPE: This should give a clear picture of the project. Objective should be clearly specified. What the project ends up to and in what way this is going to help the end user has to be mentioned.

PROCESS DISCRIPTION: The process of the whole software system proposed, to be developed, should be mentioned in brief. This may be supported by DFDs / Flowcharts to explain the flow of the information.

RESOURCES AND LIMITATIONS: The requirement of the resources for designing and developing the proposed system must be given. The resources might be in form of the hardware/software or the data from the industry. The limitation of the proposed system in respect of a larger and comprehensive system must be given.

CONCLUSION: The write-up must end with the concluding remarks-briefly describing innovation in the approach for implementing the Project, main achievements and also any other important feature that makes the system stand out from the rest.

The following suggested guidelines must be followed in preparing the Final Project Report:

The industrial project as part of the curriculum will be held in the institute as one of the laboratories. This may be in continuation to the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level). The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by RTU.

The Project study and development should be on the following lines:

FORMAT OF THE STUDENT PROJECT REPORT ON COMPLETION

1. Cover Page as per specifiedformat
2. Declaration Certificate
3. Acknowledgement
4. Certificate of the Company /Institute
5. Main Report

1. Introducton

    1.1 Objectives
    1.2 Problem description
    1.3 About Organization

2. System Study

    2.1 System with limitations
    2.2 Significance of the Project
    2.3 Beneficiaries of the System
    2.4 Feasibility study

3. System Analysis

    Requirement Specification
    i. Functional Requirement.
    ii. Non Functional Requirement.
    iii. User Requirement
    iv. System Requirement

4. System Design

a) Data Flow Diagram

b) E-R Diagrams

c) Use Case Diagrams

d) Flow Charts

e) Database Tables

f) Input output Forms

5. Development

a) Environment
b) Coding Style
c) Coding Techniques
d) Coding

6. Testing

a. Test cases

7. System Security

b. Checks and Control
c. Encryption, secure

8. Conclusion/Future Enhancement

9. Bibliography

The reports prepared by the students MUST NOT have only definitions of the above mentioned topics but should explicitly state these in the context of the project undertaken. They should submit the actual work done in details.

General instructions about preparation of report

Paper: A4

Font: Times New Roman, Bookman Old Style

Chapter Heading: 16pt, Sub heading: 14, Sub-Sub Headings: 12

Bold Running Matter: 12 pt

Paragraph Gap: 6 Pt Maximum

Line Gap: 1.5

Margins: Left 1.5, Right, Top and Bottom 1 inch

All diagrams/figures and tables should be appropriately numbered.

Submission of Project Report to the University:

The student will submit his/her project report in the prescribed format. The Project Report should include:

- Copy of the Summary/Abstract. To be mailed to college/Institute well in advance mentioning the about future project which would be undertaken.
- Two Hard Bound Copies of the Project Report which is around 80 to 120 pages.
- Soft copy of project on CD/DVD/Pen Drive pasted inside of the back cover of the project report.

Binding & Color code of the report/Thesis

For MCA – IV Semester (Industrial Project work)
Hard Bound Report
Cover/Background of the Page of Project Report – **Sky Blue**
Letters in Black

Cover page

An
Industrial Project Report
on
<"Write title of Project>

SubmittedtotheRajasthanTechnicalUniversity,Kotain

Partialfulfillmentoftherequirementforthedegreeof

MASTER OF COMPUTER APPICATIONS

<Logo of your college> **<RTUlogo>**

Supervisor Submitted By:

<Name> <Name of Candidate >

Designation Enrolment No.: .....

<Nameofyour college>

Affiliatedto

Rajasthan Technical University,
Kota(Rajasthan)-324010

Month and Year

Candidate's Declaration

I hereby declare that the work, which is being presented in the MCA-451, Instrial Project , entitled **"**.....(Title).....**"**in partial fulfilment for the award of Degree of "Master of Computer Applications" in Deptartment of Computer Applications **submitted to the** .....(Name of College)....., Rajasthan Technical University is a record of my own work carried under the Guidance of Shri/ Dr. ....., Deptartment of Computer Applications,.....(Name of College)..... .

I have not submitted the matter presented in this Project Report any where for the award of any other Degree.

<Name and Signature of Candidate>

Enrolment No.: .....

……(Name of College)……,

Name(s) of Supervisor(s)

.....

.....

<college Name>
<name of Department >

Certificate

Date:

This is to certify that the Industrial Project (MCA-451) work entitled "*name of the project*'' submitted by "*name of student*" (RTU Roll No. ……)to the Department Of Computer Science and Application of <college name> has been examined and evaluated.

The Project work has been prepared as per the regulations of Rajasthan Technical University, Kota and qualifies to be accepted in partial fulfillment of the requirement for the degree of MCA (Master of Computer Applications).

Signature of the student

Supervisor/Guide
(Name with Designation)

External Examiner
(Name with Designation)

Head of Institution/Principal

On Original Company Letter Head

Ref No…….. Date:

Certificate

This is to certify that **your name (RTU Roll No.)** is/was undertraining from _____ (**startdate**) to _____(**enddate**)undermysupervisioninpartialfulfillmentof therequirementforthe award of the Degree of **Master of Computer Applications**.

Duringthis period he /she has workedon……. ("**Project Name**") as a …..(**Role of student**).

TrainingIncharge/Project Leader/HR

(Seal/Sign and Name with Designation)