Central University of Himachal Pradesh

Department of Computer Science and Informatics

School of Mathematics, Computers and Information Science

AGENDA

6th BOARD OF STUDIES MEETING

TO BE HELD ON **23rd JULY, 2021**

Venue: through Online Mode on Google Meet

meet.google.com/pqp-ugzb-pwx

हिमाचल प्रदेश केन्द्रीय विश्वविद्यालय

Central University of Himachal Pradesh

(Established under Central Universities Act 2009)

अस्थाई शैक्षणिक खण्ड, शाहपुर, ज़िला काँगड़ा, हिमाचल प्रदेश -176206

Temporary Academic Block, Shahpur, Distt. Kangra (HP) - 176206

Website: www.cuhimachal.ac.in

AGENDA-INDEX

Agenda Item No.	PARTICULARS	Information
CSI-BOS-6/21-1	Confirmation and Approval of the Minutes of the 5th Board of Studies meeting held on 23rd September, 2020.	Annexure –I
CSI-BOS-6/21-2	To deliberate and approve the start of a MCA (Masters of Computer Applications) Programme of Two Years duration w.e.f Academic Session 2021-22.	
CSI-BOS-6/21-3	To deliberate and approve the minutes of the meeting of Course Development Committee (CDC) as well as the Course Scheme (course duration, eligibility conditions, criteria of selection, credit requirement and conditions for the award of Degree etc.) for the MCA Programme of Two Years duration.	Annexure - II & III
CSI-BOS-6/21-4	To deliberate and approve the course contents developed by CDC (Course Development Committee) for the MCA Programme of Two Years duration.	Annexure – IV
CSI-BOS-6/21-5	To deliberate and approve the course contents for the MCA Programme of Three Years duration.	Annexure – V
CSI-BOS-6/21-6	Proposal of the Faculty Member of the Department of Computer Science and Informatics to become M.Phil./Ph.D. Supervisor/Guide.	
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CSI-BOS-6/21-8	To approve the Co-Supervisor for the Ph.D. Students in the Department of Computer Science and Informatics.	
CSI-BOS-6/21-9	Approval of List of Experts as Examiners for the Practical and Viva Voce Examinations of M.Sc. IT and MCA.	Annexure - VI
CSI-BOS-6/21-10	Any other item with the permission of the Chair.	

Prof. Rakesh Kumar
Head,
Department of Computer Science and Informatics

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Website: www.cuhimachal.ac.in

File No.: CSI/1-5/BoS/CUHP/21/82(a) Dated: 23.07.2021

MINUTES OF THE 6th BOARD OF STUDIES MEETING

HELD ON 23rd JULY, 2021

The **meeting** of the 6th **Board of Studies** of the **Department of Computer Science and Informatics**, School of Mathematics, Computers and Information Science, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur was held through **online mode** on Google Meet (**meet.google.com/pqp-ugzb-pwx**)on 23rd **July, 2021** at **11:00 AM**. During the meeting, all members were available on **Google Meet**. Prof. Rakesh Kumar, **Head**, Department of Computer Science and Informatics and Dean, School of Mathematics, Computers and Information Science **chaired** the meeting.

Following members attended the meeting:

1. **Prof. Rakesh Kumar – Head and Convener**
   Head, Department of Computer Science and Informatics and Dean, School of Mathematics, Computers and Information Science, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
2. **Dr. ArvindKalia – Subject Expert**
   Department of Computer Sciences,Himachal Pradesh University, Shimla.
3. **Dr. T.P. Sharma– Subject Expert**
   Associate Professor, Department of Computer Engineering, National Institute of Technology, Hamirpur.
4. **Prof. O.S.K.S. Sastri – Vice Chancellor's Nominee**
   Professor, Department of Physics and Astronomical Science, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
5. **Dr. Rajender Kumar – Vice Chancellor's Nominee**
   Associate Professor, Department of Chemical and Chemical Sciences, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
6. **Dr. Keshav Singh Rawat – Dean's Nominee**
   Assistant Professor, Department of Computer Science and Informatics, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.
7. **Mr. ManojDhiman– Special Invitee**
   Assistant Professor, Department of Computer Science and Informatics, Central University of Himachal Pradesh, Temporary Academic Block, Shahpur.

The **Chairman** welcomed all the **Hon'ble members &Special Inviteesand briefed** about the **past activities** and also about the various **agenda items** to be **discussed** in the **meeting** which were **sent** in **advance** to all members through **e-mail** including **Subject Experts**. Various **Agenda Items** were **placed** before the **committee** and after **detailed discussion** and **deliberations** on each, the **following decisions** were taken:-

AGENDA ITEM NO. - CSI-BOS-6/21-1

Confirmation and Approval of the Minutes of the 5th Board of Studies meeting held on 23rd September, 2020attached as Annexure - I.

Decision:

The Minutes of the 5th meeting of the Board of Studies were Confirmed and Approved.

AGENDA ITEM NO. - CSI-BOS-6/21-2

To deliberate and approve the start of a MCA (Masters of Computer Applications)Programme of Two Years durationw.e.f. Academic Session 2021-22.

Decision:

Both Subject expertsDr.ArvindKalia, Dr. T. P. Sharma, and Prof. O.S.K.S. Shastrisuggested the following points regarding duration of MCA programme-

1. MCA programme of 2 year duration with eligibility criteria **"Bachelor of Computer Applications (BCA) /B.Sc.(Computer Science)/ B.Sc. (IT)/ BA(ComputerScience)/ BA (IT) OR any Graduate with PGDCA OR any Graduate with 20-24 credits in the subjects of computer OR any graduate with minimum of 6 courses of computer studied in graduation (in case of degree not in credit system)from a recognized University or an equivalent examination".**
2. Any Candidate with eligibilitycriteria**"Bachelor Degree with Mathematics either at 10+2 Level or at Graduation Level with at least 50% marks"** must be required to pass additional one year diploma course offered by the department. After completion of one year diploma course, candidate is eligible for admission in MCA programme of 2 year duration.

After deliberate discussion, all the members agreed to start MCA (Masters of Computer Applications) Programme of Two Years duration with eligibility criteria as per mentioned in point one. The MCA programme with eligibility criteria mentioned in point 2 may be started in the future.

AGENDA ITEM NO. - CSI-BOS-6/21-3

To deliberate and approve the minutes of the meeting of Course Development Committee (CDC) as well as the Course Scheme (course duration, eligibility conditions, criteria of selection, credit requirement and conditions for the award of Degree etc.) for the MCA Programme of Two Years duration.

Decision:

Subject experts strongly suggested following necessary changes in course scheme structure for MCA (Masters of Computer Applications) Programme of Two Years-

- **Student intake, examination pattern, and evaluation have been included in the proposed course scheme.**
- **Eligibility conditions are included as per suggestions in AGENDA ITEM NO. - CSI-BOS-6/21-2.**
- **All credits of fourth semester are assigned to project work.**
- **Some courses of core compulsory, core open, elective specialization, and elective open have been shifted to suggested course categories.**

All members agreed and approved the CDC minutes and the Course Schemewith above mentioned suggestions as per Annexure –II, III(a).

AGENDA ITEM NO. - CSI-BOS-6/21-4

To deliberate and approve the course contents developed by CDC (Course Development Committee) for the MCA Programme of Two Years duration

Decision:

Subject experts suggested that the course contents developed by CDC (Course Development Committee) for the MCA Programme of Two Years duration may be fitted according to the course structure as suggested in AGENDA ITEM NO. - CSI-BOS-6/21-3.All members agreed and approved the course contents with these changes as per Annexure-IV(a).

AGENDA ITEM NO. - CSI-BOS-6/21-5

To deliberate and approve the course contents for the MCA Programme of Three Years duration

Decision:

All members agreed and approved the course contents for the MCA Programme of Three Years duration as attached in Annexure –V.

AGENDA ITEM NO. - CSI-BOS-6/21-6

Proposal of the Faculty Member of the Department of Computer Science and Informatics to become M.Phil./Ph.D. Supervisor/Guide

Decision:

All the members of BoS unanimously approved the Dr.Keshav Singh Rawat, Assistant Professor, Department of Computer Science and Informatics, School of Mathematics, Computers and Information Sciences to Supervise thePh.D scholars of the Department (as per CUHP Ordinance No. 42, Clause 6);

AGENDA ITEM NO. - CSI-BOS-6/21-7

To approve the change of Research Supervisor for the Ph.D. Students in the Department of Computer Science and Informatics

Decision:

All members agreed and approvedDr.Keshav Singh Rawat, Assistant Professor, Department of Computer Science and Informatics as the Research Supervisor of Mr.Dheeraj Kumar (Roll No. CUHP20RDCS01), Mr.Girish Sharma (Roll No. CUHP20RDCS02), and Mr. Manoj Dhiman (Roll No. CUHP20RDCS03) in place of previous supervisor Dr.Sandeep Kumar Sood as he left the University.

AGENDA ITEM NO.-CSI-BOS-6/21-8

To approve the Co-Supervisor for the Ph.D. Students in the Department of Computer Science and Informatics

Decision:

All members agreed to allow Dr. Sandeep Kumar Sood, Associate Professor, NIT Kurukshetra to act as research Co-Supervisor of Mr. Dheeraj Kumar (Roll No. CUHP20RDCS01) and Mr. Girish Sharma (Roll No.CUHP20RDCS02) as per the recommendations from the present Supervisor and approval from the RAC.

AGENDA ITEM NO.-CSI-BOS-6/21-9

Approval of List of Experts as Examiners for the Practical and Viva Voce Examinations of M.Sc. IT and MCA.

Decision:

All members agreed and approved the list of examiners as proposed at Annexure VI. It was also suggested that the list will be updated regularly by the faculty members of the Department of Computer Science and Informatics with the consent of the respective Head of the Department and the same be reported in the next meeting of BoS. It was also suggested that preferably the subject course experts be invited for specific courses. The BoS also recommended that, if needed, HoD may invite a Subject Expert (External Examiner) not included in the list, on the recommendations of the concerned faculty member(s) and after approval of competent authority of the university.

AGENDA ITEM NO. - CSI-BOS-6/21-10

Any item with the permission of the Chair.

The subject experts also suggested that a different department-level committee may be constituted instead of BoS for discussion of research degree matters.
In this context, as per the CUHP ordinance, the Research Advisory Committee (RAC) of the Department is already constituted, and all research degree matters are approved by the Research Advisory Committee (RAC) followed by BoS and School Board.

The meeting ended with a vote of thanks to the chair.

Mr. Manoj Dhiman
(Special Invitee)

Dr. Keshav Singh Rawat.
(Dean's Nominee)

Dr. Rajender Kumar
(VC's Nominee)

Prof. O.S.K.S. Sastri
(VC's Nominee)

Dr. T.P. Sharma
(Subject Expert)

Dr. Arvind Kalia
(Subject Expert)

22/07/2021

Prof. Rakesh Kumar
Chairman & Convener

फाइल सं : CSI/2-2/CUHP/14

दिनांक: 13.04.2021

Minutes of the CDC Meeting

A meeting of the CDC (Curriculum Development Committee) was conducted on 12 and 13 April 2021 as per notification फ़ाइल् सं:1-4/ हि.प्र.के.वि./सा.प्र./2010/खंड II/1242-46 दिनांक 17 मार्च, 2021 and administrative and financial approval File No.: CSI/2-2/CUHP/14 dated 06-04-2021. All the members joined the meeting in offline mode whereas one of the external members (Prof. Manu Sood) joined through online mode via Google Meet Link: **https://meet.google.com/wfn-hmgm-viv**

The committee discussed the eligibility conditions for admission in Master of Computer applications (MCA) of two years duration which is to be started from academic session 2021-22, and rigorously prepared the MCA scheme as per CBCS of UGC. The curriculum of MCA programme of two year duration was discussed in detail in the CDC meeting.

The following decisions were taken in the CDC meeting:

1. The committee was of the view point that 80 Credits are not sufficient for the completion of a professional PG Degree in MCA, and suggested that minimum 24 credits per semester may be offered to the students of MCA of two years duration.
2. The committee suggested that the necessary changes may be made in the CUHP ordinance 31 for the professional PG Degree regarding the enhancement of credits.
3. The committee was of the view point that one more meeting of the CDC may be conducted at the earliest to finalize the course contents.

signed through E-mail

Prof. Manu Sood
(External Member)

13/04/2021

Dr. Rakesh Kumar
External Member

Mr. Keshav Singh rawat
Internal Member

Mr. Manoj Dhiman
Internal Member

Prof. Rakesh Kumar
Chairperson

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File No.: CSI/1-4/CDC/CUHP/21/ 14

Dated: 07.06.2021

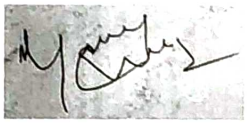
MINUTES OF THE SECOND MEETING

The **second meeting** of the **Curriculum Development Committee (CDC)** constituted vide no. 1-4/ हि.प्र.के.वि./सा.प्र./2010/खंड II/1242-46 Dated 17.03.2021 to **finalize** the **Course Curriculum** of the **Master of Computer Applications (MCA)** - 02 years Degree programme in the **Department of Computer Science and Informatics**, School of Mathematics, Computers and Information Sciences was **held/conducted** on **07.06.2021** at **11:00 AM** onwards through **online mode**. All the **respective members** joined the **meeting** in online mode via **Google Meet** Link meet.google.com/djp-gpbn-xso.

In this meeting, the **committee members** discussed the entire **course scheme** for the **admission** to **Master of Computer applications (MCA)** of **two years** duration which is to be **started** from **academic session 2021-22** onwards. The **course structure/scheme** was **prepared** and **approved,** attached as **Annexure I**. The **course contents** for the **approved courses** of MCA programme of two year duration were also **prepared** in the meeting.

The **committee** members **suggested** that **one more meeting** may be **conducted** to **finalize** the **course contents** for the entire **course structure** as per the **UGC CBCS scheme**.

Dr. Keshav Singh Rawat
Internal Member



Mr. Manoj Dhiman
Internal Member

07.6.2021

Dr. Rakesh Kumar
External Member

07/06/2021

Prof. Manu Sood
External Member

07/06/2021

Prof. Rakesh Kumar
Chairperson

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Website: www.cuhimachal.ac.in

File No.: CSI/1-4/CDC/CUHP/21/ 36 **Dated:** 30.06.2021

MINUTES OF THE MEETING

The **third meeting** of the **Curriculum Development Committee (CDC)** constituted vide no. 1-4/ हि.प्र.के.वि./सा.प्र./2010/खंड II/1242-46 Dated 17.03.2021 to **finalize** the **Course Curriculum** of the **Master of Computer Applications (MCA) -** 02 years Degree Programme in the **Department of Computer Science and Informatics**, School of Mathematics, Computers and Information Sciences was **held/conducted** on **30.06.2021** at **11:30 AM** onwards through **online mode**. All the **respective members** joined the **meeting** in online mode via **Google Meet** Link meet.google.com/syi-kthg-bed.

In this meeting, the **Committee Members finalized** the entire **Course Scheme** including **Course Contents** for the **admission** to **Master of Computer applications (MCA)** of **two years** duration which is to be **started** from **Academic Session 2021-22** onwards.

Dr. Keshav Singh Rawat
Internal Member

Mr. Manoj Dhiman
Internal Member

Dr. Rakesh Kumar
External Member

30/06/2021

Prof. Manu Sood
External Member

30/06/2021

Prof. Rakesh Kumar
Chairperson

Annexure-III

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Master of Computer Applications (MCA)-2Years Programme

(w.e.f. Academic Session 2021-22)

Name of Programme: Master of Computer Applications (MCA)

Programme Duration: Two Years (4 Semesters)

Eligibility for Admission to MCA 2-year Programme:
Passed BCA/ Bachelor Degree in Computer Science and Engineering or equivalent Degree with at least 50% marks.

OR

Passed Bachelor Degree with Mathematics either at 10+2 Level or at Graduation Level with at least 50% marks. *(The students admitted with this eligibility will have to simultaneously undertake Bridge Courses as prescribed by the University during the first semester in addition to Regular Courses. The students admitted with PGDCA need not to undertake the Bridge Courses.)*

List of equivalent degrees for eligibility:
B.Sc. (IT) / B.Sc. (Computer Science) / B.Sc. with specialization in Computer Science / any other equivalent degree.

Relaxation in Minimum Qualifying Marks:
Relaxation in minimum qualifying marks up to a maximum of 5% shall be made in case of candidates belonging to the SC, ST, OBC (Non-creamy layer) and Persons with Disabilities Categories.

Curriculum of MCA Programme

Introduction:
The curriculum for MCA Programme of study has been designed with total 96 credits. *(The students admitted with the eligibility of Bachelor Degree with Mathematics either at 10+2 Level or at Graduation Level, will have to simultaneously undertake zero credit Bridge Courses in addition to the Regular Courses.)*

Assignment of Credits:
Credit assigned to a particular course will be decided with due regard to specified Learning Outcomes, Educational Components and Workload requirements. A course of 1 Credit shall require the following work load:

Teacher – Student Contact hours

Theory Courses:

- 10 Hours of Lectures / Organized classroom activity
- 5 Hours of Problem Solving / Field Work / Tutorials / Teacher led Activities / Mentoring.

Practical (Lab) Courses:

- 20 Hours of Laboratory Work / Problem Solving / Field Work / Teacher led Activities.

Student Effort

15 Hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars etc.

Note: *Practical work of all the compulsory lab(s) will be based on the corresponding theoretical course(s).*

Definition of Credit:-

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
2 Hours Practical(Lab)/week	1 credit

Minimum Requirement(s) for the award of MCA degree:

A student must have to earn 96 credits as per the Course Scheme for the award of MCA degree*.

**The students admitted with the eligibility of Bachelor Degree with Mathematics either at 10+2 Level or at Graduation Level, will have to pass the Bridge Courses in addition to Regular Courses.*

Choice Based Credit System (CBCS) of UGC (as per CUHP Ordinance 31):

All Programmes of Studies in the University shall be broadly based on Comprehensive Choice Based Credit System (CBCS) on the same pattern as prescribed the UGC. Each Department / Centre of the university will prepare a list of courses of the programme of study to be offered by it comprising of Core-Compulsory, Core-Open, Elective-Specialization, Elective-Open, Foundation-Human-Making and Foundation-Skill Development.

(a) **Core-Compulsory** are the courses which necessarily need to be completed by every student for obtaining a degree in the said discipline.

(b) A **Core-Open** course is one that a student can opt from a basket of core-open courses offered by the Department / Centre or by a related discipline(s) included in the list of sister disciplines prepared by the concerned Department / Centre for such courses.

(c) **Elective-Specialization** course pertains to specialization in a certain sub-discipline of study and will be opted by the student out of the basket of elective specialization courses offered by the concerned Department / Centre only.

(d) **Elective-Open** course is a course which is inter-disciplinary in nature. A student may opt for Elective-Open course out of the basket of courses offered across all Departments / Centres of the University.

(e) **Foundation-Human-Making** courses are meant for the overall development of the student's personality.

(f) **Foundation-Skill Development** courses are for inculcating / enhancing specific skill in the students

CBCS Scheme for MCA Programme (2-years):

Total Credits = 96

Course Type		Credit Required
Core Courses	Core Compulsory	48
	Core Open	16
Elective Courses	Elective Specialization	20
	Elective Open	4
Foundation Courses	Human Making	4
	Skill Development	4

Nomenclature Used:

- Core-Compulsory (C)
- Core-Open(CO)
- Elective-Specialization (ES)
- Elective-Open(EO)
- Foundation-Human-Making (HM)
- Foundation-Skill Development(SD)
- Foundation-Bridge Course (FB)

Core-Compulsory (48 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	C	MCA-C1	Computer Organization and Architecture	4
2.	C	MCA-C2	Discrete Mathematics	2
3.	C	MCA-C3	Object Oriented Programming Using C++	2
4.	C	MCA-C4	LAB- Object Oriented Programming Using C++	2
5.	C	MCA-C5	Data Structures& Problem Solving Using C	4
6.	C	MCA-C6	LAB - Data Structures& Problem Solving Using C	2
7.	C	MCA-C7	Computer Networks	4
8.	C	MCA-C8	Data Base Management System	4
9.	C	MCA-C9	LAB - Data Base Management System	2
10.	C	MCA-C10	Design and Analysis of Algorithms	2
11.	C	MCA-C11	LAB - Design and Analysis of Algorithms	2
12.	C	MCA-C12	Computer Graphics	2
13.	C	MCA-C13	Operating Systems	4
14.	C	MCA-C14	Software Engineering	4
15.	C	MCA-C15	Theory of Computations	4
16.	C	MCA-C16	Internship : Industrial Training & Project	4

Core-Open (16 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	CO	MCA-CO1	Data Mining &Machine Learning	4
2.	CO	MCA-CO2	LAB- Data Mining & Machine Learning Using Python	2
3.	CO	MCA-CO3	Big Data Analytics	2
4.	CO	MCA-CO4	Compiler Design	4
5.	CO	MCA-CO5	Software Testing	4
6.	CO	MCA-CO6	Operational Research	4
7.	CO	MCA-CO7	Fundamentals of Scripting Languages Using Java Script and PHP	2
8.	CO	MCA-CO8	LAB- Fundamentals of Scripting Languages Using Java Script and PHP	2

Elective-Specialization (20 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	ES	MCA-ES1	Cryptography and Network Security	4
2.	ES	MCA-ES2	Web Programming	2
3.	ES	MCA-ES3	LAB- Web Programming	2
4.	ES	MCA-ES4	Java Programming	4
5.	ES	MCA-ES5	LAB - Java Programming	2
6.	ES	MCA-ES6	Cloud Computing Concepts	4
7.	ES	MCA-ES7	Distributed Databases	4
8.	ES	MCA-ES8	Internet of Things	2
9.	ES	MCA-ES9	Digital Image Processing	4
10.	ES	MCA-ES10	Ethical Hacking	2
11.	ES	MCA-ES11	Mobile Computing	4
12.	ES	MCA-ES12	Modeling and Simulation	4
13.	ES	MCA-ES13	Human Computer Interface	4

Elective-Open (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	EO	MCA-EO1	Soft Computing	4
2.	EO	MCA-EO2	Bioinformatics	4
3.	EO	MCA-EO3	Android Application Development	2
4.	EO	MCA-EO4	Natural Language Processing and Speech Recognition	4
5.	EO	MCA-EO5	Cyber Security	2
6.	EO	MCA-EO6	Fundamentals of E-Governance, E-Business & E-Learning	2
7.	EO	MCA-E07	Artificial Intelligence	4

Foundation Courses – I: Human Making (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	HM	MCA-HM1	Online Meeting and Web Conferencing Tools	2
2.	HM	MCA-HM2	Google Tools	2
3.	HM	MCA-HM3	Open Source Technologies	2
4.	HM	MCA-HM4	Research Ethics	2
5.	HM	MCA-HM5	IT Tools for Smart Work	2
6.	HM	MCA-HM6	Personality Development & Job Orientation	2
7.	HM	MCA-HM7	IT and Cyber Laws in India	2

Foundation Courses – II: Skill Development (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	SD	MCA-SD1	Basics of Web Designing	2
2.	SD	MCA-SD2	Network Administration	2
3.	SD	MCA-SD3	NoSQL Databases	2
4.	SD	MCA-SD4	Introduction to Latex	2
5.	SD	MCA-SD5	Linux & Shell Programming	2
6.	SD	MCA-SD6	Fundamentals of Python Programming	2

Bridge Course(s) (0 Credit)

S. No.	Course Type	Course Code	Course Name	L	T	P
1.	FB	MCA-FB1	Fundamentals of ICT	3	1	0
2.	FB	MCA-FB2	C Programming	2	0	0
3.	FB	MCA-FB3	LAB - C Programming	0	0	4
4.	FB	MCA-FB4	PC Packages	3	1	0

MCA Scheme (Semester-wise)

First Semester- Master of Computer Applications

S. No.	Course Type	Course Code	Course Name	Credit	L	T	P
1.	C	MCA-C1	Computer Organization and Architecture	4	3	1	0
2.	C	MCA-C2	Discrete Mathematics	2	1	1	0
3.	C	MCA-C3	Object oriented programming using C++	2	2	0	0
4.	C	MCA-C4	LAB- Object oriented programming using C++	2	0	0	4
5.	C	MCA-C5	Data Structures& Problem Solving Using C	4	4	0	0
6.	C	MCA-C6	LAB - Data Structures& Problem Solving Using C	2	0	0	4
7.	C	MCA-C7	Computer Networks	4	3	1	0
8.	HM	***Any course from Human making category / MOOC course***		2	2	0	0
9.	SD	***Any course from Skill development category / MOOC course***		2	2	0	0

Second Semester- Master of Computer Applications

S. No.	Course Type	Course Code	Course Name	Credit	L	T	P
1.	C	MCA-C8	Data Base Management System	4	4	0	0
2.	C	MCA-C9	LAB - Data Base Management System	2	0	0	4
3.	C	MCA-C10	Design and Analysis of Algorithms	2	2	0	0
4.	C	MCA-C11	LAB - Design and Analysis of Algorithms	2	0	0	4
5.	C	MCA-C12	Computer Graphics	2	2	0	0
6.	C	MCA-C13	Operating Systems	4	3	1	0
7.	C	MCA-C14	Software Engineering	4	3	1	0
8.	HM	***Any course from Human making category / MOOC course***		2	2	0	0
9.	SD	***Any course from Skill development category / MOOC course***		2	2	0	0

Third Semester- Master of Computer Applications

S. No.	Course Type	Course Code	Course Name	Credit
1.	C	MCA-C15	Theory of Computations	4
2.	CO	*Any course(s) from Core Open category*		8
3.	ES	*Any course(s) from Elective specialization category /MOOC courses*		8
4.	EO	*Any course(s) from Elective Open category/MOOC courses*		4

Fourth Semester- Master of Computer Applications

S. No.	Course Type	Course Code	Course Name	Credit
1.	CO	*Any course(s) from Core Open category /MOOC courses*		8
2.	ES	*Any course(s) from Elective specialization category/ MOOC courses*		12
3.	C	Internship: Industrial Training & Project		4

Dr. Keshav Singh Rawat
Internal Member

Mr. Manoj Dhiman
Internal Member

Dr. Rakesh Kumar
External Member

30/06/2021

Prof. Manu Sood
External Member

Prof. Rakesh Kumar
Chairperson

Annexure-IIIA

हिमाचल प्रदेश केन्द्रीय विश्वविद्यालय
Central University of Himachal Pradesh
(Established under Central Universities Act 2009)
TAB Shahpur, District Kangra, Himachal Pradesh-176206
Department of Computer Science &Informatics

Master of Computer Applications (MCA)-2Years Programme

(w.e.f.Academic Session 2021-22)

Name of Programme: Master of Computer Applications (MCA)

ProgrammeDuration: Two Years (4 Semesters)

Intake: 33 (As per MCA Three Years Programme)

Examination: As per CUHP rules

Eligibility for Admission to MCA 2-year Programme:
Bachelor of Computer Applications (BCA) /B.Sc.(Computer Science)/ B.Sc. (IT)/ BA(Computer Science)/ BA (IT) OR any Graduate with PGDCA OR any Graduate with 20-24 credits in the subjects of computer OR any graduate with minimum of 6 courses of computer studied in graduation (in case of degree not in credit system) from a recognized University or an equivalent examination.

Relaxation in Minimum Qualifying Marks:
Relaxation in minimum qualifying marks up to a maximum of 5% shall be made in case of candidates belonging to the SC, ST, OBC (Non-creamy layer) and Persons with Disabilities Categories.

Curriculum of MCA Programme

Introduction:
The curriculum for MCA Programme of study has been designed with total 96 credits.

Assignment of Credits:
Credit assigned to a particular course will be decided with due regard to specified Learning Outcomes, Educational Components and Workload requirements. A course of 1 Credit shall require the following work load:

Teacher – Student Contact hours

Theory Courses:

- 10 Hours of Lectures / Organized classroom activity
- 5 Hours of Problem Solving / Field Work / Tutorials / Teacher led Activities / Mentoring.

Practical (Lab) Courses:

- 20 Hours of Laboratory Work / Organized Laboratory activity
- 10 Hours of Problem Solving / Field Work / Tutorials / Teacher led Activities / Mentoring.

Student Effort

15 Hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars etc.

Note: Practical work of all the compulsory lab(s) will be based on the corresponding theoretical course(s).

Definition of Credit:-

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
2 Hours Practical(Lab)/week	1 credit

Minimum Requirement(s) for the award of MCA degree:

A student must have to earn 96 credits as per the Course Scheme for the award of MCA degree.

Choice Based Credit System (CBCS) of UGC(as per CUHP Ordinance 31):

All Programmes of Studies in the University shall be broadly based on Comprehensive Choice Based Credit System (CBCS) on the same pattern as prescribed the UGC. Each Department / Centre of the university will prepare a list of courses of the programme of study to be offered by it comprising of Core-Compulsory, Core-Open, Elective-Specialization, Elective-Open, Foundation-Human-Making and Foundation-Skill Development.

(a) **Core-Compulsory** are the courses which necessarily need to be completed by every student for obtaining a degree in the said discipline.

(b) A **Core-Open** course is one that a student can opt from a basket of core-open courses offered by the Department / Centre or by a related discipline(s) included in the list of sister disciplines prepared by the concerned Department / Centre for such courses.

(c) **Elective-Specialization** course pertains to specialization in a certain sub-discipline of study and will be opted by the student out of the basket of elective specialization courses offered by the concerned Department / Centre only.

(d) **Elective-Open** course is a course which is inter-disciplinary in nature. A student may opt for Elective-Open course out of the basket of courses offered across all Departments / Centres of the University.

(e) **Foundation-Human-Making** courses are meant for the overall development of the student's personality.

(f) **Foundation-Skill Development** courses are for inculcating / enhancing specific skill in the students

CBCS Scheme for MCA Programme (2-years):

Total Credits = 96

Course Type		Credit Required
Core Courses	Core Compulsory	48
	Core Open	16
Elective Courses	Elective Specialization	20
	Elective Open	4
Foundation Courses	Human Making	4
	Skill Development	4

Nomenclature Used:

- Core-Compulsory (C)
- Core-Open(CO)
- Elective-Specialization (ES)
- Elective-Open(EO)
- Foundation-Human-Making (HM)
- Foundation-Skill Development(SD)
- Foundation-Bridge Course (FB)

Core-Compulsory (48 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	C	MCA-C1	Object Oriented Programming Using C++	2
2.	C	MCA-C2	LAB- Object Oriented Programming Using C++	2
3.	C	MCA-C3	Data Structures	4
4.	C	MCA-C4	LAB - Data Structures	2
5.	C	MCA-C5	Data Base Management System	4
6.	C	MCA-C6	LAB - Data Base Management System	2
7.	C	MCA-C7	Operating Systems	4
8.	C	MCA-C8	Theory of Computations	4
9.	C	MCA-C9	Project	24

Core-Open (16 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	CO	MCA-CO1	Design and Analysis of Algorithms	4
2.	CO	MCA-CO2	LAB - Design and Analysis of Algorithms	2
3.	CO	MCA-CO3	Software Engineering	4
4.	CO	MCA-CO4	Computer Graphics	2
5.	CO	MCA-CO5	Compiler Design	4
6.	CO	MCA-CO6	Big Data Analytics	2
7.	CO	MCA-CO7	Computer Organization & Architecture	2
8.	CO	MCA-CO8	Software Testing	4
9.	CO	MCA-CO9	Operational Research	4

Elective-Specialization (20 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	ES	MCA-ES1	Data Mining &Machine Learning	4
2.	ES	MCA-ES2	LAB- Data Mining & Machine Learning Using Python	2
3.	ES	MCA-ES3	Computer Networks	4
4.	ES	MCA-ES4	Web Programming	2
5.	ES	MCA-ES5	LAB- Web Programming	2
6.	ES	MCA-ES6	Java Programming	4
7.	ES	MCA-ES7	LAB - Java Programming	2
8.	ES	MCA-ES8	Cloud Computing Concepts	4
9.	ES	MCA-ES9	Internet of Things	2
10.	ES	MCA-ES10	Digital Image Processing	4
11.	ES	MCA-ES11	Ethical Hacking	2
12.	ES	MCA-ES12	Mobile Computing	4
13.	ES	MCA-ES13	Modeling and Simulation	4
14.	ES	MCA-ES14	Human Computer Interface	4

Elective-Open (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	EO	MCA-EO1	Soft Computing	4
2.	EO	MCA-EO2	Bioinformatics	4
3.	EO	MCA-EO3	Android Application Development	2
4.	EO	MCA-EO4	Natural Language Processing and Speech Recognition	4
5.	EO	MCA-EO5	Cyber Security	2
6.	EO	MCA-EO6	Cryptography and Network Security	4
7.	EO	MCA-EO7	Fundamentals of E-Governance, E-Business & E-Learning	2
8.	EO	MCA-EO8	Artificial Intelligence	4
9.	EO	MCA-EO9	Distributed Databases	4

Foundation Courses – I: Human Making (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	HM	MCA-HM1	Online Meeting and Web Conferencing Tools	2
2.	HM	MCA-HM2	Google Tools	2
3.	HM	MCA-HM3	Open Source Technologies	2
4.	HM	MCA-HM4	Research Ethics	2
5.	HM	MCA-HM5	IT Tools for Smart Work	2
6.	HM	MCA-HM6	Personality Development & Job Orientation	2
7.	HM	MCA-HM7	IT and Cyber Laws in India	2

Foundation Courses – II: Skill Development (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	SD	MCA-SD1	Basics of Web Designing	2
2.	SD	MCA-SD2	Network Administration	2
3.	SD	MCA-SD3	NoSQL Databases	2
4.	SD	MCA-SD4	Introduction to Latex	2
5.	SD	MCA-SD5	Linux & Shell Programming	2
6.	SD	MCA-SD6	Fundamentals of Python Programming	2

MCA Scheme (Semester-wise)

First Semester- Master of Computer Applications

S. No.	Course Type	Course Code	Course Name	Credit
1.	C	MCA-C1	Object oriented programming using C++	2
2.	C	MCA-C2	LAB- Object oriented programming using C++	2
3.	C	MCA-C3	Data Structures	4
4.	C	MCA-C4	LAB - Data Structures	2
5.	C	MCA-C7	Operating Systems	4
6.	CO	*Any course(s) from Core Open category*		6
7.	HM	*Any course from Human making category from University/ MOOC course*		2
8.	SD	*Any course from Skill development category from University / MOOC course*		2

Second Semester- Master of Computer Applications

S. No.	Course Type	Course Code	Course Name	Credit
1.	C	MCA-C5	Data Base Management System	4
2.	C	MCA-C6	LAB - Data Base Management System	2
3.	C	MCA-C8	Theory of Computations	4
4.	CO	*Any course(s) from Core Open category*		6
5.	ES	*Any course(s) from Elective specialization category*		4
6.	HM	*Any course from Human making category from University*		2
7.	SD	*Any course from Skill development category from University*		2

Third Semester- Master of Computer Applications

S. No.	Course Type	Course Code	Course Name	Credit
1.	CO	*Any course(s) from Core Open category*		4
2.	ES	*Any course(s) from Elective specialization category /MOOC courses*		16
3.	EO	*Any course(s) from Elective Open category*		4

Fourth Semester- Master of Computer Applications

S. No.	Course Type	Course Code	Course Name	Credit
1.	MCA-C9	PROJECT		24

COURSE CONTENTS

MASTER OF COMPUTER APPLICATIONS (MCA)

DURATION - 02 YEARS

{Developed by Course Development Committee (CDC)}

Core-Compulsory (48 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	C	MCA-C1	Computer Organization and Architecture	4
2.	C	MCA-C2	Discrete Mathematics	2
3.	C	MCA-C3	Object Oriented Programming Using C++	2
4.	C	MCA-C4	LAB- Object Oriented Programming Using C++	2
5.	C	MCA-C5	Data Structures& Problem Solving Using C	4
6.	C	MCA-C6	LAB - Data Structures& Problem Solving Using C	2
7.	C	MCA-C7	Computer Networks	4
8.	C	MCA-C8	Data Base Management System	4
9.	C	MCA-C9	LAB - Data Base Management System	2
10.	C	MCA-C10	Design and Analysis of Algorithms	2
11.	C	MCA-C11	LAB - Design and Analysis of Algorithms	2
12.	C	MCA-C12	Computer Graphics	2
13.	C	MCA-C13	Operating Systems	4
14.	C	MCA-C14	Software Engineering	4
15.	C	MCA-C15	Theory of Computations	4
16.	C	MCA-C16	Internship : Industrial Training & Project	4

Core-Open (16 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	CO	MCA-CO1	Data Mining &Machine Learning	4
2.	CO	MCA-CO2	LAB- Data Mining & Machine Learning Using Python	2
3.	CO	MCA-CO3	Big Data Analytics	2
4.	CO	MCA-CO4	Compiler Design	4
5.	CO	MCA-CO5	Software Testing	4
6.	CO	MCA-CO6	Operational Research	4
7.	CO	MCA-CO7	Fundamentals of Scripting Languages Using Java Script and PHP	2
8.	CO	MCA-CO8	LAB- Fundamentals of Scripting Languages Using Java Script and PHP	2

Elective-Specialization (20 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	ES	MCA-ES1	Cryptography and Network Security	4
2.	ES	MCA-ES2	Web Programming	2
3.	ES	MCA-ES3	LAB- Web Programming	2
4.	ES	MCA-ES4	Java Programming	4
5.	ES	MCA-ES5	LAB - Java Programming	2
6.	ES	MCA-ES6	Cloud Computing Concepts	4
7.	ES	MCA-ES7	Distributed Databases	4
8.	ES	MCA-ES8	Internet of Things	2
9.	ES	MCA-ES9	Digital Image Processing	4
10.	ES	MCA-ES10	Ethical Hacking	2
11.	ES	MCA-ES11	Mobile Computing	4
12.	ES	MCA-ES12	Modeling and Simulation	4
13.	ES	MCA-ES13	Human Computer Interface	4

Elective-Open (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	EO	MCA-EO1	Soft Computing	4
2.	EO	MCA-EO2	Bioinformatics	4
3.	EO	MCA-EO3	Android Application Development	2
4.	EO	MCA-EO4	Natural Language Processing and Speech Recognition	4
5.	EO	MCA-EO5	Cyber Security	2
6.	EO	MCA-EO6	Fundamentals of E-Governance, E-Business & E-Learning	2
7.	EO	MCA-E07	Artificial Intelligence	4

Foundation Courses – I: Human Making (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	HM	MCA-HM1	Online Meeting and Web Conferencing Tools	2
2.	HM	MCA-HM2	Google Tools	2
3.	HM	MCA-HM3	Open Source Technologies	2
4.	HM	MCA-HM4	Research Ethics	2
5.	HM	MCA-HM5	IT Tools for Smart Work	2
6.	HM	MCA-HM6	Personality Development & Job Orientation	2
7.	HM	MCA-HM7	IT and Cyber Laws in India	2

Foundation Courses – II: Skill Development (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	SD	MCA-SD1	Basics of Web Designing	2
2.	SD	MCA-SD2	Network Administration	2
3.	SD	MCA-SD3	NoSQL Databases	2
4.	SD	MCA-SD4	Introduction to Latex	2
5.	SD	MCA-SD5	Linux & Shell Programming	2
6.	SD	MCA-SD6	Fundamentals of Python Programming	2

Bridge Course(s) (0 Credit)

S. No.	Course Type	Course Code	Course Name	L	T	P
1.	FB	MCA-FB1	Fundamentals of ICT	3	1	0
2.	FB	MCA-FB2	C Programming	2	0	0
3.	FB	MCA-FB3	LAB - C Programming	0	0	4
4.	FB	MCA-FB4	PC Packages	3	1	0

COURSE CONTENTS

S. No.	Course Type	Course Code	Course Name	Credit
1.	C	MCA-C1	Computer Organization and Architecture	4
2.	C	MCA-C2	Discrete Mathematics	2
3.	C	MCA-C3	Object Oriented Programming Using C++	2
4.	C	MCA-C4	LAB- Object Oriented Programming Using C++	2
5.	C	MCA-C5	Data Structures& Problem Solving Using C	4
6.	C	MCA-C6	LAB - Data Structures& Problem Solving Using C	2
7.	C	MCA-C7	Computer Networks	4
8.	C	MCA-C8	Data Base Management System	4
9.	C	MCA-C9	LAB - Data Base Management System	2
10.	C	MCA-C10	Design and Analysis of Algorithms	2
11.	C	MCA-C11	LAB - Design and Analysis of Algorithms	2
12.	C	MCA-C12	Computer Graphics	2
13.	C	MCA-C13	Operating Systems	4
14.	C	MCA-C14	Software Engineering	4
15.	C	MCA-C15	Theory of Computations	4
16.	C	MCA-C16	Internship : Industrial Training & Project	4

MCA-C1: Computer Organisation and Architecture

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives:

- To acquaint the students with the fundamental concepts of digital computer organization and architecture.
- To develop a basic understanding of the building blocks of a digital computer system
- To enable the understanding of how these building blocks are organized together to architect a digital computer system.
- To enable the understanding of how various functional units of a digital computer system interact to meet the processing requirements of the user.

UNIT – I

Digital Logic Circuits – Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Conbinational Circuits, Flip Flops, Sequential Circuits

Digital Components & Data Representation – Decoders, Multiplexers, Registers, Shift Registers, Binary Counters, Memory Units, Data Types, Complements, Fixed Point Representation, Floating Point Representation, Other Binary Codes, Error Correction Codes

UNIT – II

Register Transfer and Micro-operations – Register Transfer Language, Register transfer, Bus and Memory Transfer – Three State Bus Buffer, Memory Transfer; Arithmetic Micro-operations – Binary Adder, Binary Adder-Subtractor, Binary Incrementer, Arithmetic Circuit; Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.

Basic Computer Organization – Instruction codes – Stored Program Organization, Indirect Address; Computer Registers – Common Bus System; Computer Instructions – Instruction Set Completeness; Timing and Control; Instruction Cycle – Fetch and Decode, Determine the Type of Instruction, Register-Reference Instructions; Memory Reference Instructions; Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic

UNIT – III

Programming the Basic Computer – Machine Language, Assembly Language, Introduction to Assembler, Program Loops, Programming Arithmetic and Logic Operations

Microprogrammed Control – Control Memory, Address Sequencing – Conditional Branching, Mapping of Instructions, Subroutines, Microprogram Example – Computer Configuration, Microinstruction Format, Symbolic Microinstructions, Fetch Routine, Symbolic Microprogram, Binary Microprogram, Design of Control Unit – Microprogram Sequencer

Central Processing Unit – Introduction, General Register Organization, Stack Organization – Register Stack, Memory Stack, Reverse Polish Notation, Evaluation of Arithmetic Expressions, Instruction Formats – Three-, Two-, One- and Zero-Address Instructions, Addressing Modes, Data Transfer and Manipulation, Program Control – Status Bit Conditions, Conditional Branch Instructions, Subroutine Call and Return, Program Interrupt, Types of Interrupt, RISC & CISC Characteristics, Overlap Register Window

UNIT – IV

Pipeline and Vector Processing – Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors

Computer Arithmetic – Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic Operations, Decimal Arithmetic Unit and Operations

Input-Output Organization – Peripheral Devices, Input-Output Interface, Modes of Transfer – Programmed I/O, Interrupt-Driven I/O, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication

Memory Organization – Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware

Text Book:

1. M. Morris Mano, “Computer System Architecture”, Revised Third Edition , Pearson Education.

Reference Books:

1. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill.
2. William Stallings, “Computer Organization and Architecture: Designing for Performance”, Tenth Edition, Pearson Education.

MCA-C2: Discrete Mathematics

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The course is designed to have a thorough understanding of the discrete mathematics and its operations.

UNIT-I

Mathematical Logic: Proposition (Compound Propositions, Tautology, Contradiction, Satisfiable, Equivalent, and Dual), Equivalences, Well-formed Formula, Logical implication, Inference with rules, Predicate and Quantifiers, Proofs, Mathematical Induction.

UNIT-II

Sets, Relations and Functions: Sets, Types of sets, Set operations, Inclusion and Exclusion, relation, Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations, Partially ordered set (POSET), Hasse Diagram, Lattice, Functions, Types of functions. Algebraic System, Semigroups, monoids, Groups, Abelian groups, subgroups, cyclic groups.

UNIT-III

Graphs theory: Graph and its types, Special graphs (null graph, cycle graph, complete graph, Bipartite graph, regular graph, N-cube), Sub graph, Adjacency Matrix, Isomorphism, Complement of graph, directed and connected graph, walk, closed walk, paths, cycles, Eulerian and Hamiltonian graphs, cut edge, cut vertex, cut set, edge and vertex connectivity.

UNIT-IV

Counting Principles: Basic counting techniques, the rules of Sum and Product, Permutations, Combinations, Generation of Permutations and Combinations. Recurrence Relations, Linear recurrence relations with constant coefficients and their solving techniques.

Text Books:-

1. J.P Trembley, “Discrete mathematical Structures with Applications to Computer Science”,Seventh Edition, Tata McGrah Hill.

Reference Books:-

1. C.L. Liu, D.P Mohapatra, “Elements of Discrete Mathematics: A Computer oriented Approach”, Third Edition, Tata McGrah Hill.
2. Kenneth H. Rosen, “Discrete Mathematics”, Seventh Edition, Tata McGrah Hill.
3. Seymour Lopshutz, M. Lipson, “Discrete Mathematics”, Tata McGrah Hill.
4. Richard Hammack, “Book of Proofs”, VCU Mathematics textbook series.
5. S. Kaushik, “Logic and Prolog Programing”, New Age Publishers.

MCA-C3: Object Oriented Programming Using C++

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The main objective of this course is to help the students to learn the fundamental concepts of software construction in an object-oriented framework and conceptual knowledge of basic constructs used in C++ programming. Also by learning the basic of C++ programming, students can easily switch over to any other variant of OOPs language in future.

UNIT-I:

Data Types, Identifiers, Variables Constants and Literals, Basic input/output statements, Operators, Expressions, Type conversion, Control structures, Arrays, Strings, Structures and Pointers.

Functions: Basic, Recursive functions, Overloaded functions, inline functions, function with default arguments.

UNIT-II:

Introduction to classes and objects, Access specifiers, Constructor, Destructor, Function overloading, Operator overloading, friend functions.

UNIT-III:

Inheritance-Concept of derived and base class, accessing base class members, Single inheritance, multiple inheritance, hierarchical inheritance, multilevel inheritance, hybrid inheritance, constructor in derived classes.

Virtual Functions-Functions accessed with pointers, virtual member functions accessing with pointers, late binding, pure virtual functions, abstract classes, virtual base classes.

UNIT-IV:

Exception handling.

Working with files- classes for file stream operations, opening and closing a file, detecting end-of-file, file modes, file pointers and their manipulations, sequential input and output operations, updating a file, error handling.

Command line arguments.

Text Book:

1. E. Balagurusamy, “Object Oriented Programming with C++”, Eighth Edition , Tata McGraw Hill.

Reference Books:

1. Herbert Schildt, “ C++ The Complete Reference ” , Fourth Edition , Tata McGrah Hill.
2. Robert Lafore, “Object Oriented Programming in Turbo C++”, Fourth Edition ,Galgotia Publications Pvt. Ltd.

MCA-C4: LAB- Object Oriented Programming Using C++

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: This Lab course will enable the students to practically implement the basic constructs used in C++ programming. This course will also enable the students to find the practical solution of real world problems using the Object Oriented Programming. Moreover, students can easily switch over to any other variant of OOPs language in future.

MCA-C5: Data Structures & Problem Solving Using C

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed

- To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.
- To be able to carry out the Analysis of various Algorithms for mainly Time and Space Complexity.
- To get a good understanding of applications of Data Structures.
- To develop a base for advanced computer science study.

UNIT- I

Introduction: Basic Terminology, Data structures and its classification, Algorithm, Complexity- space & time complexity, complexity notations- big Oh, Omega, Theta. Array Definition, Representation and Analysis of Arrays, Single and Multidimensional Arrays, Address calculation, Linear Search, Binary Search of Array, Traversing, Insertion & deletion in array, Sparse Matrices, Strings. Internal and External sorting, Insertion Sort, Bubble Sort, selection sort, Quick Sort, Merge Sort, Radix sort.

UNIT- II

Linked List Introduction, Representation of linked list in to memory, Memory allocation -Garbage Collection, Traversing & Searching in Linked List, Insertion into linked list- at beginning of list & at given location, Deletion in linked list- from starting of list & given location of node, Header Linked List, two way List, Input & output restricted liked list, Circular Header Linked List, Representation of Polynomials using linked List.

UNIT- III

Stack, Array Implementation of stack, Linked Representation of Stack, Application of stack: Conversion of Infix to Prefix and Postfix Expressions and Expression evaluation. Queue, Array and linked implementation of queues, Circular queues, D-queues and Priority Queues.

UNIT- IV

Trees: Basic terminology, Binary Trees, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Binary Search Tree (BST), AVL Trees, B-trees. Graphs: Introduction, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees. Searching & Hashing: Sequential search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies.

Text Books:

1. Lipschuitz L. Seymour, “Data Structures With C”, Schaum Outline Series, Tata McGrah Hill.
2. R. S. Salaria, “Data Structures & Algorithm Using C”, Khanna Book Publishing.

Reference Books:

1. Horowitz and Sahani, “Fundamentals of data Structures”, Galgotia Publication Pvt. Ltd.
2. R. S. Salaria, “Data Structures & Algorithm Using C++”, Khanna Book Publishing.
3. A.M. Tenenbaum, “Data Structures using C & C++”, Prentice-Hall of India Pvt. Ltd.
4. J.P. Trembley and P. Sorenson, “Data Structures”, Tata McGrah Hill.

MCA-C6: LAB- Data Structures & Problem Solving Using C

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: The course is designed

- To develop proficiency in the programming aspect of various operation and applications of Data Structures.
- To develop a programming base for advanced computer science study.

MCA-C7: Computer Networks

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The main emphasis of this course is on the organization and management of local area networks (LANs) by making the students familiar with the idea of computer network organization and obtaining a theoretical understanding of data communication and computer networks

UNIT-I

Introduction To Computer Networks: Definition of a Computer Network, The OSI Reference Model, The TCP/IP Reference Model, Protocols and Hardware involved in the OSI model, Comparison of the OSI & the TCP/IP.

Application Layer: Domain name space, DNS in internet, electronic mail, FTP, WWW, HTTP, SNMP, multimedia, network security

UNIT-II

Physical Layer: Introduction: Network topologies; Linear Bus Topology, Ring Topology, Star Topology, Hierarchical or Tree Topology, Topology Comparison, Considerations when choosing a Topology: Switching; Circuit switching, Message switching, Packet switching.

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

UNIT-III

Data Link Layer: Introduction; Goal of DLL: Design issues of DLL; Services provided to the Network layer, Framing, Error control, Flow control, ARQ strategies: Stop-and-Wait, RTT estimation, sliding window, Go-Back-N retransmission, Error Detection and correction: Parity bits, Single bit error correction or (n, m), Error Detection or Cyclic Redundant Code (CRC): Data Link layer protocols; Transmission control protocols, HDLC.

Unit-IV

Network Layer: Introduction: Design issues of Network layer; Nature of the service provided, Internetworking: Principles of Routing; Types of routing algorithms, Properties of routing algorithms, Optimality principle: Routing algorithms; Shortest path algorithm, Flooding, Distance vector routing, Hierarchical routing, Link state routing, Congestion: Factors of congestion, Comparison of flow control and congestion control, General principles of congestion control, Closed loop solution: IP protocol (IPV4).

Transport Layer: Introduction: Services of Transport layer; Service primitives: Connection establishment: Connection Release: Transport Protocols; TCP protocol, UDP protocol

Text Books:

1. Behrouz A. Forouzan, “Data Communications and Networking”, Fourth Edition, Tata McGraw Hill.

Reference Books:

1. Natalia Olifer & Victor Olifer, “Computer Networks”, John Wiley & Sons.
2. William Stallings, “Data & Computer Communication”, Pearson Education.
3. Andrew S. Tanenbaum, “Computer Networks”, Pearson Education.

MCA-C8: Database Management System

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The main objective of this course is to provide the conceptual as well as practical knowledge of Database, various methodologies and applications software used for data base management. After completing the course, the student should be competent in data base handling, able to design and manage database for real life problems and the student should be proficient in query handling.

UNIT-I

Basic Concepts: Entity, Relationship and its types, Components of a database, three level architecture of a DBMS, Database models.
File Organization: Serial, Sequential, Index Sequential and Direct file organization.

UNIT-II

Entity-Relationship Model: Entity Types, Entity Sets, Attributes & keys, Relationships, Relationships Types, Roles and Structural Constraints, Design issues, E-R Diagrams, Design of an E-R Database Schema, Reduction of an E-R Schema to Tables.
Relational Data Model: Relational model concepts, Integrity constraints over Relations, Relational Algebra – Basic Operations.
SQL: DDL, DML, and DCL, views & Queries in SQL, Specifying Constraints & Indexes in SQL.

UNIT-III

Relational Database Design: Functional Dependencies, Decomposition, Normal forms based on primary keys (1 NF, 2 NF, 3 NF, & BCNF)
Transaction Processing Concepts: Introduction to Transaction Processing, Transaction & System Concepts, Properties of Transaction, Schedules and Recoverability, Serializability of Schedules.
Concurrency Control Techniques: Locking Techniques, Timestamp ordering, Multiversion Techniques, Optimistic Techniques, Granularity of Data items.

UNIT-IV

Databases for Advanced Applications: Active database concepts, Temporal database concepts, Spatial databases, Deductive databases; Emerging Database Technologies: Mobile databases, Multimedia Databases, Geographic information systems (GIS); XML and Internet Databases: Structured, Semi-structured and Unstructured Data, Introduction to web databases and XML, Structure of XML data.

Text Books:

1. R. Elmasri and S. B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Addison Wesley.
2. Ivan Bayross, "SQL, PL/SQL: The Programming Language of Oracle", Fourth Edition, BPB Publications.

Reference Books:

1. Ramakrishnan and J. Gehrke, "Database Management Systems", Third Edition Tata McGraw Hill.
2. A. Silberschatz, H. Korth and S. Sudarshan, "Database System Concepts",Sixth Edition, Tata McGraw Hill.

MCA-C9: LAB- Data Base Management System

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: The main objective of this course is to provide the practical knowledge of Database, various methodologies and applications software like MYSQL/Oracle used for data base management. After completing the course, the student should be competent in defining and manipulating database through MySQL/Oracle and proficient in query handling by using MySQL/Oracle.

MCA-C10: Design & Analysis of Algorithms

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The course is designed

- To enable the students to carry out the analysis of various Algorithms for mainly time and space complexity.
- To develop efficient algorithms for simple computational tasks, and reasoning about the correctness of them. Through the complexity measures, different range of behaviours of algorithms and the notion of tractable and intractable problems will be understood.

UNIT- I

Algorithms, designing algorithms, analyzing algorithms, asymptotic notations, Introduction to divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, merge sort, quick sort, strassen's matrix multiplication.

UNIT- II

Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum spanning trees, knapsack problem, job sequencing with deadlines, single source shortest path algorithm.

Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, multistage graph, reliability design, Floyd-Warshall algorithm.

UNIT- III

Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph coloring problem etc. Introduction to branch & bound method, examples of branch and bound method like travelling salesman problem etc. Meaning of lower bound theory and its use in solving algebraic problem.

UNIT- IV

Binary search trees, height balanced trees, 2-3 trees, B-trees, basic search and traversal techniques for trees and graphs (In order, preorder, postorder, DFS, BFS), NP-completeness.

Text Books:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms", Second Edition, Universities Press.
2. Cormen, T.H., Leiserson, C.E., Rivest, R.L. and Stein, C., "Introduction to Algorithms", Second Edition, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. A.V. Aho, J.E. Hopcroft and J.D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education.
2. Sara Baase and Allen Van Gelder, "Computer Algorithms, Introduction to Design and Analysis", Third Edition, Pearson Education.
3. S. Dasgupta, C. Papadimitriou & U. Vazirani, "Algorithms"; Tata McGraw Hill.
4. Michael T Goodrich, Robarto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley India.

MCA-C11: LAB-Design & Analysis of Algorithms

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: The course is designed to develop programs for different problem algorithms based on various strategies such as divide and conquer, greedy method, dynamic programming, backtracking, branch and bound etc.

MCA-C12: Computer Graphics

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The course is designed

- to familiarize the students with the fundamental algorithms and data structures that are used in today's interactive graphics systems as well as programming and architecture of high-resolution graphics computers.
- to aware the students about modern application domains of scientific visualisation, virtual reality, computer games and film animation.

UNIT-I

Introduction: Survey of computer Graphics and its applications; Interactive and passive graphics; display processors; Graphic Devices: Display systems-refresh CRTs, raster scan and random scan monitors, Grey shades, Interlacing, beam penetration shadow mask monitors, lookup tables, plasma panel, LED and LCD monitors, VGA and SVGA resolutions; Hard copy Devices-printers, plotters; Interactive Input Devices.

UNIT-II

Drawing Geometry: Coordinate system; resolution; use of the homogeneous coordinate system; scan conversion: symmetrical DDA, simple DDA, Bresenham's line drawing algorithm, Circle drawing using DDA and polar coordinates, Bresenham's circle drawing algorithm, generation of an ellipse. Curve Drawing

UNIT-III

2-D Transformations: Translation; rotation; scaling; mirror reflection; shearing; zooming; panning; input techniques-pointing, positioning, rubber band methods and dragging; tweening, Morphing. Graphic operations: Clipping-line clipping using Sutherland-Cohen and midpoint sub- division algorithm, Liang Barsky Line clippers algorithm, polygon clipping; window and viewport; windowing transformation; Filling algorithms.

UNIT-IV:

3-D Graphics: 3D modelling of objects; 3D display techniques; coordinate system; 3D transformation matrices for translation, scaling and rotation; parallel projection; perspective projection; Hidden-surface removal - Z-buffer, back face, scan-line, depthsorting, area subdivision; Shading - modelling light intensities, Gouraud shading, Phong shading.

Text Books:

1. D.D. Hearn, M.P. Baker, and W.R. Carithers, "Computer Graphics with OpenGL", Fourth Edition, Prentice Hall of India.

Reference Books:

1. Klinger, K.S. Fu, and T.L. Kunii, "Data Structures, Computer Graphics, and Pattern Recognition", Academic Press.
2. S. Marschner, and P. Shirley, "Fundamentals of Computer Graphics", CRC Press.
3. G. Enderle, K. Kansy, and G. Pfaff, "Computer Graphics Programming: GKS—The Graphics Standard", Springer Science & Business Media.
4. J.D. Foley, F.D. Van, A. Van Dam, S.K. Feiner, J.F. Hughes, E. Angel, and J. Hughes, "Computer Graphics: Principles and Practice", Addison-Wesley Professional.

MCA-C13: Operating Systems

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The main objective of this course is to provide conceptual as well as practical knowledge about Operating system. After completing the course, the student will be familiarized with various methodologies used by operating system to manage different types of tasks, and will be able to use operating system proficiently.

UNIT-I

Operating System Introduction: function, characteristics, structures–simple batch, multiprogrammed, timeshared, personal computer, parallel, distributed systems, real-time systems, system components, operating system services, system calls, virtual machines. **Process and CPU Scheduling:** Process concepts and scheduling, operation on processes, cooperating processes, threads and inter-process communication scheduling criteria, scheduling algorithm, multiple-processor scheduling, real time scheduling.

UNIT-II

Management and Virtual memory: logical versus physical address space, swapping, contiguous allocation, paging, segmentation, segmentation with paging. Demand paging, performance of denuding paging, page replacement, page replacement algorithm, allocation of frames, thrashing.

UNIT-III

File System Interface and Implementation: access methods, directory, structure, protection, file system structure, allocation methods, free space management, directory management, directory implementation, efficiency and performance. **I/O Management:** I/O software and its types, disk scheduling. **Process Management and Synchronization:** Critical section problem, synchronization, critical regions, monitors.

UNIT-IV

Deadlocks: system model, dead locks characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection and recovery from deadlock. **Shell Programming:** vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating shell scripts. Basic system administration in Linux/Unix.

Text Books:

1. A. Silberschart, P. Galvin and G. Gagne, “Operating System Concepts”, Ninth Edition, WSE Wiley.
2. S. Das, “Your UNIX: The Ultimate Guide”, Fourth Edition, Tata McGraw-Hill.

Reference Books:

1. D.M. Dhamdhere, “Operating Systems: A Concept Based Approach”, Tata McGraw Hill.
2. Milan Milenkovic, “Operating system-concepts and design”, Tata McGraw Hill.
3. A. S. Godbole, “Operating systems”, Tata McGraw Hill.
4. H.M. Deitel, “Operating System”, Pearson.
5. William Stallings, “Operating Systems: Internals and Design Principles”, Pearson.
6. Andrew. S. Tanenbaum, “Modern Operating Systems”, Pearson.

MCA-C14: Software Engineering

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: To introduce the methodologies involved in the development, the implementation, testing strategies, verification and validation techniques, project planning and management.

UNIT-I

Introduction: Introduction to software Engineering, Software characteristics, Software components, Software applications, Software Engineering Principles, Software metrics and measurement, monitoring and control. Software development life-cycle**,** Water fall model, prototyping model, Incremental model, Iterative enhancement Model, Spiral model.

Unit-II

Software Requirement Specification: Requirements Elicitation Techniques, Requirements analysis, Models for Requirements analysis, requirements specification, requirements validation.

System Design: Design Principles: Problem partitioning, abstraction, Top down and bottom up – design, structured approach. Functional versus object-oriented approach of design, design specification, Cohesiveness and Coupling. Overview of SA/SD Methodology, structured analysis, data flow diagrams, extending DFD to structure chart.

Unit-III

Software project Management: Project planning and Project scheduling. Software Metrics**:** Size Metrics like LOC, Token Count, Function Count. Cost estimation using models like COCOMO. Risk management activities.

Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, reliability models, Software quality, ISO 9000 certification for software industry, SEI capability maturity model.

Unit-IV

Testing: Verification and validation, code inspection, test plan, test case specification. Level of testing: Unit, Integration Testing, Top down and bottom up integration testing, Alpha and Beta testing, System testing and debugging. functional testing, structural testing, Software testing strategies.

Software Maintenance: Structured Vs unstructured maintenance, Maintenance Models, Configuration Management, Reverse Engineering, Software Re-engineering.

Text Books:

1. K. K. Aggarwal & Y. Singh, “Software Engineering”, Second Edition, New Age International Publishers.
2. Pankaj Jalote, “Software Engineering”, Wiley India.

Reference Books:

1. Roger S. Pressman, “Software Engineering- A Practitioner’s Approach”, Tata McGraw Hill.
2. Rajib Mall, “Fundamentals of Software Engineering”, PHI Learning Pvt. Ltd.

MCA-C15: Theory of Computations

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed to cover the underlying concepts and techniques used in the theory of computations.

UNIT-I

Introduction of Theory of Computation, Alphabet, Strings and their properties, Definition of an automation, Description of a finite Automation, Transition graph, transition function, Acceptability of a string by a Finite Automation, Deterministic and nondeterministic FSM'S, Equivalence of DFA and NDFA, Mealy & Moore machines, Minimization of finite automata.

UNIT-II

Chomsky classification of Languages, Languages and their relation, Languages and Automata, Regular sets, regular expression, Regular Grammars, Finite state machine and regular expression, Pumping lemma for regular sets, Application of pumping lemma, closure properties of regular sets.

Introduction to CFG, Context-free languages and Derivation Trees, Ambiguity in context-free Grammars, simplification of context-free Grammars, Normal forms for context-free Grammars – Chomsky normal form and Greiback normal form.

UNIT-III

Pushdown Automata: Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Pushdown automata and CFL, PDA corresponding to given CFG, CFG corresponding to a given PDA, Closure properties of CFL's.

UNIT-IV

Introduction, TM model Representation of Turing machines, languages acceptability of TM, Design of TM, Universal TM & Other modification, Church's hypothesis, Properties of recursive and Recursively enumerable languages.

Tractable and Untractable Problems: P, NP, NP complete and NP hard problems

Text Books:

1. John E. Hopcroft, Jeffery Ullman,"Introduction to Automata theory, Langauges & computation" , Third Edition, Narosa Publishers.
2. John C. Martin, "Introdution to Languages and Theory of Computation", Fourth Edition, Tata McGraw Hill.

Reference Books:

- K.L.P. Mishra & N. Chandrasekaran,"Theory of Computer Science", PHI Learning.
- Daniel I.A. Cohen,"Introduction to Computer Theory",Wiley India.
- Peter Linz, "An Introduction to Formal Languages and Automata", Jones & Bartlett.

MCA-C16: Internship: Industrial Training & Project

Credits: 4

L	T	P	Total
0	0	4	4

Course Objectives: The course is designed to cover the practical applications of the courses studied, industry interaction and development of programming skills either in any educational institution or in the industry.

Training duration: 4 to 6 week

Evaluation Criteria:

Type of Evaluation	Activity	Marks
Internal Evaluation (50 Marks)	Based on the two interim progress reports	**50**
External Evaluation (150 Marks)	Project Report	**25**
	Seminar/Presentation	**25**
	Project Demo	**25**
	Viva-Voce	**75**
Total Marks		**200**

COURSE CONTENTS

Core-Open (16 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	CO	MCA-CO1	Data Mining &Machine Learning	4
2.	CO	MCA-CO2	LAB- Data Mining & Machine Learning Using Python	2
3.	CO	MCA-CO3	Big Data Analytics	2
4.	CO	MCA-CO4	Compiler Design	4
5.	CO	MCA-CO5	Software Testing	4
6.	CO	MCA-CO6	Operational Research	4
7.	CO	MCA-CO7	Fundamentals of Scripting Languages Using Java Script and PHP	2
8.	CO	MCA-CO8	LAB- Fundamentals of Scripting Languages Using Java Script and PHP	2

MCA-CO1: Data Mining & Machine Learning

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed

- To Understand and implement classical models and algorithms in data mining.
- To Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.

UNIT-I

Introduction to Data mining, types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity, Exploring Data: Data Set, Summary Statistics, Visualization. Classification: Basic Concepts, Decision Trees, Nearest Neighborhood classifier, Bayesian Classifier, Support vector Machines: Linear SVM, Separable and Non Separable case.

UNIT-II

Association Analysis: Problem Definition, Frequent Item-set generation, rule generation, compact representation of frequent item sets, FP-Growth Algorithms.

Clustering: Over view, K-means, Agglomerative Hierarchical clustering, DBSCAN, Cluster evaluation: overview, Unsupervised Cluster Evaluation using cohesion and separation, using proximity matrix, Scalable Clustering algorithm.

UNIT-III

Overview and Introduction to Bayes Decision Theory: Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class conditional probability distributions, Examples of classifiers bayes optimal classifier and error, learning classification approaches.

Linear machines: General and linear discriminants, decision regions, single layer neural network, linear separability, general gradient descent, perceptron learning algorithm, mean square criterion and widrow-Hoff learning algorithm; multi-Layer perceptrons: two-layers universal approximators, backpropagation learning, on-line, off-line error surface, important parameters.

UNIT-IV

Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3 algorithm criterion, C4.5 algorithm continuous test nodes, confidence, pruning, learning with incomplete data.

Instance-based Learning: Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability, Machine learning assessment and Improvement: Statistical model selection, structural risk minimization, bootstrapping, bagging, boosting. Support Vector Machines

Text Books:

1. Jiawei Han and Micheline Kamber, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann.
2. E. Alpaydin, “Introduction to Machine Learning”, Prentice Hall of India.
3. T. M. Mitchell, “Machine Learning”, Tata McGraw Hill.

Reference Books:

1. Arun Pujari, “Data Mining Techniques”, University Press.
2. D. Hand, H. Mannila and P. Smyth, “Principles of Data Mining”, Prentice Hall of India.
3. G.K. Gupta, “Introduction to Data Mining with Case Studies”, Prentice Hall of India.
4. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer.
5. R.O. Duda, P.E. Hart, and D.G. Stork, “Pattern Classification”, John Wiley and Sons.
6. Vladimir N. Vapnik, “Statistical Learning Theory”, John Wiley and Sons.

MCA-CO2: LAB- Data Mining & Machine Learning using Python

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: The Lab course is designed to make the students understand different Data sets in implementing the machine learning algorithms utilizing Python.

MCA-CO3: Big Data Analytics

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The course is designed-

- To understand the Big Data Platform and its Use cases.
- To provide an overview of Apache Hadoop and HDFS Concepts and Interfacing with HDFS, understand Map Reduce Jobs and hands on Hodoop Eco System.

UNIT-I

Introduction to Big Data: Platform – Traits of Big data -Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - ReSampling - Statistical Inference - Prediction Error.

UNIT-II

Data Analysis: Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.

UNIT-III

Mining Data Streams: Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.
Frequent Itemsets And Clustering: Mining Frequent Item sets - Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream – Clustering Techniques – Hierarchical – K-Means – Clustering High Dimensional Data – CLIQUE and PROCLUS – Frequent Pattern based Clustering Methods – Clustering in NonEuclidean Space – Clustering for Streams and Parallelism.

UNIT-IV

Frameworks And Visualization: MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications - Analytics using Statistical packages-Approaches to modeling in Analytics – correlation, regression, decision trees, classification, association Intelligence from unstructured information-Text analytics-Understanding of emerging trends and technologies-Industry challenges and application of Analytics.

Text Books:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press.

Reference Books:

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & Sons.
2. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons.
3. Pete Warden, “Big Data Glossary”, O’Reilly.

MCA-CO4: Compiler Design

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed

- To learn how a compiler works.
- To learn the use of formal attributed grammars for specifying the syntax and semantics of programming languages.
- To understand the working knowledge of the major phases of compilation, particularly lexical analysis, parsing, semantic analysis, and code generation.

UNIT-I

Introduction to Compiler & Lexical Analysis: Introduction of Compiler, Major data Structure in compiler, BOOT Strapping, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Lexical analysis: Input buffering , Specification & Recognition of Tokens, LEX.

UNIT-II

Syntax analysis: CFGs, Top down parsing, Brute force approach, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence parsing, LR parsers (SLR,LALR, LR).

UNIT-III

Syntax directed definitions: Construction of Syntax trees, Bottom up evaluation of S-attributed definition, L-attribute definition, Top down translation, Bottom Up evaluation of inherited attributes Recursive Evaluation, Analysis of Syntax directed definition.

Intermediate code generation: Declarations, Assignment statements, Boolean expressions, Case statements.

UNIT-IV

Type Checking & Run Time Environment: Type checking: type system, specification of simple type checker.

Run time Environment: storage organization, Storage allocation strategies, parameter passing, dynamic storage allocation, and Symbol table.

Introduction to Code optimization: sources of optimization of basic blocks, dead code elimination, loop optimization, Introduction to global data flow analysis, Code Improving transformations, peephole optimization.

Code Generation: Issues in the design of code generator, Basic block and flow graphs, Register allocation and assignment, DAG representation of basic blocks.

Text Books:

1. A. V. Aho, M.S.Lam,R. Sethi, and J. D. Ullman, “Compilers: Principles, Techniques and Tools”, Second Edition, Pearson Education.
2. V. Raghavan, “Principles of Compiler Design”, Tata McGraw Hill.

Reference Books:

1. K.C. Louden, “Compiler Construction: Principles and Practice”, Cengage Learning
2. A. C. Holub, “Compiler Design in C”, Prentice Hall Inc.

MCA-CO5: Software Testing

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The objectives of this course are-

- To review basics of software testing.
- To describe the art and science of how to create test cases and plan.
- To learn the various models of software testing.

UNIT-I

Introduction: Software Failures, Testing Process, Program and Software, Verification and Validation, Fault, Error, Bug and Failure, Test, Test Case and Test Suite, Deliverables and Milestones, Alpha, Beta and Acceptance Testing, Quality and Reliability, Testing, Quality Assurance and Quality Control, Static and Dynamic Testing, Testing and Debugging, Limitations of Testing, The V Shaped Software Life Cycle Model, Graphical Representation, Relationship of Development and Testing Parts

Functional Testing: Boundary Value Analysis – Robustness Testing, Worst-Case Testing, Robust Worst-Case Testing, Applicability; Equivalence Class Testing – Creation of Equivalence Classes, Applicability; Decision Table Based Testing – Parts of the Decision Table, Limited Entry and Extended Entry Decision Tables, 'Do Not Care' Conditions and Rule Count, Impossible Conditions, Applicability; Cause-Effect Graphing Technique – Identification of Causes and Effects, Design of Cause-Effect Graph, Use of Constraints in Cause-Effect Graph, Design of Limited Entry Decision Table, Writing of Test Cases, Applicability

UNIT-II

Structural Testing: Control Flow Testing – Statement Coverage, Branch Coverage, Condition Coverage, Path Coverage; Data Flow Testing – Define/Reference Anomalies, Definitions, Identification of du and dc Paths, Testing Strategies Using du-Paths, Generation of Test Cases; Slice Based Testing – Guidelines for Slicing, Creation of Program Slices, Generation of Test Cases; Mutation Testing – Mutation and Mutants, Mutation Operators, Mutation Score

Software Verification: Verification Methods – Peer Reviews, Walkthroughs, Inspections, Applications; Software Requirements Specification (SRS) Document Verification – Nature of the SRS Document, Characteristics and Organization of the SRS Document, SRS Document Checklist; Software Design Description (SDD) Document Verification – Organization of the SDD Document, SDD Document Checklist; Source Code Reviews – Issues Related to Source Code Reviews, Checklist of Source Code Reviews; User Documentation Verification – Review Process Issues, User Documentation Checklist; Software Project Audit – Relevance Scale, Theory and Practice Scale, Project Audit and Review Checklist

UNIT-III

Creating Test Cases from Requirements and Use Cases: Use Case Diagram and Use Cases – Identification of Actors, Identification of Use Cases, Drawing of Use Case Diagram, Writing of Use Case Description; Generation of Test Cases from Use Cases – Generation of Scenario Diagrams, Creation of Use Case Scenario Matrix, Identification of Variables in a Use Case, Identification of Different Input States of a Variable, Design of Test Case Matrix, Assigning Actual Values to Variables; Guidelines for generating validity checks – Data Type, Data Range, Special Data Conditions, Mandatory Data Inputs, Domain Specific Checks; Strategies for Data Validity – Accept Only Known Valid Data, Reject Known Bad Data, Sanitize All Data; Database Testing

Selection, Minimization and Prioritization of Test Cases for Regression Testing: What is Regression Testing – Regression Testing Process, Selection of Test Cases; Regression Test Cases Selection – Select All Test Cases, Select Test Cases Randomly, Select Modification Traversing Test Cases; Reducing the Number of Test Cases – Minimization of Test Cases, Prioritization of Test Cases; Risk Analysis – What is Risk, Risk Matrix; Code Coverage Prioritization Technique – Test Cases Selection Criteria, Modification Algorithm, Deletion Algorithm

Software Testing Activities: Levels of Testing – Unit Testing, Integration Testing, System Testing, Acceptance Testing; Debugging – Why Debugging is so Difficult, Debugging Process, Debugging

Approaches, Debugging Tools; Software Testing Tools – Static Software Testing Tools, Dynamic Software Testing Tools, Process Management Tools; Software Test Plan

UNIT-IV

Object Oriented Testing: What is Object Orientation – Classes and Objects, Inheritance, Messages, Methods, Responsibility, Abstraction, Polymorphism, Encapsulation, What is Object Oriented Testing – What is a Unit, Levels of Testing; Path Testing, Activity Diagram, Calculation of Cyclomatic Complexity, Generation of Test Cases; State Based Testing – What is a State Machine, State Chart Diagram, State Transition Tables, Generation of Test Cases; Class Testing – How Should We Test a Class, Issues Related to Class Testing, Generating Test Cases

Metrics and Models in Software Testing: Software Metrics – Measure, Measurement and Metrics, Applications, Categories of Metrics – Product Metrics for Testing, Process Metrics for Testing; Object Oriented Metrics Used in Testing – Coupling Metrics, Cohesion Metrics, Inheritance Metrics, Size Metrics; What Should We Measure During Testing – Time, Quality of Source Code, Source Code Coverage, Test Case Defect Density, Review Efficiency; Software Quality Attributes Prediction Models – Reliability Models, An Example of Fault Prediction Model in Practice, Maintenance Effort Prediction Model

Automated Test Data Generation: What is Automated Test Data Generation – Test Adequacy Criteria, Static and Dynamic Test Data Generation; Approaches to Test Data Generation – Random Testing, Symbolic Execution, Dynamic Test Data Generation; Test Data Generation using Genetic Algorithm – Initial Population, Crossover and Mutation, Fitness Function, Selection, Algorithm for Generating Test Data; Test Data Generation Tools

Text Book:

1. Yogesh Singh , “Software Testing” , Cambridge University Press.

Reference Books:

1. Paul C. Jorgensen, “Software Testing: A Craftsman’s Approach”, Fourth Edition, CRC Press.
2. Boris Beizer, “Software Testing Techniques”, Second Edition, Dreamtech Press.
3. A.P. Mathur, “Fundamentals of Software Testing”, Pearson.
4. S. Desikan & G. Ramesh, “Software Principles and Practices”, Pearson.
5. G.J. Myers, T. Badgett, C. Sandler, “The Art of Software Testing”, Third Edition, Wiley India.

MCA-CO6: Operations Research

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The objectives of the course are to familiarize the students with the use of quantities methods and techniques for effective decisions–making; model formulation and applications that are used in solving business decision problems.

UNIT-I

Introduction of operation research. LP Formulations, Graphical method for solving LP's with 2 variables, Simplex method, Duality theory in linear programming and applications, Integer linear programming, dual simplex method

UNIT-II

Transportation problem, Assignment problem. Dynamic Programming: Basic Concepts, Bellman's optimality principles, Dynamics programming approach in decision making problems, optimal subdivision problem. Sequencing Models: Sequencing problem, Johnson's Algorithm for processing n jobs through 2 machines, Algorithm for processing n jobs through 3 or more machines, Processing 2 jobs through n machines.

UNIT-III

Project Management: PERT and CPM : Project management origin and use of PERT, origin and use of CPM, Applications of PERT and CPM, Project Network, Diagram representation, Critical path calculation by network analysis and critical path method (CPM), Determination of floats, Construction of time chart and resource labelling, Project cost curve and crashing in project management, Project Evaluation and review Technique (PERT).

UNIT-IV

Queuing Models: Essential features of queuing systems, operating characteristics of queuing system, probability distribution in queuing systems, classification of queuing models, solution of queuing M/M/1: ∞ /FCFS,M/M/1 : N/FCFS, M/M/S : ∞/FCFS, M/M/S : N/FCFS

Inventory Models: Introduction to the inventory problem, Deterministic Models, The classical EOQ (Economic Order Quantity) model, Inventory models with deterministe demands (no shortage & shortage allowed), Inventory models with probabilistic demand, multiitem determinise models.

Text Books:

1. B.E. Gillet, "Introduction to Operation Research: Computer Oriented Algorithmic approach", Tata McGraw Hill.
2. S.D. Sharma, "Operations Research", Kedar Nath Ram Nath Publication, Meerut, India.

Reference Books:

1. P.K. Gupta & D.S. Hira, "Operations Research", S. Chand & Co.
2. J.K. Sharma, "Operations Research: Theory and Applications", Mac Millan.
3. S.S. Rao "Optimization Theory and Application", Wesley Eastern.
4. Tata Hamdy, A "Operations Research - An Introduction", Prentice Hall of India.
5. H. A. Taha, "Operations Research: An Introduction", Pearson.

MCA-CO7: Fundamentals of Scripting Languages Using Java Script and PHP

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The main objective of this course is to provide conceptual as well as practical knowledge of Scripting Languages (Java Script and PHP), and tools used in these languages. This will enable the students to be competent in scripting language tools and enable them to use these tools to create dynamic web pages.

UNIT-I

Introduction to Java Script: Basic functions (alert, confirm, prompt), adding javascript in page body. Document object model (DOM), Defining and calling functions: variables, operators, control structures. JavaScript Events, Predefined objects (String, date, math, array, window).

UNIT-II

Validating form using JavaScript; Enhancing form with javascript: Focusing on form element, Auto-tabbing between fields, disabling text input, Case Conversion. Javascript Libraries: Introduction, jquery, creating sliders using jquery.

UNIT-III

PHP: Overview of server side scripting, phpinfo(); embedding PHP Codes in HTML,generating HTML Codes using PHP. PHP Operators and Expressions. PHP Control Statements PHP: Arrays. Functions, Pattern Matching, Form handling, File handling, cookies, Session Tracking;

Unit-IV

Database access using PHP and MySQL: Connecting to database-server, selecting database, creating query, reading records from database, storing records in database.

Text Books:

1. Larry Ulman ,“PHP and MySQL5”, Pearson .
2. Danny Goodman, “Javascript Bible”, Seventh Edition ,Wiley India.

Reference Books:

1. Robert Sebesta,” Programming with World Wide Web”, Pearson.
2. John Duckett, “Beginning with HTML, XHTML, CSS and Javascript”, Wiley- Wrox.

MCA- CO8: LAB- Fundamentals of Scripting Languages Using Java Script and PHP

Credits: 2

L	T	P	Total
0	0	4	4

Course Objective: The main objective of this course is to provide practical knowledge of Scripting Languages (Java Script and PHP), and tools used in these languages.

COURSE CONTENTS

Elective-Specialization (20 credits)

S. No.	Course Type	Course Code	Course Name	Credit
14.	ES	MCA-ES1	Cryptography and Network Security	4
15.	ES	MCA-ES2	Web Programming	2
16.	ES	MCA-ES3	LAB- Web Programming	2
17.	ES	MCA-ES4	Java Programming	4
18.	ES	MCA-ES5	LAB - Java Programming	2
19.	ES	MCA-ES6	Cloud Computing Concepts	4
20.	ES	MCA-ES7	Distributed Databases	4
21.	ES	MCA-ES8	Internet of Things	2
22.	ES	MCA-ES9	Digital Image Processing	4
23.	ES	MCA-ES10	Ethical Hacking	2
24.	ES	MCA-ES11	Mobile Computing	4
25.	ES	MCA-ES12	Modeling and Simulation	4
26.	ES	MCA-ES13	Human Computer Interface	4

MCA-ES1: Cryptography and Network Security

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: The prime aim of this course is to provide the conceptual knowledge of cryptography & network security. This course will also enable the students to learn some tools and techniques to secure the information of the real world.

UNIT-I

Classical Encryption Techniques: Symmetric Cipher Model, substitution Techniques, tranposition techniques, rotor machines, steganography.

Block Ciphers and the Data Encyption standards: Simplified DES, block cipher principles, the data encryption standard, the strength of DES, differential and linear cryptanalysis, blockcipher design principles, block cipher modes of operation.

Advanced Encryption Standard: Evaluation Criteria for AES, the AES cipher.

Contemporary symmetric ciphers: Triple DES, blowfish.

Confidentiality using symmetric encryption: Placement of Encryption function, traffic confidentiality, key distribution, and random number generation.

UNIT-II

Public key Encryption and Hash functions: Prime numbers, Fermat's and Euler's Theorems, testing for primality, the chinese remainder theorem, discrete logarithms.

Public key cryptography and RSA: Principles of Public key cryptosystems, the RSA algorithm.

Key Management other public key cryptosystems: Key management, diffie-Hallman key exchange, elliptic curve arithmetic, and elliptic curve cryptography.

UNIT-III

Message authentication and Hash function: Authentication

Requirements, Authentication functions, message authentication codes, hash functions, security of hash function and MACs.

Hash Algorithms: MD5 message digest algorithm, secure Hash algorithm, ripemd-160, HMAC.

Digital Signature and Authentication protocols: Digital signatures, Authentication protocols, and digital signature standard.

Authentication Applications: Kerberos, X.509 Authentication service.

UNIT-IV

Electronic Mail Security: Pretty Good privacy, S/MIME.

IP Security: IP Security overview, IP security architecture,authentication header, encapsulating security payload, combining security associations, key management.

Web Security: Web security considerations, Secure sockets layer and transport layer security, secure electronic transaction.

System security: Intruders, intrusion detection, and password management. Malicious software: Viruses and related threats, virus countermeasures. Firewalls: Firewall Design Principles, Trusted systems.

Text Books:

1. William Stallings "Cryptography and Network Security", Third Edition, Pearson.
2. W.Stallings, " Network security Essential : Applications & Standards", Sixth Edition-, Pearson.

Reference Books:

1. Eric Maiwald " Network Security : A Preginner's Guide", Tata McGraw Hill.
2. Roberta Bragg, Mark Rhodes, Ousley & Keith Strassberg, "Network Security : The Complete Reference", Tata McGraw Hill.
3. Eric Maiwald, "Fundamentals of Network Security", Wiley India.

MCA-ES2: Web Programming

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The main objective of this course is to provide the conceptual knowledge of Web Programming using PHP to enable the students competent in Web designing to create dynamic websites.

UNIT-I

Introduction to PHP: how PHP script work, PHP syntax, write your first PHP program, embed PHP in html/html in PHP, PHP data type, variable in PHP, operator in PHP.

Control Structure: if statement, if.....else statement, if...if else statement, nested if statement, switch statement

Looping Structure: for loop, while loop, do...while loop, for each loop function.

UNIT-II

Function: introduction, syntax, user defined function, system defined function, parameterized function, date & time function, hash function, mail function

Array: syntax, associative array, numeric array, multi-dimensional array.

String matching with regular expression: creating and accessing string, searching & replacing string, formatting string, string related library function, what is regular expression, pattern matching in PHP, replacing text, splitting a string with a Regular Expression?

UNIT-III

Objects: Creating classes and object in PHP, working with methods, overloading, inheritance, constructor and destructor.

Handling HTML form with PHP, Preserving state with query strings, cookies & sessions.

Working with file and directories: Understanding file & directory, Opening and closing a file, Reading, writing, coping, renaming and deleting a file, working with directories, Building a text editor

UNIT-IV

Generating images with PHP: Basics of computer graphics, creating images, manipulating images, using text in images.

Database access using PHP and MySQL: Connecting to MySQL from PHP, Retrieving data from MySQL with PHP, Manipulating MySQL data with PHP.

Text Book:

1. Matt Doyale ,"Beginning PHP 5.3", Wiley India.

Reference Books:

1. Larry Ulman ,"PHP and MySQL5", Pearson.
2. Robert Sebesta,"Programming with World Wide Web", Pearson.
3. John Duckett, "Beginning with HTML, XHTML, CSS and Javascript", Wiley- Wrox.

MCA-ES3: LAB-Web Programming

Credits: 2

L	T	P	Total
0	0	4	4

Course Objective: The main objective of this course is to provide the practical knowledge of Web Programming using PHP to enable the students competent in Web designing to create dynamic websites.

MCA-ES4: Java Programming

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course objective is to understand fundamentals of object-oriented programming in Java including classes, methods, inheritance, packages, interfaces, multithreading, exception handling. The course will also provide introduction to some advanced topics in java like applet, collections and swing.

UNIT-1

Object oriented programming, features of java, general structure of java program, sample program, lexical issues, data types, variables, type conversion and casting, arrays & strings, operators and expressions, controls statements.

String handling: String class, String class constructors, String class methods, StringBuffer class, StringBuffer class constructors, StringBuffer class methods.

UNIT-II Class

fundamentals & objects, Methods, constructors, this keyword, garbage collection, overloading methods & constructors, using object as arguments, returning objects, recursion, nested and inner classes, inheritance, using super, method overriding, dynamic method dispatch, using abstract classes, using final with inheritance.

Interfaces: Defining interfaces, extending interfaces, implementing interfaces, accessing interface variables.

UNIT-III

Packages: Introduction, java API packages, Using system packages, naming conventions, creating packages, accessing a package, using a package, adding a class to a package.

Multithreading: Introduction, crating threads, creating multiple threads, thread priorities, synchronization, in thread communication, suspending, resuming and stopping threads.

Exception handling: Introduction, exception types, uncaught exceptions, using try, catch, throw and throws, java‘s built in exceptions, creating own exception subclasses.

Applets programming: introduction, applet architecture, an applet Skelton, the HTML APPLET tag, passing parameters to applet.

UNIT-IV

Collections: Array List, Linked List, collections Methods, Stack, Sets, Maps.

Java Swings: Java Foundation Classes, Hierarchy of Java Swing classes, Swing components (Container: Window, Frame ,Dialog, Panel and Applet; JComponent: JLabel, JList, JTable, JComboBox, JSlider, JMenu, Abstract Button, JButton).

Text book:

1. Herbert Schildt, “The Complete Reference”, Eleventh Edition, Tata McGraw Hill.

Reference Books:

1. Cay S. Horstmann, Gary Cornell,” Core Java”, Pearson.
2. R. NageswaraRao, “Core Java an integrated approach”, Dreamtech Press.
3. James R. Levenick , “Simply JAVA :An Introduction to JAVA programming”, Firewall Media Publication, New Delhi.
4. E. Balaguruswamy,” Programming with Java”, Tata McGraw Hill.

MCA-ES5: LAB-Java Programming

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: This Lab course will provide practical understanding of the object-oriented programming concepts in Java such as classes, methods, inheritance, packages, interfaces, multithreading, exception handling, including the advanced topics in Java like applet, collections and swing.

MCA-ES6 : Cloud Computing Concepts

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: This course will enable the students to understand cloud computing concepts and enable them to design cloud based applications for distributed systems.

UNIT-I

Overview of Computing Paradigms: Recent Trends in Computing: Distributed Computing, Cluster Computing, Grid Computing, Utility Computing, Cloud Computing, Evolution of Cloud Computing: Migrating into a Cloud

Cloud Computing Basics: Cloud Computing Overview; Characteristics; Applications; Benefits; Limitations; Challenges, SOA; Cloud Computing Service Models: Infrastructure as a Service; Platform as a Service; Software as a Service, Cloud Computing Deployment Models: Private Cloud; Public Cloud; Community Cloud; Hybrid Cloud, Major Cloud Service providers.

UNIT-II

Virtualization Concepts: Overview of Virtualization Technologies, Types of Virtualization, Benefits of Virtualization, Hypervisors VM Provisioning & Migration: VM Lifecycle, VM Provisioning Process, VM Migration Techniques

Scheduling in Cloud: Overview of Scheduling problem, Different types of scheduling, Scheduling for independent and dependent tasks, Static vs. Dynamic scheduling, Optimization techniques for scheduling.

UNIT-III

Cloud Storage: Overview; Storage as a Service, Benefits and Challenges, Storage Area Networks(SANs), Case Study of Amazon S3.

Cloud Security: Infrastructure Security: Network Level Security, Host Level Security and Application Level Security; Data Security: Data Security & Privacy Issues; Identity & Access Management; Legal Issues in Cloud Computing

UNIT-IV

Mobile Cloud Computing: Overview of Mobile Cloud Computing, Advantages, Challenges, Using Smartphones with the Cloud, Offloading techniques - their pros and cons, Mobile Cloud Security.

SLA Management: Overview of SLA, Types of SLA, SLA Life Cycle, SLA Management Process.

Text Books:

1. Rajkumar Buyya, James Broberg, AndrzejGoscinski, " Cloud Computing: Principles and Paradigms", Wiley.
2. Barrie Sosinsky, "Cloud Computing Bible", Wiley.

Reference Books:

1. Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw Hill.
2. Judith Hurwitz, Robin Bloor, Marcia Kaufman,Fern Halper, "Cloud Computing for Dummies", Wiley.
3. BorkoFurht, Armando Escalante , "Handbook of Cloud Computing", Springer.

MCA-ES7: Distributed Databases

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: This course will acquaint the students with the basics of Distributed databases, architectures of databases, query processing, various query optimization algorithms, transaction management & various approaches to control concurrency in distributed databases.

UNIT-I

Introduction: Distributed Data Processing, Distributed Database Systems, Promises of DDBSs, Complicating factors, Problem areas.

Distributed DBMS Architecture: Models-Autonomy, Distribution, Heterogeneity DDBMS Architecture – Client/Server, Peer to peer, MDBS.

UNIT-II

Data Distribution Alternatives: Design Alternatives–localized data, distributed data Fragmentation– Vertical, Horizontal (primary & derived), hybrid, general guidelines, correctness rules Distribution transparency–location, fragmentation, replication Impact of distribution on user queries–No Global Data Dictionary(GDD), GDD containing location information, Example on fragmentation.

Semantic Data Control: View Management, Authentication –database authentication, OS authentication, Access Rights, Semantic Integrity Control –Centralized & Distributed, Cost of enforcing semantic integrity.

UNIT-III

Query Processing: Query Processing Problem, Layers of Query ProcessingQuery Processing in Centralized Systems –Parsing & Translation, Optimization, Code generation, ExampleQuery Processing in Distributed Systems –Mapping global query to local, Optimization.

UNIT-IV

Distributed Transaction Management & Concurrency Control: Transaction management, Concurrency Control techniques, Distributed Deadlock–Detection, Prevention, Avoidance, and Recovery.

Text Books:

1. Ozsu, “Principles of Distributed Database Systems”, Third Edition, Pearson.
2. Rahimi & Haug, “Distributed Database Mangement Systems”, Wiley.

Reference Books:

1. Chanda Ray, “Distributed Database Systems”, Pearson.
2. Sachin Deshpande, “Distributed Databases”, Dreamtech.
3. Ceri , Pelagatti, “Distributed Databases Principles and Systems”, Tata McGrah Hill.
4. C.J. Date, “An Introduction to Database System, Vol I & II”, Addition Wesley.
5. Elmasari , Navathe, “Fundamentals of Data Base Systems”, Addition Wesley.

MCA-ES8: Internet of Things

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: In this course, various components of Internet of things such as Sensors, internet working and cyber space are explored to the students to enable them to design and implement IoT circuits and solutions.

UNIT-I

Introduction to IoT: Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs.

UNIT-II

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

M2M vs IoT An Architectural Overview–Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. Reference Architecture and Reference Model of IoT

UNIT-III

IoT Reference Architecture- Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. Constraints affecting design in IoT world-Introduction, Technical design Constraints.

Domain specific applications of IoT: Home automation, Industry applications, Surveillance applications, Other IoT application.

UNIT-IV

Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT.

Text Books:

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-onApproach)”, First Edition, VPT
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, First Edition, Academic Press.

Reference Books:

1. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications.
2. Cuno Pfister, “Getting Started with the Internet of Things”, O’Reilly .

MCA-ES9: Digital Image Processing

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: The course is designed to introduce the concepts of image processing and basic analytical methods to be used in image processing. To familiarize students with image enhancement and restoration techniques, To explain different image compression techniques. To introduce segmentation and morphological processing techniques.

UNIT-I

Introduction: The role of Computer Vision, applications, successes, research issues; its relationship to natural vision, basic image properties. Digital image representation, fundamental steps in image processing, elements of digital image processing systems digitization, Display and recording devices.

UNIT-II

Digital Image fundamentals: A simple Image model. Sampling and quantization, Relationship between pixel, imaging geometry, image transformation, introduction to fourier transformation, Discrete fourier transformation, fast fourier transformation.

UNIT-III

Image Enhancement: Histogram processing, image subtraction, image averaging, smoothing filters, sharpening filters, enhancement in frequency domain, low pass filtering, high pass filtering.

UNIT-IV

Image Encoding & Segmentation: Segmentation, detection of discontinuation by point detection, line detection, edge detection. Edge linking & Boundary Detection: Local analysis, global by Hough transform & Global by graph theoretic techniques.

Image Representation and Description: Chain codes, polygonal approximation, signatures, boundary segments, boundary descriptors, regional descriptors, introduction to image understanding. Motion Tracking , Image differencing, Feature matching, Optic flow.

Text Book:

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Fourth Edition, Addison-Wesley.

Reference Book:

1. Anil K. Jain, "Fundamentals of digital image processing", Prentice Hall of India.

MCA-ES10: Ethical Hacking

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The course is designed to provide deep insights of cyber laws, Linux Security and Ethical Hacking.

UNIT-I

Introduction to Ethical Hacking, Cyber Laws and Standards, Spoofing, Foot printing and Reconnaissance, System Hacking, Trojans, Backdoors, Viruses, and Worms.

UNIT-II

Scanning Networks, Enumeration, Metasploit, Denial of Service, Session Hijacking, Sniffing, Phishing, Social Engineering, Security of Email account.

UNIT-III

Protecting Web servers from Hacking, Protecting Web Applications from Hacking, Protecting Mobile Platforms from Hacking, Evading IDS, Firewalls, and Honeypots, SQL Injection and Buffer Overflows.

UNIT-IV

Image Encoding & Segmentation: Segmentation, detection of discontinuation by point detection, line detection, edge detection. Edge linking & Boundary Detection: Local analysis, global by Hough transform & Global by graph theoretic techniques.
Linux Security, Secure Wireless Networks, Wi-Fi Security, Cloud Computing Security, IoT Security.

Text Book:

1. Sean Oriyano, "CEH V9: Certified Ethical Hacker Version 9 Study Guide", Wiley.

Reference Book:

1. Manthan Desai, "Hacking For Beginners", HT Hacking Tech.

MCA-ES11: Mobile Computing

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed

- To study the regulatory environment in which the wireless industry operates.
- To understand functions and operational principles of the various components of wireless networks, and to learn the setup and management of connections.
- To understand the concept of frequency reuse, and be able to apply it in design of simple frequency reuse patterns.
- To become familiar with some of the existing and emerging wireless standards.

Unit-I:

Wireless Networks: Introduction, Applications, History of Wireless Communication. Electromagnetic Spectrum, Radio Propagation Mechanisms, Characteristics of the Wireless Channel, Modulation Techniques, Multiple Access Techniques, Voice Coding, Error Control.
Wireless LANS and PANS: Introduction, Fundamentals of WLANs, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, HomeRF.

Unit-II:

Wireless WANS AND MANS: Introduction, Cellular Concept, Cellular Architecture, The First-Generation Cellular Systems, The Second-Generation Cellular Systems, The Third-Generation Cellular Systems, Wireless in Local Loop, Wireless ATM.

Unit-III:

Wireless Internet: Introduction, Mobile network Layer, Mobile IP, Route optimization, Handoffs, IPv6 Advancements, IP for Wireless domains, Security in Mobile IP, Mobile Transport layer, TCP in Wireless Domain, Optimizing Web over Wireless.

Unit-IV:

Ad Hoc Wireless Networks: Introduction. Issues in Ad Hoc Wireless Networks. Ad Hoc Wireless Internet. MAC Protocols for Ad Hoc Wireless Networks, Routing Protocols for Ad Hoc Wireless Networks, Security in Ad hoc wireless networks, Recent advances in Wireless Networks.

Text Book:

1. C-Siva Ram Murthy & B S Majo, “Adhoc Wireless Networks, Architectures Protocols” , Pearson.
2. Jochen Schiller “Mobile Communications”, Pearson.

Reference Book:

1. William C.Y Lee, “Mobile Communication Design Fundamental”, John Wiley.
2. William Stalling, “Wireless Communication and Network”, Pearson Education.

MCA-ES12: Modeling and Simulation

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The objectives of this course are-

- To review the basic simulation methods and principles applied to the architecting and engineering of complex systems.
- To describe the art and science of the modeling process, especially in complex systems, and provide access to the tools and executable models.

UNIT-I

Physical Modeling: Concept of system and environment, continuous and discrete system, linear and nonlinear system, stochastic activities, static and dynamic models, principles used in modeling, Basic simulation modeling, Role of simulation in model evaluation and studies, Advantages and Disadvantages of simulation. Modeling of systems, Iconic, analog and Mathematical Modeling.

UNIT-II

Computer Based System Simulation: Technique of simulation, Monte Carlo method, experimental nature of simulation, numerical computation techniques, calumnious system models, analog and hybrid simulation, feedback systems, Buildings simulation models- Financial Model for an office Building, Sensitivity analysis for office building Model.

UNIT-III

System Dynamics Modeling: Identification of problem situation, Exponential Growth Model and Decay Model, Logistic Curve, System Dynamic Diagrams, Simulation of System Dynamics- Waiting Times in Single Server Queuing System.

UNIT-IV

Probability Concepts In Simulation: Stochastic variables, discrete and continuous probability functions, Distributed Random numbers, generation of random numbers Uniform and Non Uniform Random numbers, variance reduction techniques-Introduction, Common Random numbers-Rationale, Applicability and Synchronization.

Simulation Software: Introduction, Comparison of Simulation Package with Programming Languages, Classification of Simulation Software, Desirable Software features, Basics of General Purpose Simulation Package-ARENA, Study of SIMULA.

Text Books:

1. G. Gorden, “System simulation”,Second Edition , Prentice Hall of India.
2. Averill M Law “ Simulation Modeling and Analysis”, Fifth Edition, Tata McGraw Hill.

Reference Books:

1. Seila, Ceric and Tadikamalla “ Applied Simulation Modeling”, Cengage Learning.
2. Severance, ” System Modelling & Simulation : An Introduction”, John Wiley.
3. Allan Carrie, "Simulation and Modeling" Tata McGraw Hill.

MCA-ES13: Human Computer Interface

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: This Course contains the following objectives:

- To describe and apply the fundamental theories and methodologies from the HCI domain.
- To design, implement and evaluate the effective and usable computer interfaces.

UNIT-I

Introduction to Human Computer Interface: Importance of user interface, process of Interaction Design, History of Human Computer Interface, Good Design: Importance, Benefits. Principles of User Interface Design. Human: I/O channels, Memory, Reasoning and problem solving. Interaction: Models, frameworks, Ergonomics, styles, elements, interactivity, Paradigms.

UNIT-II

Design & Software Process: Interactive Design basics, process, scenarios, navigation, screen design, Iteration and prototyping. HCI in software process, software life cycle, usability engineering, Prototyping in practice, design rationale. Design rules, principles, standards, guidelines, rules. Evaluation Techniques, Universal Design.

Prototypes: Hand Sketches and Scenarios, Interactive Paper Prototypes, Program Facades, Prototype-Oriented Languages, Comparisons of Prototypes.

UNIT-III

Models and Theories: Cognitive models, Socio-Organizational issues and stake holder requirements, Communication and collaboration models, Multimedia and WWW. Information Search and Visualization: Database query, Phase search in documents, Multimedia document searches, Information visualization, Advanced filtering, Hypertext, Web technology, Static web content and dynamic web content.

UNIT-IV

Mobile Ecosystem: Platforms, Application frameworks, Types of Mobile Applications: Widgets, Applications, Games, Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Web Interfaces: Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Text Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, Third Edition, Pearson Education.
2. Brian Fling, “Mobile Design and Development”, First Edition , O’Reilly.
3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O’Reilly.

Reference Book:

1. Sutcliffe, Alistair, “Human-computer interface design”, Macmillan International Higher Education.

COURSE CONTENTS

Elective-Open (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
8.	EO	MCA-EO1	Soft Computing	4
9.	EO	MCA-EO2	Bioinformatics	4
10.	EO	MCA-EO3	Android Application Development	2
11.	EO	MCA-EO4	Natural Language Processing and Speech Recognition	4
12.	EO	MCA-EO5	Cyber Security	2
13.	EO	MCA-EO6	Fundamentals of E-Governance, E-Business & E-Learning	2
14.	EO	MCA-E07	Artificial Intelligence	4

MCA-EO1: Soft Computing

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed to provide an introduction to the basic principles, techniques, and applications of soft computing.

UNIT-I

Introduction, Soft Computing concept explanation, brief description of separate theories. Neural Networks and Probabilistic Reasoning; Biological and artificial neuron, neural networks and their classification. Adaline, Perceptron, Madaline and BP (Back Propagation) neural networks. Adaptive feed forward multilayer networks. Algorithms: Marchand, Upstart, Cascade correlation, Tilling. RBF and RCE neural networks. Topologic organized neural network, competitive learning, Kohonen maps.

UNIT-II

CPN , LVQ, ART, SDM and Neocognitron neural networks. Neural networks as associative memories(Hopfield, BAM). Solving optimization problems using neural networks. Stochastic neural networks, Boltzmann machine.

UNIT-III

Fundamentals of fuzzy sets and fuzzy logic theory, fuzzy inference principle. Examples of use of fuzzy logic in control of real-world systems.

UNIT-IV

Fundamentals of genetic programming, examples of its using in practice. Genetic Algorithms Applications of GA's – Class.

Text Books:

1. Cordón, O., Herrera, F., Hoffman, F., Magdalena, L," Genetic Fuzzy systems", World Scientific Publishing Co. Pte. Ltd
2. Kecman, V."Learning and Soft Computing", The MIT Press.

Reference Books:

1. Mehrotra, K., Mohan, C., K., Ranka, S. "Elements of Artificial Neural Networks", The MIT Press.
2. Munakata, T, "Fundamentals of the New Artificial Intelligence" ,Springer.

MCA-EO2: Bioinformatics

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The unprecedented increase in the amount of available biological data ranging from protein sequences to biomedical images have rendered the use of computers and computational techniques for analyzing and managing the biological data inevitable. This course aims to provide students with the basics of bioinformatics algorithms that have been applied over various types of biological data.

UNIT-I

Introduction to Bioinformatics: What is a Database, Types of Databases, Biological Databases, Pitfalls of Biological Databases, Information Retrieval from Biological Databases.

UNIT-II

Sequences: Problem statement, Edit distance and substitution matrices, HMMs and pairwise HMMs, Global and local alignments, Spliced alignment, Space-efficient sequence alignment, Multiple alignment, Database searching tools, Sequence by hybridization, Profile HMMs.

UNIT-III

Structures: Protein structure alignment, Protein Structure Prediction: Methods for predicting the secondary and tertiary structure of proteins. Techniques: neural networks, SVMs, genetic algorithms and stochastic global optimization.

UNIT-IV

Transcriptomics: Methods for analysing gene expression and microarray data. Techniques: clustering, SVMs. Agent-based Genome Analysis: Automation of genome analysis using intelligent software agents. Drug Discovery Informatics: Approaches to drug discovery using bioinformatics techniques.

Text Books:

1. Compeau, P. and Pevzner, P.A., "Bioinformatics Algorithms: An Active Learning Approach", Active Learning Publishers.
2. Jones, N.C., Pevzner, P.A. and Pevzner, P., "An Introduction to Bioinformatics Algorithms", MIT press.

Reference Books:

1. Krawetz, S.A. and Womble, D.D., "Introduction to Bioinformatics: A Theoretical and Practical Approach", Springer Science & Business Media.
2. Lesk, A., "Introduction to bioinformatics", Oxford University Press.
3. Mandoiu, I. and Zelikovsky, A., "Bioinformatics Algorithms: Techniques and Applications", John Wiley & Sons.

MCA-EO3: Android App Development

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: This course aims to provide the students with a detailed knowledge on Android platform. This course covers Android programming from fundamentals to building mobile applications for smart gadgets. Objectives On successful completion of the course, the students should have acquired mobile application development skills with Android.

UNIT-I

Android: Introduction, History of Android, Android Features, OSS, OHA, Android Versions and compatibility, Android devices, Prerequisites to learn Android, Android Architecture: Android Stack, Linux Kernel, Android Runtime, Dalvik VM, Application Framework, Android emulator, Android applications.

UNIT-II

Android development: Java, Android Studio, Eclipse, Virtualization, APIs and Android tools, Debugging with DDMS, Android File system, Working with emulator and smart devices, A Basic Android Application, Deployment.

UNIT-III

Android Services: Simple services, Binding and Querying the service, Executing services.
Broadcast Receivers: Creating and managing receivers, Receiver intents, ordered broadcasts.
Content Providers: Creating and using content providers, Content resolver. Working with databases: SQLite, coding for SQLite using Android, Sample database applications, Data analysis.

UNIT-IV

Android User Interface: Android Layouts, Attributes, Layout styles, Linear, Relative, Table, Grid, Frame. Menus: Option menu, context menu, pop-up menu. Lists and Notifications:
creation and display. Input Controls: Buttons, Text, Fields, Checkboxes, alert, dialogs, Spinners, progress bar.

Text Books:

1. Barry Burd, "Android Application Development – All-in-one for Dummies", Second Edition, Wiley India.
2. Lauren Darcey, Shane Conder, "Sams Teach Yourself Android Application Development in 24 hours", Second Edition, Pearson.

Reference Book:

1. Paul Deitel, Harvey Deitel, Alexander Wald, " Android 6 for Programmers – An App-driven Approach".

MCA-EO4: Natural Language Processing and Speech Recognition

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: The main objective of this course is to introduce the fundamental concepts and ideas in natural language processing (NLP), and to get them up to speed with current research in the area. It develops an in-depth understanding of both the algorithms available for the processing of linguistic information and the underlying computational properties of natural languages.

UNIT-I

Introduction: Overview of NLP, Statistical machine translation, Language models and their role in speech processing, NLP phases, Morphology and Finite State transducers, Computational Phonology and Pronunciation Modelling, Probabilistic models of pronunciation and spelling, Ngram Models of syntax, Hidden markov models and Speech recognition.

UNIT-II

Parts-of-speech Tagging: Basic concepts, Tagset, Early approaches, Rule based and TBL, POS tagging using HMM, Introduction to POS Tagging using Neural Model.

Statistical estimation and smoothing for language models: Statistical Machine Translation (MT), Alignment Models Smoothing, Smoothing absolute discounting.

UNIT-III

Introduction to supervised machine, learning methods: Naïve Bayes (NB), classifiers for entity classification, Maximum Entropy Classifiers, Corpora and other resources, Maximum Entropy Sequence Classifiers, IE and text mining, Maximum entropy sequence models.

Parsing: Top down and bottom up parsing, treebank, Syntactic parsing, CKY parsing, Statistical Parsing basics, Probabilistic Context Free Grammar (PCFG), Probabilistic CKY Parsing of PCFGs.

UNIT-IV

Semantics: Vector Semantics, Words and Vector; Measuring Similarity; Semantics with dense vectors, SVD and Latent Semantic Analysis, Embeddings from prediction, Skip-gram and CBOW, Concept of Word Sense, Introduction to WordNet.

Speech Recognition: Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system acoustics, context dependent subword units, Applications and present status.

Speech Synthesis: Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub word units for TTS, intelligibility and naturalness role of prosody, Applications and present status.

Text Books:

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Second Edition, Prentice Hall of India.
2. Christopher D. Manning and Hinrich Schütze, “Foundations of Statistical Natural Language Processing” MIT Press.

Reference Book:

1. James Allen, “Natural Language Understanding”, Benjamin/Cummings.
2. Frederick Jelinek, “Statistical Methods for Speech Recognition”, MIT Press.

MCA-E05: Cyber Security

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The main objective of this course is to understand the different types of malware and security breaches and develop effective prevention methods which will increase overall security. They will also understand the basic concepts associated with Cyber Security and what are the needs to stay secure.

UNIT-I

Cyber security Fundamentals: Introduction to Cyberspace, Cyber security, need of cyber security. Types of Malware: Worms, Viruses, Spyware, Trojans.Cyber Security Breaches: Phishing, Identity Theft, Harassment etc.

UNIT-II

Types of Cyber Attacks: Password Attacks, Denial of Service Attacks, Passive Attack, Penetration Testing.

Prevention Tips: Craft a Strong Password, Two-Step Verification, Download with care, Question Legitimacy of Websites.

UNIT-III

Cryptography and Network Security: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography.

UNIT-IV

Cyber Forensics: Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.

Text Book:

1. William Stallings,"Cryptography and Network Security", Seventh Edition, Pearson.
2. " Introduction to Cyber Security", http://uou.ac.in/foundation-course

MCA-EO6 : Fundamentals of E-Governance, E-Business & E-Learning

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives:

- The objective of this course is to understand the fundamentals and applicability of Information and Communication Technology (ICT) in various fields such as Governance, Learning and Business.
- The course also provides introduction and detailed study of E Governance, E learning and E Business.
- The recent trends and developments in the fields of E Governance, E learning and E Business will be demonstrated to the students.

UNIT-I

E-Governance: Introduction, E-Governance & E-Government, Need for e-Governance, Measures, work plan and infrastructure for E-Governance, Scope,(types) of e-Governance, Objectives of e-Governance, Evolution of e-Governance, Phases of e-Governance, e-Governance Project Development Lifecycle, Software Development Lifecycle vs e-Governance Lifecycle. E Governance: international scenario, Challenges in e-Governance.

UNIT-II

E-Governance: Strategies for e-Governance in India, National e-Governance Plan, Mission Mode Projects conceptualized under NeGP: Central Government Category, State Government Category, Integrated Services Category, Components of NeGP: The Institutional Structure, The common Support Infrastructure, The Mission Mode Projects, Recent Initiatives in e-Governance in India: Government to citizen (G2C) initiatives, Government to business (G2B) initiatives, Government to Government (G2G) initiatives.

UNIT-III

E-Business: Introduction, Global Online Retail Spending: Statistics and Trends, E-business & E-commerce, E-business environment, E-marketplaces, E-business markets, Technical ingredients of e-business, Electronic business infrastructure, Potential benefits of E-business, Basic E-Commerce Strategies, E-business Types & Categories, Phases of e-Business Development, E-business technology, Technology Issues in Internet Commerce, E-commerce Security, M-Commerce.

UNIT-IV

E-Learning: what is learning, why e-learning, concept and definition, e-leaning basics, types of e-learning, computer based learning, internet based learning, completely online mode, the use of e-learning in education, advantages and disadvantages of e-learning, e-learning model-ADDIE model, MERRILL's principles of Instruction (MPI),GAGNE's nine events of instruction, e-learning components, e-learning content, E-Tutoring, E-Coaching, E-Mentoring, collaborative learning, virtual classroom, e-learning in India.

Text Books:

1. Parag Kulkarni, Sunita Jahirabadkar, Pradip Chande, "E Business",Oxford University Press
2. Dave Chaffey, "E-Business and E-Commerce Management: Strategy, Implementation and Practice", Pearson.

Reference Book:

1. Srinivasa H. Rajeshwari ,"E-Governance in India Concepts and Cases", AP Lambert Academic Publishing

MCA-C07: Artificial Intelligence

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives:

- To impart knowledge about Artificial Intelligence.
- To give understanding of the main abstractions and reasoning for intelligent systems.
- To enable the students to understand the basic principles of Artificial Intelligence in various applications

UNIT-I

Introduction to AI- Definitions, Goals of AI, AI Approaches, AI Techniques, Branches of AI, Applications of AI.

Problem Solving, Search and Control Strategies: General problem solving, production systems, control strategies forward and backward chaining, exhaustive searches depth first breadth first search.

Heuristic Search Techniques: Hill climbing, Branch and bound technique, Best first search & A* algorithm, Problem reduction & AO* algorithm.

UNIT-II

Game Playing - Overview, Mini-Max search procedure, Game playing with Mini-Max, Alpha-Beta pruning.

Learning Systems-Rote learning, learning from example: Induction, Explanation Based Learning (EBL), Discovery, Clustering, Analogy, Neural net and genetic Learning, Reinforcement learning.

Knowledge Representations: First order predicate calculus, skolemization, resolution principle & unification, interface mechanisms, horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency.

UNIT-III

Natural Language Processing - Introduction, Syntactic processing , Semantic and Pragmatic analysis.

Pattern Recognition - Introduction, Recognition and Classification Process, Learning Classification Pattern, Recognizing and Understanding Speech.

UNIT-IV

Expert Systems - Knowledge acquisition, Knowledge base, Working memory, Inference engine, Expert system shells, Explanation, Application of expert systems.

Fundamentals of Neural Networks -Research history, Model of artificial neuron, Neural networks architectures, Learning methods in neural networks, Single-layer neural network system, Applications of neural networks.

Fundamentals of Genetic Algorithms - Search optimization algorithm, Evolutionary algorithm, Encoding, Operators of genetic algorithm, Basic genetic algorithm.

Common Sense - Introduction, Formalization of common sense reasoning, Physical world, Common sense ontologies, Memory organization.

Text Books:

1. Norvig, P. Russel, and S. ”Artificial Intelligence. A modern approach”, Fourth Edition, Prentice Hall of India.

Reference Books:

1. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Prentice Hall of India.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”,Tata McGraw Hill.
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson.

COURSE CONTENTS

Foundation Courses – I: Human Making (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
8.	HM	MCA-HM1	Online Meeting and Web Conferencing Tools	2
9.	HM	MCA-HM2	Google Tools	2
10.	HM	MCA-HM3	Open Source Technologies	2
11.	HM	MCA-HM4	Research Ethics	2
12.	HM	MCA-HM5	IT Tools for Smart Work	2
13.	HM	MCA-HM6	Personality Development & Job Orientation	2
14.	HM	MCA-HM7	IT and Cyber Laws in India	2

MCA-HM1: Online Meeting and Web Conferencing Tools

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: To learn the usage of various online meeting and web conferencing tools.

UNIT-I

Introduction to Online Meetings: Online Meeting, host an Online Meeting, Advantages and Disadvantages of Online Meetings, Difference between Online Meeting and Online Events.

UNIT-II

Choosing the right tools and platform for Online Meetings, Study of Various Online Meeting tools and their usage.

UNIT-III

Introduction to Web conferencing: Web Conferencing, Web Conferencing users, Web Conferencing Working, Importance of web Conferencing in an Online Meeting, Tools Used for web Conferencing.

UNIT-IV

Study of various web conferencing tools: Zoom, ClickMeeting, GoToMeeting, Lifesize, Cisco Webex Meetings, BlueJeans Meetings, Skype and Google Meet.

Text Book:

1. Sue Spielman and Liz Winfeld arms, “The Web Conferencing”, Tata McGraw Hill.

Reference Book:

1. Firestone, Scott, Thiya Ramalingam, and Steve Fry, “Voice and Video Conferencing Fundamentals” Cisco Systems.

MCA-HM2: Google Tools

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: To learn the usage of various google tools.

UNIT-I

Google Tools For all-1: Android Auto, Android OS, Android TV, Calendar, Cardboard, Chrome, Chrome Web Store, Chrome book, Chrome cast, Connected Home, Contacts, Docs, Drive, Earth, Finance, Forms, Gboard, Gmail, Google Alerts, Google Assistant, Google Cast, Google Chat, Google Classroom, Google Cloud Print, Google Duo, Google Expeditions, Google Fi, Google Fit, Google Flights, Google Fonts.

UNIT-II

Google Tools For all-2: Google Groups, Google Meet, Google One, Google Pay, Google Photos, Google Play, Google Play Books, Google Play Games, Google Play Movies & TV, Google Play Music, Google Shopping, Google Street View, Hangouts, Keep, Maps, Messages, Nest Wifi, News, Pixel, Pixel Buds, Pixel book Go, Play Protect, Podcasts, Scholar, Search, Sheets,, Sites, Slides, Stadia, Tilt Brush, Translate, Voice, Waze, Wear OS by Google, YouTube, YouTube Kids, YouTube, YouTube TV.

UNIT-III

Google Tools For developers: App Testing, Cloud Computing, Devices, Engagement, Game Services, Growth, Maps + Location, Messaging + Notifications, Monetization, Monitoring, Payments, Sign in + Identity, Storage + Sync.

UNIT-IV

Google Tools For business: AdMob, AdSense, Analytics, Android, Blogger, Business Messages, Chrome Enterprise Data Studio, G Suite, Google Ads, Google Assistant, Google Cloud, Google Digital Garage, Google Domains, Google Enterprise Search, Google Manufacturer Center, Google Maps Platform, Google Marketing Platform, Google Merchant Center, Google My Business, Google Podcasts Manager, Google Shopping Campaigns, Google Trends, Google Web Designer, Optimize, Search Console, Shopping Actions, Surveys, Tag Manager, Waze Local.

Text Book:

1. Donna L. Baker,"How to Do Everything with Google Tool", First Edition , Tata McGraw Hill.

MCA-HM3: Open Source Technologies

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: To learn various open source technologies.

UNIT-I

Open source software: Features, advantages over proprietary software, examples, Free software: concepts, features, Free software Vs Open Source software, Free software movements. Policies, GPL, Free OS, History and Features of Linux, Various flavours of Linux, Linux Kernel and Shell, Graphical Desktops-GNOME, KDE, Linux File System and Directories.

UNIT-II

Apache Explained-Starting, Stopping and Restarting Apache-Modifying the Default Configuration -Securing Apache-Set User and Group -Consider Allowing Access to Local Documentation -Don't Allow public html Web sites-Apache control with .htaccess

UNIT-III

Open source database software: MySQL features MySQL data types: Numeric, date & time, string, Table creation in MySQL: insert, select, where clause, ordering the result ,like operator, Selecting Multiple tables: using join, using queries Modifying records: update command, replace command, delete command date & time functions in MySQL.

UNIT-IV

PHP: Introduction-General Syntactic Characteristics, PHP Scripting, Commenting your code, Primitives, Operations and Expressions, PHP Variables, Operations and Expressions Control Statement, Array, Functions, Basic Form Processing, File and Folder Access, Cookies, Sessions, Database Access with PHP

Text Books:

1. James Lee and Brent Ware , "Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP", Dorling Kindersley(India) Pvt. Ltd, 2008.
2. Graham Glass, King Ablas, "Unix for Programmers and Users", Pearson Education

Reference Books:

1. Rasmus Lerdorf and Levin Tatroe, "Programming PHP", O'Reilly Publications.
2. Rem Card, Eric Dumas and Frank Mevel , "The Linux Kerne", Wiley.
3. Suchring John ,"MySQL Bible Steve", Wiley.

MCA-HM4: Research Ethics

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: To understand the philosophy of science and ethics, research integrity and publication ethics. To identify research misconduct and predatory publications.

UNIT-I

Introduction to philosophy: definition, nature and scope, concept, branches-Ethics: definition, moral philosophy, nature of moral judgements and reactions.

Ethics with respect to science and research -Intellectual honesty and research integrity -Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP) -Redundant Publications: duplicate and overlapping publications, salami slicing -Selective reporting and misrepresentation of data.

UNIT-II

Publication ethics: definition, introduction and importance -Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. -Conflicts of interest -Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types -Violation of publication ethics, authorship and contributor ship-Identification of publication misconduct, complaints and appeals -Predatory publisher and journals.

UNIT-III

Open access publications and initiatives -SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies -Software tool to identify predatory publications developed by SPPU -Journal finger / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer, Journal Suggester, etc

UNIT-IV

Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools.

Databases: Indexing databases, Citation databases: Web of Science, Scopus, etc

Research Metrics: Impact Factor of journal as per Journal Citations Report, SNIP, SJR, IPP, Cite Score - Metrics: h-index, g index, i10 Index, altmetrics.

Text Books:

1. K.S. Bordens and B.B. Abbott, “Research Design and Methods”, Tata McGraw Hill.
2. Paul Oliver , “The Student's Guide to Research Ethics”, Open University Press.

Reference Books:

1. Anderson B.H., Dursaton, and Poole M., “Thesis and assignment writing”, Wiley.
2. Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi ,“Ethics in Science Education, Research and Governance”, Indian National Science Academy.
3. Nicholas H. Steneck, “Introduction to the Responsible Conduct of Research”, Office of Research Integrity.

MCA-HM5: IT Tools for Smart Work

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The main objective of this course is

- To impart knowledge of various tools, techniques and technologies that facilitates smart work.
- To make learns aware of various apps, websites that help them to handle their routine chores more efficiently.
- To help students to have knowledge of extending such tools and develop their own tools.

UNIT-I

Introduction of Learning, E-learning, need of e-learning, concept and definition, e-leaning basics, types of e-learning, computer based learning, internet based learning, completely online mode, the use of e-learning in education, advantages and disadvantages of e-learning, e-learning components, e-learning content, E-learning model-ADDIE model, MERRILL's principles of Instruction (MPI), virtual classroom, e-learning in India.

UNIT-II

E-learning Tools and Technologies: Communication Tools: E-mail, Instant Messaging (IM), Chat, Blogging, Collaboration Tools: Wiki, Social Bookmarking, Social Networking sites, Web Conferencing, Content Creation Tools/Authoring Tools: Adapt, Learning Activity Management System (LAMS), Delivery and Distribution Tools: Audio/Video streaming, Massive Open Online Course (MOOC), WebQuest, Learning Management System (LMS), Learning Content Management System (LCMS), E-learning Standards.

UNIT-III

IT tools for smart work in education: ePathsala, National Mission on Education through ICT (NME-ICT), epgpathsala, Youtube, National Program on Technology Enhanced Learning (NPTEL), education apps for India, IT tool for data mining, Big data analysis, IT tools for academic research.

UNIT-IV

IT tools for smart work in professional life: Search engine, best search engines of world, search engine optimization, search engine optimization tools, email, best email servers of world, Video conferencing, examples of best video conference apps, time management apps.

IT tools for smart work in personal life: Money saving tools, tools for productivity enhancement, tools for creative time saving, quick tools for everyday task, video calling apps, social media sites, Note taking tools, Lecturer capture and recording tools, drawing tools, presentation tools.

Text Books:

1. Hardy Bower," From Distance Education to E-Learning: Lessons Along the Way", Wiley.
2. Hossen Najan," Distance Education and E Learning", Lambert Academic Publishing.

Reference Books:

1. Jiawei Han, Micheline Kamber , Jian Pei Professor," Data Mining: Concepts and Techniques", The Morgan Kaufmann Series.

MCA-HM6: Personality Development & Job Orientation

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The main objective of this course is to provide knowledge of Presentation and Interview skills for job seeking.

UNIT-I

Presentation: Need and Importance of presentation, Types of Presentation, Parts of Presentation, Audience requirements, Rehearsals, Fear Overcome techniques, Pre-presentation preparation (On the day of Presentation), Question Handling during and after presentation. Presentation Tools: Types of Presentation tools, Importance and need of Presentation tools, Animation and other tools for presentation enhancement. Successful Presentation Secretes: Body Language, Positive Attitude, Eye contact, Anticipate the questions.

UNIT-II

Personality Development: Personality and its types, Attitude and its types, Attitude and Personality grooming techniques. Body Language: Body language and its reflection in Personality, Gesture and Posture, Confidence, Confidence building techniques. Group Discussion: GD and its types, Parts of GD (Initiation, Follow-up, Arguments and Conclusion), Role of listening and speaking, Do(s) and Don't(s) in GD, Pre-preparations for GD.

UNIT-III

Professional Resume writing: Resume, Parts of resume, Standard formats for professional resume, Questions based on resume, Do(s) and Don't(s) in resume writing. Profession Email drafting: Email, Parts of Email (Email-Address, Subject, CC, BCC and Text), Standard Email drafting, Attachments, Digital Signatures, Cover letter, Do(s) and Don't(s) in email drafting. Profession Letter drafting: Joining Letter(s), Letters to avail Casual Leave, Resignation Letter(s).

UNIT-IV

Interview and its types (HR, Technical, Telephonic, Online), Introduction and its types, Do(s) and Don't(s) in Introduction, Question based on your introduction, Analysis of SWOT, Hobbies and interests, Pre-preparations for interview, Do(s) and Don't(s) in Interview. Offer letter: Offer letters and its legal obligations, Things to check before signing any offer letter.

Text Books:

1. James Carole Martin, "Boost your Interview IQ", Tata McGraw Hill.
2. Barun K Mitra, "Personality Development and Soft Skills", Oxford University Press.

Reference Books:

1. Praveen Joe I.R., "Interview Skills and Group Discussions", Laxmi Publications.
2. S. Hundiwala, "Tricks and Techniques of Group Discussions", Arihant.
3. Laslie Rae, "The Sills of Interviewing", Jaico Publishing House.
4. Priyadarshi Patnaik, "Group Discussion and Interview Skills", Foundation Books.

MCA-HM7: IT and Cyber Laws in India

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The main objective of this course is to provide knowledge about Information Technology Act and Cyber Laws in India.

UNIT-I

Introduction –Cyberspace vs. Physical space; Scope of Cyber Laws.

Components of Cyber Laws in India - Information Technology Act, 2000 & 2008 with recent amendments; Relevant provisions from Indian Penal Code, Indian Evidence Act, Bankers Book Evidence Act, Reserve Bank of India Act, etc.

Information Technology Act –a brief overview; Documents or transactions to which IT Act shall not be applicable; meaning of Computer, Computer system and Computer network; E –commerce; E –governance; Concept of Electronic Signature; Concept of Cyber contraventions and Cyber Offences.

UNIT-II

E-Contract –legal provisions regulating the e –contract with special reference to the provisions of Information Technology Act, 2000 & 2008 with recent amendments.

Copyright issues in Cyberspace –relevant provisions under Copyright Act, 1957 regulating copyright issues in Cyberspace; Online Software Piracy –legal issues involved; Analysis of sufficiency of provisions of Copyright Act to deals with Online Software Piracy.

Trademark issues in Cyberspace –Domain Name; Cybersquatting as a form of Domain Name dispute; Case law.

UNIT-III

Concept of Cyber Crimes – 'Cyber Contraventions' & 'Cyber Offences' "Study Of Some Specific Kinds Of Cyber Crimes"

- 'Unauthorised Access' & 'Accessing the Protected System'-meaning with reference to an idea of Cyber Hacking; the legal issues involved.
- Introducing Computer contaminant or virus –legal issues involved.
- Denial of Access to Authorised Person –e.g.-Denial of Service (DoS) Attacks; E mail bombing –legal issues involved.
- Web jacking, Web Defacement & Salami Attacks -legal issues involved.
- Cyber Defamation –meaning; applicability of provisions of IPC; penal liabilities.

UNIT-IV

Concept of Cyber Crimes – 'Cyber Contraventions' & 'Cyber Offences' "Study Of Some Specific Kinds of Cyber Crimes"

- Phishing –a kind of online fraud; meaning; legal issues involved with reference to applicable provisions from Information Technology Act, 2000 & 2008 with recent amendments.
- Cyber Stalking -meaning; elements; applicable provisions from Information Technology Act, 2000 & 2008 with recent amendments.
- Cyber pornography –meaning; relevant provisions from Constitution of India; relevant provisions from IPC; relevant provisions from IT Act; reported case law.
- Cyber Terrorism –meaning; various modes of committing Cyber terrorism; applicable provisions from IT Act.

Text Books:

1. RohasNagpal, "Fundamentals of Cyber Law", ASCL Publication.
2. Anirudh Rastogi, "Cyber Law Law of Infromation Technology and Internet", Lexis Nexis Publication.

Reference Books:

1. Karnika Seth, "Computers, Internet and New Technology Laws-A comprehensive reference work with special focus on developments in India", LexisNexis Publication.
2. Apar Gupta, "Commentary on Information Technology Act-With rules, regulations, Orders, Guidelines and reports etc.", Lexis Nexis Publication.

COURSE CONTENTS

Foundation Courses – II: Skill Development (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
7.	SD	MCA-SD1	Basics of Web Designing	2
8.	SD	MCA-SD2	Network Administration	2
9.	SD	MCA-SD3	NoSQL Databases	2
10.	SD	MCA-SD4	Introduction to Latex	2
11.	SD	MCA-SD5	Linux & Shell Programming	2
12.	SD	MCA-SD6	Fundamentals of Python Programming	2

MCA-SD1: Basics of Web Designing

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: After learning the course the students should be able to develop Websites using HTML and CSS.

UNIT-I

Web Design Principles: Basic principles involved in developing a web site, Planning process, Five Golden rules of web designing , Designing navigation bar , Page design , Home Page Layout, Design Concept. Basics in Web Design: Brief History of Internet, World Wide Web, need of web site, Web Standards, Audience requirement.

UNIT-II

Introduction to HTML: What is HTML, HTML Documents, Basic structure of an HTML document, creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags.

UNIT-III

Elements of HTML: Introduction to elements of HTML, working with Text, working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls.

UNIT-IV

Introduction to Cascading Style Sheets, Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class 5.8 Box Model(Introduction, Border properties, Padding Properties, Margin properties), CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Color, Creating page Layout and Site Designs.

Text Books:

1. Kogent Learning Solutions Inc., “HTML 5 in simple steps”, Dreamtech Press.
2. Steven M. Schafer, “HTML, XHTML, and CSS Bible”, Fifth Edition, Wiley.

Reference Books:

1. Ian Pouncey and Richard York, “Beginning CSS: Cascading Style Sheets for Web Design”, Fifth Edition, Wiley.
2. John Duckett, “Beginning HTML, XHTML, CSS, and JavaScript”, Wiley.

MCA-SD2: Network Administration

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: To learn basic knowledge and skills needed to configure, manage and troubleshoot the network infrastructure

UNIT-I

Introduction to Computer Networks: OSI & TCP/IP Model
Physical Media: UTP, Fiber and Wireless Media
LAN Architecture: 10/100/1000/10G Ethernet

UNIT-II

Switching & Routing: Layer 2 & Layer 3 switching; Routing; VLAN; Cisco L2 and L3 Switch Configuration
IP Addressing: IPv4 Addressing and Sub-netting; DHCP Configuration; IPv6
Wireless LAN: 802.11 a/b/g/n/ac WiFi; Access Point and Wireless Router configuration
Internet Architecture: ISP Architecture; DNS Resolution; BGP Routing; Content Mirroring

UNIT-III

Internet Applications: DNS; Web; Mail; Proxy; NTP
Perimeter Security: Firewall; UTM
Network Security: LAN and WLAN Security issues; IP Spoofing; Dictionary Attack; DoS

UNIT-IV

DDoS Attack; Rogue/Misconfigured/External APs
Network Troubleshooting: ping, traceroute, nslookup, dig, tcpdump
Network Monitoring: SNMP; MRTG

Text Books:

1. CCENT/CCNA ICND1 (Official Exam Certification Guide, Second Edition)By – Wendell Odom.
2. Hunt, Craig, “TCP/IP network administration”, Vol. 2. " O'Reilly Media, Inc.

Reference Book:

1. Bergstra, Jan and Mark Burgess eds,”Handbook of network and system administration”, Elsevier.

MCA-SD3: NoSQL Databases

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: After learning the course the students should be able to use NOSQL databases like MongoDB and other similar databases.

UNIT-I

Define what a NoSQL database is, Why we need NoSQL and how is it different from traditional databases. Learn about the various tools available such as MongoDB, Cassandra, HBase etc. Explore the principles of NoSQL using elementary examples in MongoDB.

UNIT-II

Develop an understanding of the available data models: value stores, document databases, column-family stores, graph databases. Understand the basic storage architecture in a distributed environment – column oriented databases, nested maps of key/value pairs, Hbase distributed storage architecture.

UNIT-III

The set of essential operations – CRUD refers to Create, Read, Update and Delete operations in the context of a NoSQL database environment. Practical experience of CRUD operations for document databases using MongoDB.

UNIT-IV

Developing Web Application with NOSQL and NOSQL Administration: Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP, NOSQL Database Administration.

Text Books:

1. Shashank Tiwari, “Professional NoSQL”, John Wiley and Sons.
2. Pramod J. Sadalage, Martin Fowler, “NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence”, Addison-Wesley.

MCA-SD4: Introduction to Latex

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The objective of this course is to create understanding of the LaTeX.

UNIT-I

Installation of the software LaTeX, Understanding Latex compilation Basic Syntax, Writing equations, Matrix, Tables.

UNIT-II

Page Layout – Titles, Abstract Chapters, Sections, References, Equation references, citation.
List making environments Table of contents, generating new commands, Figure handling numbering, List of figures, List of tables, Generating index.

UNIT-III

Packages: Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tiles listing.

UNIT-IV

Classes: article, book, report, beamer, slides. IEEEtran.
Applications to: Writing Resume, Writing question paper, Writing articles/ research papers.

Text Book:

1. Leslie Lamport, "LaTeX: A Document Preparation System, Second Edition", Addison Wesley.

Reference Book:

1. Frank Mittelbach, Michel Goossens, Johannes Braams, David Carlisle, Chris Rowley, "LaTeX Companion", Addison Wesley.

MCA-SD5: Linux & Shell Programming

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: To introduce the Unix/Linux operating system and shell programming basics.

UNIT-I

Linux Startup and Shell Programming: User accounts, accessing linux-starting and shutting process, Logging in and Logging out, Command line, simple command, Unix file system: Linux/Unix files, inodes and structure and file system related commands, Shell as command processor, shell variables, creating command substitution, scripts, functions, conditionals, loops, customizing

UNIT-II

Regular Expressions and Filters: Introducing regular expressions patterns, syntax, character classes, quantifiers, introduction to egrep, sed, programming with awk and perl

UNIT-III

The C/C++ Environment: The C compiler, vi editor, compiler options, managing projects, memory management, use of makefiles, dependency calculations, memory management-dynamic and static memory, building and using static and dynamic libraries, using ldd, soname, dynamic loader, debugging with gdb.

vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating shell scripts. Basic system administration in Linux/Unix

UNIT-IV

Processes in Linux Processes, starting and stopping processes, initialization processes, rc and init files, job control-at, batch, cron, time, network files, security, privileges, authentication, password administration, archiving, Signals and signal handlers, Linux I/O system.

Text Books:

1. Sumitabha Das, "Your Unix-The Ultimate Guide", Tata McGrah Hill.
2. Behrouz A. Forouzan, Richard F. Gilberg: "UNIX and Shell Programming", Brooks/Cole-Thomson Learning.

Reference Books:

1. A. Martelli, A. Ravenscroft, S. Holden, "Python in a Nutshell", O'Reiley.
2. Guido van Rossum, "An Introduction to Python", Network Theory Ltd
3. John Goerzen, "Linux Programming Bible, IDG Books", New Delhi
4. Neil Matthew, Richard Stones, "Beginning Linux Programming", Wrox-Shroff
5. Welsh & Kaufmann, "Running Linux", O'Reiley.
6. Pooja Sharma, "Programming in Python", BPB Publications.

MCA-SD6: Python Programming

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: After learning the course the students should learn how to design Python applications. Students also learn the basic concepts like how to use lists, tuples, dictionaries, objects, functions, packages, files, inheritance and exception handling in Python programs.

UNIT-I

Introduction to Python Programming Language: History and Origin of Python Language, Installing Python, setting up Path and Environment Variables, Running Python, First Python Program. Python Data Types & Input/ Output: Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command. Operators and Expressions: Operators in Python, Expressions, Precedence, Associativity of Operators, Non Associative Operators.

UNIT-II

Control Structures: Decision making statements, Python loops, Python control statements. Python Native. Data Types: Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).

UNIT-III

Python Functions: Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables. Python Modules: Module definition, Need of modules, creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages.

UNIT-IV

Exception Handling: Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python. File Management in Python: Operations on files (opening, modes, attributes, encoding, closing), read() & write() methods, tell() & seek() methods, renaming & deleting files in Python, directories in Python. Classes and Objects: The concept of OOPS in Python, Designing classes, Creating objects, Accessing attributes, Editing class attributes, Built-in class attributes, Garbage collection, Destroying objects.

Text Books:

1. R. S. Salaria, “Programming in Python”, Khanna Publishing.
2. A. Martelli, A. Ravenscroft, S. Holden, “Python in a Nutshell”, O’Reiley.

Reference Books:

1. Pooja Sharma,“Programming in Python”, BPB Publications.
2. R. Nageswara Rao, “Core Python Programming”, Second Edition, Dreamtech.
3. Martin C. Brown, “Python - The complete Reference”, Tata McGraw Hill.

COURSE CONTENTS

Bridge Course(s) (0 Credit)

S. No.	Course Type	Course Code	Course Name	L	T	P
5.	FB	MCA-FB1	Fundamentals of ICT	3	1	0
6.	FB	MCA-FB2	C Programming	2	0	0
7.	FB	MCA-FB3	LAB - C Programming	0	0	4
8.	FB	MCA-FB4	PC Packages	3	1	0

MCA-FB1: Fundamental of ICT

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective:

- Knowledge of Basic Computing Concepts.
- Identifying the functions of Input & Output Devices.
- To understand the concept of Computer Software.
- In general, develop an intuitive sense of how computers work and how they can be used to make your work more efficient.

UNIT-I

Introduction: Computer, Data Processing, Computer System Characteristics, Evolution of Computers, Capabilities and Limitations, Generations of computers, Block diagram of computer, Basic components of a computer system- Input unit, Output unit, Storage unit, ALU, Control unit, Central Processing unit; Number Systems- Non-positional number system, Positional number system, Decimal Number system, Binary number system, Octal number system, Hexadecimal number system.

UNIT-II

Memory: Main memory organization, Main memory capacity, RAM, ROM, PROM, EPROM, Cache Memory, Secondary storage devices: Sequential access devices- Magnetic tape; Direct access devices- Magnetic disks, Floppy disks, Optical disks, Types of Optical disks: CD-ROM, CD-R, CD-RW, DVD.
Input devices: Keyboard, Pointing Devices-Mouse, Touch screens, Joystick, Electronic pen, Trackball, Scanning devices: Optical Scanners, OCR, OMR, Bar code reader, MICR, Electronic card reader, Image capturing devices, Digital cameras.
Output devices: Monitors- CRT, LCD, Printers-Dot matrix, Inkjet, Laser; Plotters, Screen image projector.

UNIT-III

Introduction: Software, Relationship between Hardware and Software, Types of Software-System Software, Application Software; System Software-Operating System, Utility Program; Programming Languages-Machine, Assembly, High Level; Assembler, Compiler, Interpreter.

UNIT-IV

Data Communication & Computer Networks, Basic elements of a communication system, Data Transmission modes-Simplex, Half duplex, Full duplex; Data Transmission speed-Narrowband, Voice band, Broadband; Data Transmission media-Twisted Pair Wire, Coaxial cable, Optical fibers; Modems, Types of Network-LAN, WAN, MAN; Internet, World Wide Web, Web Browsers.

Text Book:

1. Pradeep K. Sinha and Priti Sinha, “Computer Fundamentals”, Sixth Edition , BPB Publications.

Reference Books:

2. V. Rajaraman, “Fundamental of Computers”, Fifth Edition, Prentice Hall of India.
3. E. Balagurusamy, “Introduction to Computers ”, Tata McGraw Hill.

MCA-FB2: C Programming

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The course is designed to

- The main purpose of this course is to introduce students with the Problem solving Analysis, Approach and Techniques using C Programming language. C being the rich source of built in functions and constructs will help students to write simple and complex programs.
- C is having the ability to extend itself. Thus students can continuously add their own functions to C library.
- Further as the course will continue the students will be introduced and taught many more concepts, features and programming skills in C.

UNIT-I

Overview of C- General Structure of C Program, C compilers, Editing, Compiling & , Running of a C program Data types, Constants and Variables, Operators and expressions, Storage Classes, Different types of expressions and their Evaluation, Conditional Expression, Assignment statement, Enumerated data type, Redefining/ Creating data types, Library functions, Type casting.
Input/Output- Unformatted and formatted I/O Functions.

UNIT-II

Control Statements- Decision making using if, if-else, elseif and switch statements, Looping using for, while and do-while statements, Transferring Program controlling break and continue statements, Programming examples to illustrate the use of these control statements.
Functions- Defining a function, Local variables, return statement, invoking a Function, specifying and passing arguments to a function, Functions returning non Integer, External, static, and register variable, block structure, initialization and recursion.

UNIT-III

Array & strings- Introduction to arrays, Declaring arrays, Initializing, arrays, Processing arrays, Pointers to arrays, Passing arrays as arguments to functions, Introduction to strings, Pointers to strings, Passing strings and Arrays of strings as arguments to a function, Programming examples to illustrate the use of arrays and strings.
Pointers- Definition, Need of pointers, declaring Pointers, Accessing Values via Pointers, Pointer arithmetic, Types of pointers, Programming examples to illustrate the use of pointers.

Unit-IV

Structures- Declaring a structure type, Declaring Variables of structure type, Initializing Structures, Accessing Elements of structures, arrays of structures, nested structures, Pointers to structures Programming examples to illustrate the use of Structures.

Text Books:

1. E. Balagurusamy, “Programming in ANSI C”, Eighth Edition , Tata McGraw Hill.

Reference Books:

1. R S Salaria, “Application in C”, Khanna book publishing.
2. Yashwant Kanetakar, “Let us C”, BPB Publications.
3. Kerninghan B.W. & Ritchie D.M. “The C Programming Language”, Prentice Hall of India.
4. Mullish Cooper, “The Spirit of C”, Jaico Publishing House.
5. Byron Gottfried, “Programming with C”, Tata McGraw Hill.
6. Herbert Schildt, “C: The complete reference”, Tata McGraw hill.

MCA-FB3: Lab- C programming

Credits: 2

L	T	P	Total
0	0	4	4

Course Objective: The course is designed to

- The main purpose of this course is to introduce students with the Problem solving Analysis, Approach and Techniques using C Programming language. C being the rich source of built in functions and constructs will help students to write simple and complex programs.
- C is having the ability to extend itself. Thus students can continuously add their own functions to C library.
- Further as the course will continue the students will be introduced and taught many more concepts, features and programming skills in C.

MCA-FB4: PC Packages

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: The course is designed to

- Understand the basic concepts of windows.
- Further as the course will continue the students will be learn the basic as well as advanced concepts of MS word, Excel and Power point.

UNIT-I

MS Windows: Introduction to MS Windows: Features of Windows; Various versions of Windows & its use; Working with Windows; My Computer Use: Opening, Content, Short Cut to Open, Recycle bin : Use, Moving and restoring files to and from Recycle bin. Delete File directly without sending to Recycle Bin. Empty Recycle Bin. Short cut key uses for Recycle bin. Desktop : Definition, Purpose, Component, Changing Desktop theme, Default Icons, Windows Explorer : Purpose and Using Mechanism. Screen description & working styles of Windows; Dialog Boxes & Toolbars; Working with Files & Folders; simple operations like copy, delete, moving of files and folders from one drive to another, Shortcuts & Autostarts; Accessories and Windows Settings using Control Panel- setting common devices using control panel, modem, printers, audio, network, fonts, creating users, internet settings, Start button & Program lists; Installing and Uninstalling new Hardware & Software program on your computer.

UNIT-II

Office Packages: Office activates and their software requirements, Word-processing, Spreadsheet, Presentation graphics, Database, introduction and comparison of various office suites like MS-Office, Lotus-Office, Star-Office, Open-Office etc.

MS Word Basics: Introduction to MS Word, , Working with MS Word, Quick Access toolbar, Ribbon, Ruler, Tab, Group, Document Window, Windows Control, Status bar, Scroll Bar, Title Bar, Help Button, Zoom Slide, Menus & Commands, Toolbars & Buttons, Shortcut Menus, and Wizards &Templates. Creating a New Document, Styles, Different Page Views and layouts, Applying various Text , Finding and Replacing Text, Enhancements, Working with -Styles, Text Attributes Font, Size Color, Highlight. Paragraph and Page Formatting, Margins, Page Number, Header Footer Text Editing using various features; Bullets, Numbering, Auto formatting, Printing & various print options.

Advanced Features of MS-Word: Spell Check, Thesaurus, Find & Replace; Headers & Footers, Inserting - Page Numbers, Pictures, Files, Auto texts, Symbols etc., Working with Columns, Tabs & Indents, Creation & Working with Tables including conversion to and from text, Margins & Space management in Document, Adding References and Graphics, Mail Merge Select Document Type, Various methods of selecting Recipients, Creating Document, Merging, Creating Envelops & Mailing Labels. Importing and exporting to and from various formats.

UNIT-III

MS Excel: Introduction and area of use, Working with MS Excel, concepts of Workbook & Worksheets, Row, Column and Cell, Menus and Dialog box, Sheets, Using Wizards, Various Data Types, Using different features with Data, Cell and Texts, Inserting, Removing & Resizing of Columns & Rows, Working with Data & Ranges, Different Views of Worksheets, Column Freezing, Labels, Hiding, Splitting, Using different features with Data and Text, Use of Formulas, Calculations & Functions: Logical, Database, Date and Time, Information, Mathematical and statistical Functions. Cell Formatting : Format cell Dialogue Box , Borders & Shading , Decimal Places, Date and Time Formats, Fractions, Currency vs Accounting , Text to Numbers, Numbers to Text, Custom Number Format, Format Painter, Cell Styles, Themes.

Working with Different Chart Types: Create chart , Change Chart Type, Switch Row/Column ,Chart Title, Legend Position , Data Labels. Printing of Workbook & Worksheets with various options.

UNIT-IV

MS PowerPoint: Introduction & area of use, Working with MS PowerPoint, The Main Screen Component, Creating a New Presentation, Working with Presentation Color, Transition, Drawing tool, Using Wizards; Slides & its different views, Inserting, Deleting and Copying of Slides; Working with Notes, Handouts, Columns & Lists, Adding Graphics, Sounds and Movies to a Slide; Working with PowerPoint Objects, Designing & Presentation of a Slide

Show, Custom Animation with Timing , Chart effect, Action button and Action Settings, Determining What to Animate, Automate Presentation. Printing Presentations, Notes, and Handouts with print options. Outlook Express: Features and uses, Configuration and using Outlook Express for accessing e-mails in office.

Text Book:

1. Jennifer Kettell , Guy Hart-Davis ,Curt Simmons, "Microsoft Office 2003: The Complete Reference", Tata McGraw Hill

COURSE CONTENTS

MASTER OF COMPUTER APPLICATIONS (MCA)

DURATION - 02 YEARS

Core-Compulsory (48 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	C	MCA-C1	Object Oriented Programming Using C++	2
2.	C	MCA-C2	LAB- Object Oriented Programming Using C++	2
3.	C	MCA-C3	Data Structures	4
4.	C	MCA-C4	LAB - Data Structures	2
5.	C	MCA-C5	Data Base Management System	4
6.	C	MCA-C6	LAB - Data Base Management System	2
7.	C	MCA-C7	Operating Systems	4
8.	C	MCA-C8	Theory of Computations	4
9.	C	MCA-C9	Project	24

Core-Open (16 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	CO	MCA-CO1	Design and Analysis of Algorithms	4
2.	CO	MCA-CO2	LAB - Design and Analysis of Algorithms	2
3.	CO	MCA-CO3	Software Engineering	4
4.	CO	MCA-CO4	Computer Graphics	2
5.	CO	MCA-CO5	Compiler Design	4
6.	CO	MCA-CO6	Big Data Analytics	2
7.	CO	MCA-CO7	Computer Organization & Architecture	2
8.	CO	MCA-CO8	Software Testing	4
9.	CO	MCA-CO9	Operational Research	4

Elective-Specialization (20 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	ES	MCA-ES1	Data Mining &Machine Learning	4
2.	ES	MCA-ES2	LAB- Data Mining & Machine Learning Using Python	2
3.	ES	MCA-ES3	Computer Networks	4
4.	ES	MCA-ES4	Web Programming	2
5.	ES	MCA-ES5	LAB- Web Programming	2
6.	ES	MCA-ES6	Java Programming	4
7.	ES	MCA-ES7	LAB - Java Programming	2
8.	ES	MCA-ES8	Cloud Computing Concepts	4
9.	ES	MCA-ES9	Internet of Things	2
10.	ES	MCA-ES10	Digital Image Processing	4
11.	ES	MCA-ES11	Ethical Hacking	2
12.	ES	MCA-ES12	Mobile Computing	4
13.	ES	MCA-ES13	Modeling and Simulation	4
14.	ES	MCA-ES14	Human Computer Interface	4

Elective-Open (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	EO	MCA-EO1	Soft Computing	4
2.	EO	MCA-EO2	Bioinformatics	4
3.	EO	MCA-EO3	Android Application Development	2
4.	EO	MCA-EO4	Natural Language Processing and Speech Recognition	4
5.	EO	MCA-EO5	Cyber Security	2
6.	EO	MCA-EO6	Cryptography and Network Security	4
7.	EO	MCA-E07	Fundamentals of E-Governance, E-Business & E-Learning	2
8.	EO	MCA-E08	Artificial Intelligence	4
9.	EO	MCA-E08	Distributed Databases	4

Foundation Courses – I: Human Making (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	HM	MCA-HM1	Online Meeting and Web Conferencing Tools	2
2.	HM	MCA-HM2	Google Tools	2
3.	HM	MCA-HM3	Open Source Technologies	2
4.	HM	MCA-HM4	Research Ethics	2
5.	HM	MCA-HM5	IT Tools for Smart Work	2
6.	HM	MCA-HM6	Personality Development & Job Orientation	2
7.	HM	MCA-HM7	IT and Cyber Laws in India	2

Foundation Courses – II: SkillDevelopment (4 credits)

S. No.	Course Type	Course Code	Course Name	Credit
1.	SD	MCA-SD1	Basics of Web Designing	2
2.	SD	MCA-SD2	Network Administration	2
3.	SD	MCA-SD3	NoSQLDatabases	2
4.	SD	MCA-SD4	Introduction to Latex	2
5.	SD	MCA-SD5	Linux & Shell Programming	2
6.	SD	MCA-SD6	Fundamentals of Python Programming	2

MCA-C1: Object Oriented Programming Using C++

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The main objective of this course is to help the students to learn the fundamental concepts of software construction in an object-oriented framework and conceptual knowledge of basic constructs used in C++ programming. Also by learning the basic of C++ programming, students can easily switch over to any other variant of OOPs language in future.

UNIT-I:
Data Types, Identifiers, Variables Constants and Literals, Basic input/output statements, Operators, Expressions, Type conversion, Control structures, Arrays, Strings, Structures and Pointers.
Functions: Basic, Recursive functions, Overloaded functions, inline functions, function with default arguments.

UNIT-II:
Introduction to classes and objects, Access specifiers, Constructor, Destructor, Function overloading, Operator overloading, friend functions.

UNIT-III:
Inheritance-Concept of derived and base class, accessing base class members, Single inheritance, multiple inheritance, hierarchical inheritance, multilevel inheritance, hybrid inheritance, constructor in derived classes.
Virtual Functions-Functions accessed with pointers, virtual member functions accessing with pointers, late binding, pure virtual functions, abstract classes, virtual base classes.

UNIT-IV:
Exception handling.
Working with files- classes for file stream operations, opening and closing a file, detecting end-of-file, file modes, file pointers and their manipulations, sequential input and output operations, updating a file, error handling.
Command line arguments.

Text Book:

1. E. Balagurusamy, “Object Oriented Programming with C++”, Eighth Edition, Tata McGraw Hill.

Reference Books:

1. Herbert Schildt, “ C++ The Complete Reference ” , Fourth Edition , Tata McGrahHill.
2. RobertLafore, “Object Oriented Programming in Turbo C++”, Fourth Edition ,Galgotia Publications Pvt. Ltd.

MCA-C2: LAB-Object Oriented Programming Using C++

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: This Lab course will enable the students to practically implement the basic constructs used in C++ programming. This course will also enable the students to find the practical solution of real world problems using the Object Oriented Programming.Moreover, students can easily switch over to any other variant of OOPs language in future.

MCA-C3: Data Structures

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed

- To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.
- To be able to carry out the Analysis of various Algorithms for mainly Time and Space Complexity.
- To get a good understanding of applications of Data Structures.
- To develop a base for advanced computer science study.

UNIT- I

Introduction: Basic Terminology, Data structures and its classification, Algorithm, Complexity- space & time complexity, complexity notations- big Oh, Omega, Theta. Array Definition, Representation and Analysis of Arrays, Single and Multidimensional Arrays, Address calculation, Linear Search, Binary Search of Array, Traversing, Insertion & deletion in array, Sparse Matrices, Strings. Internal and External sorting, Insertion Sort, Bubble Sort, selection sort, Quick Sort, Merge Sort, Radix sort.

UNIT- II

Linked List Introduction, Representation of linked list in to memory, Memory allocation -Garbage Collection, Traversing & Searching in Linked List, Insertion into linked list- at beginning of list & at given location, Deletion in linked list- from starting of list & given location of node, Header Linked List, two way List, Input & output restricted liked list, Circular Header Linked List, Representation of Polynomials using linked List.

UNIT- III

Stack, Array Implementation of stack, Linked Representation of Stack, Application of stack: Conversion of Infix to Prefix and Postfix Expressions and Expression evaluation. Queue, Array and linked implementation of queues, Circular queues, D-queues and Priority Queues.

UNIT- IV

Trees: Basic terminology, Binary Trees, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Binary Search Tree (BST), AVL Trees, B-trees. Graphs: Introduction, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees. Searching & Hashing: Sequential search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies.

Text Books:

1. Lipschuitz L. Seymour, “Data Structures With C”, Schaum Outline Series, Tata McGrahHill.
2. R. S. Salaria, “Data Structures & Algorithm Using C”, Khanna Book Publishing.

Reference Books:

1. Horowitz and Sahani, “Fundamentals of data Structures”, Galgotia Publication Pvt. Ltd.
2. R. S. Salaria, “Data Structures & Algorithm Using C++”, Khanna Book Publishing.
3. A.M. Tenenbaum, “Data Structures using C & C++”, Prentice-Hall of India Pvt. Ltd.
4. J.P. Trembley and P.Sorenson, “Data Structures”, Tata McGrahHill.

MCA-C4: LAB- Data Structures

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: The course is designed

- To develop proficiency in the programming aspect of various operation and applications of Data Structures.
- To develop a programming base for advanced computer science study.

MCA-C5: Database Management System

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The main objective of this course is to provide theconceptual as well as practical knowledge of Database, various methodologies and applications software used for data base management. After completing the course, the student should be competent in data base handling, able to design and manage database for real life problems and the student should be proficient in query handling.

UNIT-I

Basic Concepts: Entity, Relationship and its types, Components of a database, three level architecture of a DBMS, Database models.

File Organization: Serial, Sequential, Index Sequential and Direct file organization.

UNIT-II

Entity-Relationship Model: Entity Types, Entity Sets, Attributes & keys, Relationships, Relationships Types, Roles and Structural Constraints, Design issues, E-R Diagrams, Design of an E-R Database Schema, Reduction of an E-R Schema to Tables.

Relational Data Model: Relational model concepts, Integrity constraints over Relations, Relational Algebra – Basic Operations.

SQL: DDL, DML, and DCL, views & Queries in SQL, Specifying Constraints & Indexes in SQL.

UNIT-III

Relational Database Design: Functional Dependencies, Decomposition, Normal forms based on primary keys (1 NF, 2 NF, 3 NF, & BCNF).

Transaction Processing Concepts: Introduction to Transaction Processing, Transaction & System Concepts, Properties of Transaction, Schedules and Recoverability, Serializability of Schedules.

UNIT-IV

Concurrency Control Techniques: Locking Techniques, Timestamp ordering, Multiversion Techniques, Optimistic Techniques, Granularity of Data items.

Databases for Advanced Applications: Active database concepts, Temporal database concepts, Spatial databases, Deductive databases; Emerging Database Technologies: Mobile databases, Multimedia Databases, Geographic information systems (GIS).

Text Books:

1. R. Elmasri and S. B. Navathe, “Fundamentals of Database Systems”,Seventh Edition, Addison Wesley.
2. IvanBayross, “SQL, PL/SQL: The Programming Language of Oracle”, Fourth Edition, BPB Publications.

Reference Books:

1. Ramakrishnan and J. Gehrke, “Database Management Systems”, Third EditionTata McGraw Hill.
2. A. Silberschatz, H. Korth and S. Sudarshan, “Database System Concepts”,Sixth Edition, Tata McGraw Hill.

MCA-C6: LAB-Data Base Management System

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: The main objective of this course is to provide thepractical knowledge of Database, various methodologies and applications software like MYSQL/Oracle used for data base management. After completing the course, the student should be competent in defining and manipulating database through MySQL/Oracle and proficient in query handling by using MySQL/Oracle.

MCA-C7: Operating Systems

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The main objective of this course is to provide conceptual as well as practical knowledge about Operating system. After completing the course, the student will be familiarized with various methodologies used by operating system to manage different types of tasks, and will be able to use operating system proficiently.

UNIT-I

Operating System Introduction: function, characteristics, structures–simple batch, multiprogrammed, timeshared, personal computer, parallel, distributed systems, real-time systems, system components, operating system services, system calls, virtual machines. **Process and CPU Scheduling:** Process concepts and scheduling, operation on processes, cooperating processes, threads and inter-process communication scheduling criteria, scheduling algorithm, multiple-processor scheduling, real time scheduling.

UNIT-II

Management and Virtual memory: logical versus physical address space, swapping, contiguous allocation, paging, segmentation, segmentation with paging. Demand paging, performance of denuding paging, page replacement, page replacement algorithm, allocation of frames, thrashing.

UNIT-III

File System Interface and Implementation: access methods, directory, structure, protection, file system structure, allocation methods, free space management, directory management, directory implementation, efficiency and performance. **I/O Management:** I/O software and its types, disk scheduling. **Process Management and Synchronization:** Critical section problem, synchronization, critical regions, monitors.

UNIT-IV

Deadlocks: system model, dead locks characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection and recovery from deadlock. **Shell Programming:** vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating shell scripts. Basic system administration in Linux/Unix.

Text Books:

1. A. Silberschart, P. Galvin andG. Gagne, “Operating System Concepts”, Ninth Edition, WSE Wiley.
2. S. Das, “Your UNIX: The Ultimate Guide”, Fourth Edition, Tata McGraw-Hill.

Reference Books:

1. D.M. Dhamdhere, “Operating Systems: A Concept Based Approach”, Tata McGraw Hill.
2. Milan Milenkovic, “Operating system-concepts and design”, Tata McGraw Hill.
3. A. S. Godbole, “Operating systems”, Tata McGraw Hill.
4. H.M. Deitel, “Operating System”, Pearson.
5. William Stallings, “Operating Systems: Internals and Design Principles”,Pearson.
6. Andrew. S. Tanenbaum, “Modern Operating Systems”, Pearson.

MCA-C8: Theory of Computations

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed to cover the underlying concepts and techniques used in the theory of computations.

UNIT-I

Introduction of Theory of Computation, Alphabet, Strings and their properties, Definition of an automation, Description of a finite Automation, Transition graph, transition function, Acceptability of a string by a Finite Automation, Deterministic and nondeterministic FSM'S, Equivalence of DFA and NDFA, Mealy & Moore machines, Minimization of finite automata.

UNIT-II

Chomsky classification of Languages, Languages and their relation, Languages and Automata, Regular sets, regular expression, Regular Grammars, Finite state machine and regular expression, Pumping lemma for regular sets, Application of pumping lemma, closure properties of regular sets.

Introduction to CFG, Context-free languages and Derivation Trees, Ambiguity in context-free Grammars, simplification of context-free Grammars, Normal forms for context-free Grammars – Chomsky normal form and Greiback normal form.

UNIT-III

Pushdown Automata: Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Pushdown automata and CFL, PDA corresponding to given CFG, CFG corresponding to a given PDA, Closure properties of CFL's.

UNIT-IV

Introduction, TM model Representation of Turing machines, languages acceptability of TM, Design of TM, Universal TM & Other modification, Church's hypothesis, Properties of recursive and Recursively enumerable languages.

Tractable and Untractable Problems: P, NP, NP complete and NP hard problems

Text Books:

1. John E. Hopcroft, Jeffery Ullman,"Introduction to Automata theory, Langauges& computation" ,Third Edition, Narosa Publishers.
2. John C. Martin, "Introdution to Languages and Theory of Computation", Fourth Edition, Tata McGraw Hill.

Reference Books:

- K.L.P. Mishra & N.Chandrasekaran,"Theory of Computer Science", PHI Learning.
- Daniel I.A. Cohen,"Introduction to Computer Theory",Wiley India.
- Peter Linz, "An Introduction to Formal Languages and Automata", Jones & Bartlett.

MCA-C9: Project

Credits: 24

Course Objectives: The course is designed to cover the practical applications of the courses studied, industry interaction and development of programming skills either in any educational institution or in the industry.

Evaluation Criteria:

Type of Evaluation	Activity	Credits
Internal Evaluation	Log Book & Interim Reports	4
	Seminar	4
	Project Report	4
External Evaluation	Project Report	4
	Project Demo	4
	Viva-Voce	4

MCA-CO1: Design & Analysis of Algorithms

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed

- To enable the students to carry out the analysis of various Algorithms for mainly time and space complexity.
- To develop efficient algorithms for simple computational tasks, and reasoning about the correctness of them. Through the complexity measures, different range of behaviours of algorithms and the notion of tractable and intractable problems will be understood.

UNIT- I

Algorithms, designing algorithms, analyzing algorithms, asymptotic notations, Introduction to divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, merge sort, quick sort, strassen's matrix multiplication.

UNIT- II

Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum spanning trees, knapsack problem, job sequencing with deadlines, single source shortest path algorithm.

Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, multistage graph, reliability design, Floyd-Warshall algorithm.

UNIT- III

Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph coloring problem etc.Introduction to branch & bound method, examples of branch and bound method like travelling salesman problem etc.Meaning of lower bound theory and its use in solving algebraic problem.

UNIT- IV

Binary search trees, height balanced trees, 2-3 trees, B-trees, basic search and traversal techniques for trees and graphs (In order, preorder, postorder, DFS, BFS), NP-completeness.

Text Books:

1. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, "Computer Algorithms", Second Edition, Universities Press.
2. Cormen, T.H., Leiserson, C.E., Rivest, R.L. and Stein, C., "Introduction to Algorithms", Second Edition, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. A.V. Aho, J.E. Hopcroft and J.D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education.
2. Sara Baase and Allen Van Gelder, "Computer Algorithms, Introduction to Design and Analysis", Third Edition, Pearson Education.
3. S. Dasgupta, C. Papadimitriou&U. Vazirani, "Algorithms"; Tata McGraw Hill.
4. Michael T Goodrich, RobartoTamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley India.

MCA-CO2: LAB-Design & Analysis of Algorithms

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: The course is designed to develop programs for different problem algorithms based on various strategies such as divide and conquer, greedy method, dynamic programming, backtracking, branch and bound etc.

MCA-CO3: Software Engineering

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: Tointroduce the methodologies involved in the development, the implementation, testing strategies, verification and validation techniques, project planning and management.

UNIT-I

Introduction: Introduction to software Engineering, Software characteristics, Software components, Software applications, Software Engineering Principles, Software metrics and measurement, monitoring and control. Software development life-cycle**,** Water fall model, prototyping model, Incremental model, Iterative enhancement Model, Spiral model.

Unit-II

Software Requirement Specification: Requirements Elicitation Techniques, Requirements analysis, Models for Requirements analysis, requirements specification, requirements validation.

System Design: Design Principles: Problem partitioning, abstraction, Top down and bottom up – design, structured approach. Functional versus object-oriented approach of design, design specification, Cohesiveness and Coupling.Overview of SA/SD Methodology, structured analysis, data flow diagrams, extending DFD to structure chart.

Unit-III

Software project Management: Project planning and Project scheduling. Software Metrics**:** Size Metrics like LOC, Token Count, Function Count. Cost estimation using models like COCOMO. Riskmanagement activities.

Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, reliability models, Software quality, ISO 9000 certification for software industry, SEI capability maturity model.

Unit-IV

Testing: Verification and validation, code inspection, test plan, test case specification. Level of testing: Unit, Integration Testing, Top down and bottom up integration testing, Alpha and Beta testing, System testing and debugging. functional testing, structural testing, Software testing strategies.

Software Maintenance: Structured Vs unstructured maintenance, Maintenance Models, Configuration Management, Reverse Engineering, Software Re-engineering.

Text Books:

1. K. K. Aggarwal& Y. Singh, “Software Engineering”, Second Edition, New Age International Publishers.
2. PankajJalote, “Software Engineering”, Wiley India.

Reference Books:

1. Roger S. Pressman, “Software Engineering- A Practitioner’s Approach”, Tata McGraw Hill.
2. Rajib Mall, “Fundamentals of Software Engineering”, PHI Learning Pvt. Ltd.

MCA-CO4: Computer Graphics

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The course is designed

- to familiarize the students with the fundamental algorithms and data structures that are used in today's interactive graphics systems as well as programming and architecture of high-resolution graphics computers.
- to aware the students about modern application domains of scientific visualisation, virtual reality, computer games and film animation.

UNIT-I

Introduction: Survey of computer Graphics and its applications; Interactive and passive graphics; display processors; Graphic Devices: Display systems-refresh CRTs, raster scan and random scan monitors, Grey shades, Interlacing, beam penetration shadow mask monitors, lookup tables, plasma panel, LED and LCD monitors, VGA and SVGA resolutions; Hard copy Devices-printers, plotters; Interactive Input Devices.

UNIT-II

Drawing Geometry: Coordinate system; resolution; use of the homogeneous coordinate system; scan conversion: symmetrical DDA, simple DDA, Bresenham's line drawing algorithm, Circle drawing using DDA and polar coordinates, Bresenham's circle drawing algorithm, generation of an ellipse. Curve Drawing

UNIT-III

2-D Transformations: Translation; rotation; scaling; mirror reflection; shearing; zooming; panning; input techniques-pointing, positioning, rubber band methods and dragging; tweening, Morphing. Graphic operations: Clipping-line clipping using Sutherland-Cohen and midpoint sub- division algorithm, Liang Barsky Line clippers algorithm, polygon clipping; window and viewport; windowing transformation; Filling algorithms.

UNIT-IV:

3-D Graphics: 3D modelling of objects; 3D display techniques; coordinate system; 3D transformation matrices for translation, scaling and rotation; parallel projection; perspective projection; Hidden-surface removal - Z-buffer, back face, scan-line, depthsorting, area subdivision; Shading - modelling light intensities, Gouraud shading, Phong shading.

Text Books:

1. D.D. Hearn, M.P. Baker, and W.R. Carithers, "Computer Graphics with OpenGL", Fourth Edition, Prentice Hall of India.

Reference Books:

1. Klinger, K.S. Fu, and T.L. Kunii, "Data Structures, Computer Graphics, and Pattern Recognition", Academic Press.
2. S. Marschner, and P. Shirley, "Fundamentals of Computer Graphics", CRC Press.
3. G. Enderle, K. Kansy, and G. Pfaff, "Computer Graphics Programming: GKS—The Graphics Standard", Springer Science & Business Media.
4. J.D. Foley, F.D. Van, A. Van Dam, S.K. Feiner, J.F. Hughes, E. Angel, and J. Hughes, "Computer Graphics: Principles and Practice", Addison-Wesley Professional.

MCA-CO5: Compiler Design

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed

- To learn how a compiler works.
- To learn the use of formal attributed grammars for specifying the syntax and semantics of programming languages.
- To understand the working knowledge of the major phases of compilation, particularly lexical analysis, parsing, semantic analysis, and code generation.

UNIT-I

Introduction to Compiler & Lexical Analysis:Introduction of Compiler, Major data Structure in compiler, BOOT Strapping, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Lexical analysis: Input buffering , Specification & Recognition of Tokens, LEX.

UNIT-II

Syntax analysis: CFGs, Top down parsing, Brute force approach, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence parsing, LR parsers (SLR,LALR, LR).

UNIT-III

Syntax directed definitions: Construction of Syntax trees, Bottom up evaluation of S-attributed definition, L-attribute definition, Top down translation, Bottom Up evaluation of inherited attributes Recursive Evaluation, Analysis of Syntax directed definition.

Intermediate code generation: Declarations, Assignment statements, Boolean expressions, Case statements.

UNIT-IV

Type Checking & Run Time Environment: Type checking: type system, specification of simple type checker.

Run time Environment: storage organization, Storage allocation strategies, parameter passing, dynamic storage allocation, and Symbol table.

Introduction to Code optimization: sources of optimization of basic blocks, dead code elimination, loop optimization, Introduction to global data flow analysis, Code Improving transformations, peephole optimization.

Code Generation: Issues in the design of code generator, Basic block and flow graphs, Register allocation and assignment, DAG representation of basic blocks.

Text Books:

1. A. V. Aho, M.S.Lam,R. Sethi, and J. D. Ullman, “Compilers: Principles, Techniques and Tools”, Second Edition, Pearson Education.
2. V. Raghavan, “Principles of Compiler Design”, Tata McGraw Hill.

Reference Books:

1. K.C. Louden, “Compiler Construction: Principles and Practice”, Cengage Learning
2. A. C. Holub, “Compiler Design in C”, Prentice Hall Inc.

MCA-CO6: Big Data Analytics

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The course is designed-

- To understand the Big Data Platform and its Use cases.
- To provide an overview of Apache Hadoop and HDFS Concepts and Interfacing with HDFS, understand Map Reduce Jobs and hands on Hodoop Eco System.

UNIT-I

Introduction to Big Data: Platform – Traits of Big data -Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - ReSampling - Statistical Inference - Prediction Error.

UNIT-II

Data Analysis: Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.

UNIT-III

Mining Data Streams: Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.
Frequent Itemsets And Clustering: Mining Frequent Item sets - Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream – Clustering Techniques – Hierarchical – K-Means – Clustering High Dimensional Data – CLIQUE and PROCLUS – Frequent Pattern based Clustering Methods – Clustering in NonEuclidean Space – Clustering for Streams and Parallelism.

UNIT-IV

Frameworks And Visualization: MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications - Analytics using Statistical packages-Approaches to modeling in Analytics – correlation, regression, decision trees, classification, association Intelligence from unstructured information-Text analytics-Understanding of emerging trends and technologies-Industry challenges and application of Analytics.

Text Books:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer.
2. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press.

Reference Books:

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley &Sons.
2. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons.
3. Pete Warden, “Big Data Glossary”, O’Reilly.

MCA-CO7: Computer Organisation and Architecture

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives:

- To acquaint the students with the fundamental concepts of digital computer organization and architecture.
- To develop a basic understanding of the building blocks of a digital computer system
- To enable the understanding of how these building blocks are organized together to architect a digital computer system.
- To enable the understanding of how various functional units of a digital computer system interact to meet the processing requirements of the user.

UNIT – I

Digital Logic Circuits – Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Conbinational Circuits, Flip Flops, Sequential Circuits

Register Transfer and Micro-operations – Register Transfer Language, Register transfer, Bus and Memory Transfer – Three State Bus Buffer, Memory Transfer; Arithmetic Micro-operations – Binary Adder, Binary Adder-Subtractor, Binary Incrementer, Arithmetic Circuit; Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.

UNIT – II

Basic Computer Organization – Instruction codes – Stored Program Organization, Indirect Address; Computer Registers – Common Bus System; Computer Instructions – Instruction Set Completeness; Timing and Control; Instruction Cycle – Fetch and Decode, Determine the Type of Instruction, Register-Reference Instructions; Memory Reference Instructions; Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic, Programming of the Basic Computer.

UNIT – III

Microprogrammed Control – Control Memory, Address Sequencing – Conditional Branching, Mapping of Instructions, Subroutines, Microprogram Example – Computer Configuration, Microinstruction Format, Fetch Routine, Design of Control Unit.

Central Processing Unit – Introduction, General Register Organization, Stack, Reverse Polish Notation, Evaluation of Arithmetic Expressions, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control – Status Bit Conditions, Conditional Branch Instructions, Subroutine Call and Return, Program Interrupt, Types of Interrupt, RISC & CISC

UNIT – IV

Computer Arithmetic – Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

Input-Output Organization –Input-Output Interface, Modes of Transfer – Programmed I/O, Interrupt-Driven I/O, Direct Memory Access (DMA), Input-Output Processor.

Memory Organization – Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Text Book:

2. M. Morris Mano, "Computer System Architecture", Revised Third Edition, Pearson Education.

Reference Books:

1. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill.
2. William Stallings, "Computer Organization and Architecture: Designing for Performance", Tenth Edition, Pearson Education.

MCA-CO8: Software Testing

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The objectives of this course are-

- To review basics of software testing.
- To describe the art and science of how to create test cases and plan.
- To learn the various models of software testing.

UNIT-I

Introduction: Software Failures, Testing Process, Program and Software, Verification and Validation, Fault, Error, Bug and Failure, Test, Test Case and Test Suite, Deliverables and Milestones, Alpha, Beta and Acceptance Testing, Quality and Reliability, Testing, Quality Assurance and Quality Control, Static and Dynamic Testing, Testing and Debugging, Limitations of Testing, The V Shaped Software Life Cycle Model, Graphical Representation, Relationship of Development and Testing Parts

Functional Testing: Boundary Value Analysis – Robustness Testing, Worst-Case Testing, Robust Worst-Case Testing, Applicability; Equivalence Class Testing – Creation of Equivalence Classes, Applicability; Decision Table Based Testing – Parts of the Decision Table, Limited Entry and Extended Entry Decision Tables, 'Do Not Care' Conditions and Rule Count, Impossible Conditions, Applicability; Cause-Effect Graphing Technique – Identification of Causes and Effects, Design of Cause-Effect Graph, Use of Constraints in Cause-Effect Graph, Design of Limited Entry Decision Table, Writing of Test Cases, Applicability

UNIT-II

Structural Testing: Control Flow Testing – Statement Coverage, Branch Coverage, Condition Coverage, Path Coverage; Data Flow Testing – Define/Reference Anomalies, Definitions, Identification of du and dc Paths, Testing Strategies Using du-Paths, Generation of Test Cases; Slice Based Testing – Guidelines for Slicing, Creation of Program Slices, Generation of Test Cases; Mutation Testing – Mutation and Mutants, Mutation Operators, Mutation Score

Software Verification: Verification Methods – Peer Reviews, Walkthroughs, Inspections, Applications; Software Requirements Specification (SRS) Document Verification – Nature of the SRS Document, Characteristics and Organization of the SRS Document, SRS Document Checklist; Software Design Description (SDD) Document Verification – Organization of the SDD Document, SDD Document Checklist; Source Code Reviews – Issues Related to Source Code Reviews, Checklist of Source Code Reviews; User Documentation Verification – Review Process Issues, User Documentation Checklist; Software Project Audit – Relevance Scale, Theory and Practice Scale, Project Audit and Review Checklist

UNIT-III

Creating Test Cases from Requirements and Use Cases: Use Case Diagram and Use Cases – Identification of Actors, Identification of Use Cases, Drawing of Use Case Diagram, Writing of Use Case Description; Generation of Test Cases from Use Cases – Generation of Scenario Diagrams, Creation of Use Case Scenario Matrix, Identification of Variables in a Use Case, Identification of Different Input States of a Variable, Design of Test Case Matrix, Assigning Actual Values to Variables; Guidelines for generating validity checks – Data Type, Data Range, Special Data Conditions, Mandatory Data Inputs, Domain Specific Checks; Strategies for Data Validity – Accept Only Known Valid Data, Reject Known Bad Data, Sanitize All Data; Database Testing

Selection, Minimization and Prioritization of Test Cases for Regression Testing: What is Regression Testing – Regression Testing Process, Selection of Test Cases; Regression Test Cases Selection – Select All Test Cases, Select Test Cases Randomly, Select Modification Traversing Test Cases; Reducing the Number of Test Cases – Minimization of Test Cases, Prioritization of Test Cases; Risk Analysis – What is Risk, Risk Matrix; Code Coverage Prioritization Technique – Test Cases Selection Criteria, Modification Algorithm, Deletion Algorithm

Software Testing Activities: Levels of Testing – Unit Testing, Integration Testing, System Testing, Acceptance Testing; Debugging – Why Debugging is so Difficult, Debugging Process, Debugging

Approaches, Debugging Tools; Software Testing Tools – Static Software Testing Tools, Dynamic Software Testing Tools, Process Management Tools; Software Test Plan

UNIT-IV

Object Oriented Testing: What is Object Orientation – Classes and Objects, Inheritance, Messages, Methods, Responsibility, Abstraction, Polymorphism, Encapsulation, What is Object Oriented Testing – What is a Unit, Levels of Testing; Path Testing, Activity Diagram, Calculation of Cyclomatic Complexity, Generation of Test Cases; State Based Testing – What is a State Machine, State Chart Diagram, State Transition Tables, Generation of Test Cases; Class Testing – How Should We Test a Class, Issues Related to Class Testing, Generating Test Cases

Metrics and Models in Software Testing: Software Metrics – Measure, Measurement and Metrics, Applications, Categories of Metrics – Product Metrics for Testing, Process Metrics for Testing; Object Oriented Metrics Used in Testing – Coupling Metrics, Cohesion Metrics, Inheritance Metrics, Size Metrics; What Should We Measure During Testing – Time, Quality of Source Code, Source Code Coverage, Test Case Defect Density, Review Efficiency; Software Quality Attributes Prediction Models – Reliability Models, An Example of Fault Prediction Model in Practice, Maintenance Effort Prediction Model

Automated Test Data Generation: What is Automated Test Data Generation – Test Adequacy Criteria, Static and Dynamic Test Data Generation; Approaches to Test Data Generation – Random Testing, Symbolic Execution, Dynamic Test Data Generation; Test Data Generation using Genetic Algorithm – Initial Population, Crossover and Mutation, Fitness Function, Selection, Algorithm for Generating Test Data; Test Data Generation Tools

Text Book:

1. Yogesh Singh , “Software Testing” , Cambridge University Press.
2. Paul C. Jorgensen, “Software Testing: A Craftsman’s Approach”, Fourth Edition, CRC Press.

Reference Books:

1. Boris Beizer, “Software Testing Techniques”, Second Edition, Dreamtech Press.
2. A.P. Mathur, “Fundamentals of Software Testing”, Pearson.
3. S. Desikan& G. Ramesh, “Software Principles and Practices”, Pearson.
4. G.J. Myers, T. Badgett, C. Sandler, “The Art of Software Testing”, Third Edition, Wiley India.

MCA-CO9: Operational Research

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The objectives of the course are to familiarize the students with the use of quantities methods and techniques for effective decisions–making; model formulation and applications that are used in solving business decision problems.

UNIT-I

Introduction of operation research. LP Formulations, Graphical method for solving LP's with 2 variables, Simplex method, Duality theory in linear programming and applications, Integer linear programming, dual simplex method

UNIT-II

Transportation problem, Assignment problem. Dynamic Programming: Basic Concepts, Bellman's optimality principles, Dynamics programming approach in decision making problems, optimal subdivision problem. Sequencing Models: Sequencing problem, Johnson's Algorithm for processing n jobs through 2 machines, Algorithm for processing n jobs through 3 or more machines, Processing 2 jobs through n machines.

UNIT-III

Project Management: PERT and CPM : Project management origin and use of PERT, origin and use of CPM, Applications of PERT and CPM, Project Network, Diagram representation, Critical path calculation by network analysis and critical path method (CPM), Determination of floats, Construction of time chart and resource labelling, Project cost curve and crashing in project management, Project Evaluation and review Technique (PERT).

UNIT-IV

Queuing Models: Essential features of queuing systems, operating characteristics of queuing system, probability distribution in queuing systems, classification of queuing models, solution of queuing M/M/1: ∞ /FCFS,M/M/1 : N/FCFS, M/M/S : ∞/FCFS, M/M/S : N/FCFS

Inventory Models: Introduction to the inventory problem, Deterministic Models, The classical EOQ (Economic Order Quantity) model, Inventory models with deterministe demands (no shortage & shortage allowed), Inventory models with probabilistic demand, multiitemdeterminise models.

Text Books:

1. B.E. Gillet,"Introduction to Operation Research: Computer Oriented Algorithmic approach", Tata McGraw Hill.
2. S.D. Sharma, "Operations Research", KedarNath Ram Nath Publication, Meerut, India.

Reference Books:

1. P.K. Gupta & D.S. Hira, "Operations Research", S.Chand & Co.
2. J.K. Sharma, "Operations Research: Theory and Applications", Mac Millan.
3. S.S. Rao "Optimization Theory and Application", Wesley Eastern.
4. Tata Hamdy, A "Operations Research - An Introduction", Prentice Hall of India.
5. H.A.Taha, "Operations Research: An Introduction",Pearson.

MCA-ES1: Data Mining & Machine Learning

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed

- To Understand and implement classical models and algorithms in data mining.
- To Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.

UNIT-I

Introduction to Data mining, types of Data, Data Quality, Data Processing, Measures ofSimilarity and Dissimilarity, Exploring Data: Data Set, Summary Statistics, Visualization.Classification: Basic Concepts, Decision Trees, Nearest Neighborhood classifier, Bayesian Classifier, Support vector Machines: Linear SVM, Separable and Non Separable case.

UNIT-II

Association Analysis: Problem Definition, Frequent Item-set generation, rule generation, compact representation of frequent item sets, FP-Growth Algorithms.

Clustering: Over view, K-means, Agglomerative Hierarchical clustering, DBSCAN, Cluster evaluation: overview, Unsupervised Cluster Evaluation using cohesion and separation, using proximity matrix, Scalable Clustering algorithm.

UNIT-III

Overview and Introduction to Bayes Decision Theory: Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class conditional probability distributions, Examples of classifiers bayes optimal classifier and error, learning classification approaches.

Linear machines: General and linear discriminants, decision regions, single layer neural network, linear separability, general gradient descent, perceptron learning algorithm, mean square criterion and widrow-Hoff learning algorithm; multi-Layer perceptrons: two-layers universal approximators, backpropagation learning, on-line, off-line error surface, important parameters.

UNIT-IV

Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3 algorithm criterion, C4.5 algorithm continuous test nodes, confidence, pruning, learning with incomplete data.

Instance-based Learning: Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability, Machine learning assessment and Improvement: Statistical model selection, structural risk minimization, bootstrapping, bagging, boosting. Support Vector Machines

Text Books:

1. Jiawei Han and MichelineKamber, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann.
2. E. Alpaydin, “Introduction to Machine Learning”, Prentice Hall of India.
3. T. M. Mitchell, “Machine Learning”, Tata McGraw Hill.

Reference Books:

1. ArunPujari, “Data Mining Techniques”, University Press.
2. D. Hand, H. Mannila and P. Smyth, “Principles of Data Mining”, Prentice Hall of India.
3. G.K. Gupta, “Introduction to Data Mining with Case Studies”, Prentice Hall of India.
4. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer.
5. R.O. Duda, P.E. Hart, and D.G. Stork, “Pattern Classification”, John Wiley and Sons.
6. Vladimir N. Vapnik, “Statistical Learning Theory”, John Wiley and Sons.

MCA-ES2: LAB- Data Mining & Machine Learning using Python

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: The Lab course is designed to make the students understand different Data sets in implementing the machine learning algorithms utilizing Python.

MCA-ES3: Computer Networks

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The main emphasis of this course is on the organization and management of local area networks (LANs)by making the students familiar with the idea ofcomputer network organization and obtaining a theoretical understanding of data communication andcomputer networks

UNIT-I

Introduction To Computer Networks: Definition of a Computer Network, The OSI Reference Model, The TCP/IP Reference Model, Protocols and Hardware involved in the OSI model, Comparison of the OSI & the TCP/IP.

Application Layer: Domain name space, DNS in internet, electronic mail, FTP, WWW, HTTP, SNMP, multimedia, network security

UNIT-II

Physical Layer: Introduction: Network topologies; Linear Bus Topology, Ring Topology, Star Topology, Hierarchical or Tree Topology, Topology Comparison, Considerations when choosing a Topology: Switching; Circuit switching, Message switching, Packet switching.

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

UNIT-III

Data Link Layer: Introduction; Goal of DLL: Design issues of DLL; Services provided to the Network layer, Framing, Error control, Flow control, ARQ strategies: Stop-and-Wait, RTT estimation, sliding window, Go-Back-N retransmission, Error Detection and correction: Parity bits, Single bit error correction or (n, m), Error Detection or Cyclic Redundant Code (CRC): Data Link layer protocols; Transmission control protocols, HDLC.

Unit-IV

Network Layer: Introduction: Design issues of Network layer; Nature of the service provided, Internetworking: Principles of Routing; Types of routing algorithms, Properties of routing algorithms, Optimality principle: Routing algorithms; Shortest path algorithm, Flooding, Distance vector routing, Hierarchical routing, Link state routing, Congestion: Factors of congestion, Comparison of flow control and congestion control, General principles of congestion control, Closed loop solution: IP protocol (IPV4).

Transport Layer: Introduction: Services of Transport layer; Service primitives: Connection establishment: Connection Release: Transport Protocols; TCP protocol, UDP protocol

Text Books:

1. Behrouz A. Forouzan, “Data Communications and Networking”, Fourth Edition, Tata McGraw Hill.

Reference Books:

1. Natalia Olifer& Victor Olifer, “Computer Networks”, John Wiley & Sons.
2. William Stallings, “Data & Computer Communication”, Pearson Education.
3. Andrew S. Tanenbaum, “Computer Networks”, Pearson Education.

MCA-ES4: Web Programming

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The main objective of this course is to provide the conceptual knowledge of Web Programming using PHP to enable the students competent in Web designing to create dynamic websites.

UNIT-I

Introduction to PHP: how PHP script work, PHP syntax, write your first PHP program, embed PHP in html/html in PHP, PHP data type, variable in PHP, operator in PHP.

Control Structure: if statement, if.....else statement, if...if else statement, nested if statement, switch statement

Looping Structure: for loop, while loop, do...while loop, for each loop function.

UNIT-II

Function: introduction, syntax, user defined function, system defined function, parameterized function, date & time function, hash function, mail function

Array: syntax, associative array, numeric array, multi-dimensional array.

String matching with regular expression: creating and accessing string, searching & replacing string, formatting string, string related library function, what is regular expression, pattern matching in PHP, replacing text, splitting a string with a Regular Expression?

UNIT-III

Objects: Creating classes and object in PHP, working with methods, overloading, inheritance, constructor and destructor.

Handling HTML form with PHP, Preserving state with query strings, cookies & sessions.

Working with file and directories: Understanding file & directory, Opening and closing a file, Reading, writing, coping, renaming and deleting a file, working with directories, Building a text editor

UNIT-IV

Generating images with PHP: Basics of computer graphics, creating images, manipulating images, using text in images.

Database access using PHP and MySQL: Connecting to MySQL from PHP, Retrieving data from MySQL with PHP, Manipulating MySQL data with PHP.

Text Book:

1. Matt Doyale ,“Beginning PHP 5.3”, Wiley India.

Reference Books:

1. Larry Ulman ,“PHP and MySQL5”, Pearson.
2. Robert Sebesta,”Programming with World Wide Web”, Pearson.
3. John Duckett, “Beginning with HTML, XHTML, CSS and Javascript”, Wiley- Wrox.

MCA-ES5: LAB-Web Programming

Credits: 2 **L T P Total**

0 0 4 4

Course Objective: The main objective of this course is to provide the practical knowledge of Web Programming using PHP to enable the students competent in Web designing to create dynamic websites.

MCA-ES6: Java Programming

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course objective is to understand fundamentals of object-oriented programming in Java including classes, methods, inheritance, packages, interfaces, multithreading, exception handling. The course will also provide introduction to some advanced topics in java like applet, collections and swing.

UNIT-1

Object oriented programming, features of java, general structure of java program, sample program, lexical issues, data types, variables, type conversion and casting, arrays & strings, operators and expressions, controls statements.

String handling: String class, String class constructors, String class methods,StringBuffer class,StringBuffer class constructors, StringBuffer class methods.

UNIT-II

Class fundamentals & objects, Methods, constructors, this keyword, garbage collection, overloading methods & constructors, using object as arguments, returning objects, recursion, nested and inner classes, inheritance, using super, method overriding, dynamic method dispatch, using abstract classes, using final with inheritance.

Interfaces: Defining interfaces, extending interfaces, implementing interfaces, accessing interface variables.

UNIT-III

Packages: Introduction, java API packages, Using system packages, naming conventions, creating packages, accessing a package, using a package, adding a class to a package.

Multithreading: Introduction, crating threads, creating multiple threads, thread priorities, synchronization, in thread communication, suspending, resuming and stopping threads.

Exception handling: Introduction, exception types, uncaught exceptions, using try, catch, throw and throws, java‘s built in exceptions, creating own exception subclasses.

Applets programming: introduction, applet architecture, an applet Skelton, the HTML APPLET tag, passing parameters to applet.

UNIT-IV

Collections: Array List, Linked List, collections Methods, Stack, Sets, Maps.

Java Swings: Java Foundation Classes, Hierarchy of Java Swing classes, Swing components (Container: Window, Frame ,Dialog, Panel and Applet; JComponent: JLabel, JList, JTable, JComboBox, JSlider, JMenu, Abstract Button, JButton).

Text book:

1. Herbert Schildt, “The Complete Reference”, Eleventh Edition,Tata McGraw Hill.

Reference Books:

1. Cay S. Horstmann, Gary Cornell,” Core Java”, Pearson.
2. R. NageswaraRao, “Core Java an integrated approach”, Dreamtech Press.
3. James R. Levenick , “Simply JAVA :An Introduction to JAVA programming”, Firewall Media Publication, New Delhi.
4. E.Balaguruswamy,” Programming with Java”, Tata McGraw Hill.

MCA-ES7: LAB-Java Programming

Credits: 2

L	T	P	Total
0	0	4	4

Course Objectives: This Lab course will provide practicalunderstanding ofthe object-oriented programming concepts in Java such as classes, methods, inheritance, packages, interfaces, multithreading, exception handling, including the advanced topics in Java like applet, collections and swing.

MCA-ES8 : Cloud Computing Concepts

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: This course will enable the students to understand cloud computing concepts and enable them to design cloud based applications for distributed systems.

UNIT-I

Overview of Computing Paradigms: Recent Trends in Computing: Distributed Computing, Cluster Computing, Grid Computing, Utility Computing, Cloud Computing, Evolution of Cloud Computing: Migrating into a Cloud

Cloud Computing Basics: Cloud Computing Overview; Characteristics; Applications; Benefits; Limitations; Challenges, SOA; Cloud Computing Service Models: Infrastructure as a Service; Platform as a Service; Software as a Service, Cloud Computing Deployment Models: Private Cloud; Public Cloud; Community Cloud; Hybrid Cloud, Major Cloud Service providers.

UNIT-II

Virtualization Concepts: Overview of Virtualization Technologies, Types of Virtualization, Benefits of Virtualization, Hypervisors VM Provisioning & Migration: VM Lifecycle, VM Provisioning Process, VM Migration Techniques

Scheduling in Cloud: Overview of Scheduling problem, Different types of scheduling, Scheduling for independent and dependent tasks, Static vs. Dynamic scheduling, Optimization techniques for scheduling.

UNIT-III

Cloud Storage: Overview; Storage as a Service, Benefits and Challenges, Storage Area Networks(SANs), Case Study of Amazon S3.

Cloud Security: Infrastructure Security: Network Level Security, Host Level Security and Application Level Security; Data Security: Data Security & Privacy Issues; Identity & Access Management; Legal Issues in Cloud Computing

UNIT-IV

Mobile Cloud Computing: Overview of Mobile Cloud Computing, Advantages, Challenges, Using Smartphones with the Cloud, Offloading techniques - their pros and cons, Mobile Cloud Security.

SLA Management: Overview of SLA, Types of SLA, SLA Life Cycle, SLA Management Process.

Text Books:

1. RajkumarBuyya, James Broberg, AndrzejGoscinski, " Cloud Computing: Principles and Paradigms", Wiley.
2. Barrie Sosinsky, "Cloud Computing Bible", Wiley.

Reference Books:

1. Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw Hill.
2. Judith Hurwitz, Robin Bloor, Marcia Kaufman,FernHalper, "Cloud Computing for Dummies", Wiley.
3. BorkoFurht, Armando Escalante ,"Handbook of Cloud Computing", Springer.

MCA-ES9: Internet of Things

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: In this course, various components of Internet of things such as Sensors, internetworking and cyber space are explored to the students to enable them to design and implement IoT circuits and solutions.

UNIT-I

Introduction to IoT: Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs.

UNIT-II

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

M2M vsIoT An Architectural Overview–Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. Reference Architecture and Reference Model of IoT

UNIT-III

IoT Reference Architecture- Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. Constraints affecting design in IoT world-Introduction, Technical design Constraints.

Domain specific applications of IoT: Home automation, Industry applications, Surveillance applications, Other IoT application.

UNIT-IV

Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT.

Text Books:

1. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-onApproach)”, First Edition, VPT
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, First Edition, Academic Press.

Reference Books:

1. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications.
2. CunoPfister, “Getting Started with the Internet of Things”, O’Reilly .

MCA-ES10: Digital Image Processing

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: The course is designed to introduce the concepts of image processing and basic analytical methods to be used in image processing. To familiarize students with image enhancement and restoration techniques, To explain different image compression techniques. To introduce segmentation and morphological processing techniques.

UNIT-I

Introduction: The role of Computer Vision, applications, successes, research issues; its relationship to natural vision, basic image properties. Digital image representation, fundamental steps in image processing, elements of digital image processing systems digitization, Display and recording devices.

UNIT-II

Digital Image fundamentals: A simple Image model. Sampling and quantization, Relationship between pixel, imaging geometry, image transformation, introduction to fourier transformation, Discrete fourier transformation, fast fourier transformation.

UNIT-III

Image Enhancement: Histogram processing, image subtraction, image averaging, smoothing filters, sharpening filters, enhancement in frequency domain, low pass filtering, high pass filtering.

UNIT-IV

Image Encoding & Segmentation: Segmentation, detection of discontinuation by point detection, line detection, edge detection. Edge linking & Boundary Detection: Local analysis, global by Hough transform & Global by graph theoretic techniques.

Image Representation and Description: Chain codes, polygonal approximation, signatures, boundary segments, boundary descriptors, regional descriptors, introduction to image understanding.Motion Tracking , Image differencing, Feature matching, Optic flow.

Text Book:

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Fourth Edition, Addison-Wesley.

Reference Book:

1. Anil K. Jain, "Fundamentals of digital image processing",Prentice Hall of India.

MCA-ES11: Ethical Hacking

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The course is designed to provide deep insights of cyber laws, Linux Security and Ethical Hacking.

UNIT-I

Introduction to Ethical Hacking, Cyber Laws and Standards, Spoofing, Foot printing and Reconnaissance, System Hacking, Trojans, Backdoors, Viruses, and Worms.

UNIT-II

Scanning Networks, Enumeration, Metasploit, Denial of Service, Session Hijacking, Sniffing, Phishing, Social Engineering, Security of Email account.

UNIT-III

Protecting Web servers from Hacking, Protecting Web Applications from Hacking, Protecting Mobile Platforms from Hacking, Evading IDS, Firewalls, and Honeypots, SQL Injection and Buffer Overflows.

UNIT-IV

Image Encoding & Segmentation: Segmentation, detection of discontinuation by point detection, line detection, edge detection. Edge linking & Boundary Detection: Local analysis, global by Hough transform & Global by graph theoretic techniques.
Linux Security, Secure Wireless Networks, Wi-Fi Security, Cloud Computing Security, IoT Security.

Text Book:

1. Sean Oriyano, "CEH V9: Certified Ethical Hacker Version 9 Study Guide", Wiley.

Reference Book:

1. Manthan Desai, "Hacking For Beginners", HT Hacking Tech.

MCA-ES12: Mobile Computing

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed

- To study the regulatory environment in which the wireless industry operates.
- To understand functions and operational principles of the various components of wireless networks, and to learn the setup and management of connections.
- To understand the concept of frequency reuse, and be able to apply it in design of simple frequency reuse patterns.
- To become familiar with some of the existing and emerging wireless standards.

Unit-I:

Wireless Networks: Introduction, Applications, History of Wireless Communication. Electromagnetic Spectrum, Radio Propagation Mechanisms, Characteristics of the Wireless Channel, Modulation Techniques, Multiple Access Techniques, Voice Coding, Error Control.
Wireless LANS and PANS: Introduction, Fundamentals of WLANs, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, HomeRF.

Unit-II:

Wireless WANS AND MANS: Introduction, Cellular Concept, Cellular Architecture, The First-Generation Cellular Systems, The Second-Generation Cellular Systems, The Third-Generation Cellular Systems, Wireless in Local Loop, Wireless ATM.

Unit-III:

Wireless Internet: Introduction, Mobile network Layer, Mobile IP, Route optimization, Handoffs, IPv6 Advancements, IP for Wireless domains, Security in Mobile IP, Mobile Transport layer, TCP in Wireless Domain, Optimizing Web over Wireless.

Unit-IV:

Ad Hoc Wireless Networks: Introduction. Issues in Ad Hoc Wireless Networks. Ad Hoc Wireless Internet. MAC Protocols for Ad Hoc Wireless Networks, Routing Protocols for Ad Hoc Wireless Networks, Security in Ad hoc wireless networks, Recent advances in Wireless Networks.

Text Book:

1. C-Siva Ram Murthy & B S Majo, “Adhoc Wireless Networks, Architectures Protocols” , Pearson.
2. Jochen Schiller “Mobile Communications”, Pearson.

Reference Book:

1. William C.Y Lee, “Mobile Communication Design Fundamental”, John Wiley.
2. William Stalling, “Wireless Communication and Network”, Pearson Education.

MCA-ES13: Modeling and Simulation

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The objectives of this course are-

- To review the basic simulation methods and principles applied to the architecting and engineering of complex systems.
- To describe the art and science of the modeling process, especially in complex systems, and provide access to the tools and executable models.

UNIT-I

Physical Modeling: Concept of system and environment, continuous and discrete system, linear and nonlinear system, stochastic activities, static and dynamic models, principles used in modeling, Basic simulation modeling, Role of simulation in model evaluation and studies, Advantages and Disadvantages of simulation. Modeling of systems, Iconic, analog and Mathematical Modeling.

UNIT-II

Computer Based System Simulation: Technique of simulation, Monte Carlo method, experimental nature of simulation, numerical computation techniques, calumnious system models, analog and hybrid simulation, feedback systems, Buildings simulation models- Financial Model for an office Building, Sensitivity analysis for office building Model.

UNIT-III

System Dynamics Modeling: Identification of problem situation, Exponential Growth Model and Decay Model, Logistic Curve, System Dynamic Diagrams, Simulation of System Dynamics- Waiting Times in Single Server Queuing System.

UNIT-IV

Probability Concepts In Simulation: Stochastic variables, discrete and continuous probability functions, Distributed Random numbers, generation of random numbers Uniform and Non Uniform Random numbers, variance reduction techniques-Introduction, Common Random numbers-Rationale, Applicability and Synchronization.

Simulation Software: Introduction, Comparison of Simulation Package with Programming Languages, Classification of Simulation Software, Desirable Software features, Basics of General Purpose Simulation Package-ARENA, Study of SIMULA.

Text Books:

1. G.Gorden, “System simulation”,Second Edition ,Prentice Hall of India.
2. Averill M Law “ SimulationModeling and Analysis”, Fifth Edition, Tata McGraw Hill.

Reference Books:

1. Seila, Ceric and Tadikamalla“ Applied Simulation Modeling”, Cengage Learning.
2. Severance, ” System Modelling & Simulation : An Introduction”, John Wiley.
3. Allan Carrie, "Simulation and Modeling" Tata McGraw Hill.

MCA-ES14: Human Computer Interface

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: This Course contains the following objectives:

- To describe and apply the fundamental theories and methodologies from the HCI domain.
- To design, implement and evaluate the effective and usable computer interfaces.

UNIT-I

Introduction to Human Computer Interface: Importance of user interface, process of Interaction Design, History of Human Computer Interface, Good Design: Importance, Benefits.Principles of User Interface Design. Human: I/O channels, Memory, Reasoning and problemsolving. Interaction: Models, frameworks, Ergonomics, styles, elements, interactivity, Paradigms.

UNIT-II

Design & Software Process: Interactive Design basics, process, scenarios, navigation, screen design, Iteration andprototyping. HCI in software process, software life cycle, usability engineering, Prototyping inpractice, design rationale. Design rules, principles, standards, guidelines, rules. EvaluationTechniques, Universal Design.

Prototypes: Hand Sketches and Scenarios, Interactive Paper Prototypes, ProgramFacades, Prototype-Oriented Languages, Comparisons of Prototypes.

UNIT-III

Models and Theories: Cognitive models, Socio-Organizational issues and stake holder requirements, Communication andcollaboration models, Multimedia and WWW.Information Search and Visualization: Database query, Phase search in documents, Multimedia document searches, Information visualization, Advanced filtering, Hypertext, Web technology, Static web content and dynamic web content.

UNIT-IV

Mobile Ecosystem: Platforms, Application frameworks, Types of Mobile Applications: Widgets,Applications, Games, Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of MobileDesign, Tools.

Web Interfaces: Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays andVirtual Pages, Process Flow. Case Studies.

Text Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, Third Edition, Pearson Education.
2. Brian Fling, “Mobile Design and Development”, First Edition , O’Reilly.
3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O’Reilly.

Reference Book:

1. Sutcliffe, Alistair, “Human-computer interface design”, Macmillan International Higher Education.

MCA-EO1: Soft Computing

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The course is designed to provide an introduction to the basic principles, techniques, and applications of soft computing.

UNIT-I

Introduction, Soft Computing concept explanation, brief description of separate theories.Neural Networks and Probabilistic Reasoning; Biological and artificial neuron, neural networks and their classification.Adaline, Perceptron, Madaline and BP (Back Propagation) neural networks. Adaptive feed forward multilayer networks. Algorithms: Marchand, Upstart, Cascade correlation, Tilling. RBF and RCE neural networks. Topologic organized neural network, competitive learning, Kohonen maps.

UNIT-II

CPN , LVQ, ART, SDM and Neocognitron neural networks. Neural networks as associative memories(Hopfield, BAM). Solving optimization problems using neural networks. Stochastic neural networks, Boltzmann machine.

UNIT-III

Fundamentals of fuzzy sets and fuzzy logic theory, fuzzy inference principle.Examples of use of fuzzy logic in control of real-world systems.

UNIT-IV

Fundamentals of genetic programming, examples of its using in practice. Genetic Algorithms Applications of GA's – Class.

Text Books:

1. Cordón, O., Herrera, F., Hoffman, F., Magdalena, L," Genetic Fuzzy systems", World Scientific Publishing Co. Pte. Ltd
2. Kecman, V."Learning and Soft Computing", The MIT Press.

Reference Books:

1. Mehrotra, K., Mohan, C., K., Ranka, S. "Elements of Artificial Neural Networks", The MIT Press.
2. Munakata, T, "Fundamentals of the New Artificial Intelligence" ,Springer.

MCA-EO2: Bioinformatics

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives: The unprecedented increase in the amount of available biological data ranging from protein sequences to biomedical images have rendered the use of computers and computational techniques for analyzing and managing the biological data inevitable. This course aims to provide students with the basics of bioinformatics algorithms that have been applied over various types of biological data.

UNIT-I

Introduction to Bioinformatics: What is a Database, Types of Databases, Biological Databases, Pitfalls of Biological Databases, Information Retrieval from Biological Databases.

UNIT-II

Sequences: Problem statement, Edit distance and substitution matrices, HMMs and pairwise HMMs, Global and local alignments, Spliced alignment, Space-efficient sequence alignment, Multiple alignment, Database searching tools, Sequence by hybridization, Profile HMMs.

UNIT-III

Structures: Protein structure alignment, Protein Structure Prediction: Methods for predicting the secondary and tertiary structure of proteins. Techniques: neural networks, SVMs, genetic algorithms and stochastic global optimization.

UNIT-IV

Transcriptomics: Methods for analysing gene expression and microarray data. Techniques: clustering, SVMs. Agent-based Genome Analysis: Automation of genome analysis using intelligent software agents. Drug Discovery Informatics: Approaches to drug discovery using bioinformatics techniques.

Text Books:

1. Compeau, P. and Pevzner, P.A., "Bioinformatics Algorithms: An Active Learning Approach", Active Learning Publishers.
2. Jones, N.C., Pevzner, P.A. and Pevzner, P., "An Introduction to Bioinformatics Algorithms", MIT press.

Reference Books:

1. Krawetz, S.A. and Womble, D.D., "Introduction to Bioinformatics: A Theoretical and Practical Approach", Springer Science & Business Media.
2. Lesk, A., "Introduction to bioinformatics", Oxford University Press.
3. Mandoiu, I. and Zelikovsky, A., "Bioinformatics Algorithms: Techniques and Applications", John Wiley & Sons.

MCA-EO3: Android App Development

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: This course aims to provide the students with a detailed knowledge on Android platform. This course covers Android programming from fundamentals to building mobile applications for smart gadgets. Objectives On successful completion of the course, the students should have acquired mobile application development skills with Android.

UNIT-I

Android: Introduction, History of Android, Android Features, OSS, OHA, Android Versions and compatibility, Android devices, Prerequisites to learn Android, Android Architecture: Android Stack, Linux Kernel, Android Runtime, Dalvik VM, Application Framework, Android emulator, Android applications.

UNIT-II

Android development: Java, Android Studio, Eclipse, Virtualization, APIs and Android tools, Debugging with DDMS, Android File system, Working with emulator and smart devices, A BasicAndroid Application, Deployment.

UNIT-III

Android Services: Simple services, Binding and Querying the service, Executing services. Broadcast Receivers: Creating and managing receivers, Receiver intents, ordered broadcasts. Content Providers: Creating and using content providers, Content resolver. Working with databases: SQLite, coding for SQLite using Android, Sample database applications, Data analysis.

UNIT-IV

Android User Interface: Android Layouts, Attributes, Layout styles, Linear, Relative, Table, Grid, Frame. Menus: Option menu, context menu, pop-up menu. Lists and Notifications: creation and display. Input Controls: Buttons, Text, Fields, Checkboxes, alert, dialogs, Spinners, progress bar.

Text Books:

1. Barry Burd, "Android Application Development – All-in-one for Dummies", Second Edition,Wiley India.
2. Lauren Darcey, Shane Conder, "Sams Teach Yourself Android Application Development in 24 hours", Second Edition, Pearson.

Reference Book:

1. Paul Deitel, Harvey Deitel, Alexander Wald, " Android 6 for Programmers – An App-driven Approach".

MCA-EO4: Natural Language Processing and Speech Recognition

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: The main objective of this course is to introduce the fundamental concepts and ideas innatural language processing (NLP), and to get them up to speed with current research in the area. Itdevelops an in-depth understanding of both the algorithms available for the processing of linguisticinformation and the underlying computational properties of natural languages.

UNIT-I

Introduction:Overview of NLP, Statistical machine translation, Language models and their role in speechprocessing, NLP phases, Morphology and Finite State transducers, Computational Phonology and Pronunciation Modelling, Probabilistic models of pronunciation and spelling,Ngram Models of syntax, Hidden markov models and Speech recognition.

UNIT-II

Parts-of-speech Tagging: Basic concepts, Tagset, Early approaches, Rule based and TBL, POStagging using HMM, Introduction to POS Tagging using Neural Model.

Statisticalestimation and smoothing for language models:Statistical Machine Translation (MT), AlignmentModelsSmoothing,Smoothing absolute discounting.

UNIT-III

Introduction to supervised machine, learning methods: Naïve Bayes (NB), classifiers for entityclassification, Maximum Entropy Classifiers, Corpora and other resources, Maximum Entropy SequenceClassifiers, IE and text mining, Maximum entropy sequence models.

Parsing:Top down and bottom up parsing, treebank, Syntactic parsing, CKY parsing, Statistical Parsing basics,Probabilistic Context Free Grammar (PCFG), Probabilistic CKYParsing of PCFGs.

UNIT-IV

Semantics: Vector Semantics, Words and Vector; Measuring Similarity; Semantics with dense vectors, SVD and Latent Semantic Analysis,Embeddings from prediction, Skip-gram and CBOW, Concept of Word Sense, Introduction to WordNet.

SpeechRecognition: Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabularycontinuous speech recognition system acoustics, context dependent subword units, Applications and present status.

Speech Synthesis:Text-to-Speech Synthesis:Concatenativeand waveform synthesis methods, sub word units for TTS, intelligibility and naturalness role of prosody,Applications and present status.

Text Books:

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing,Computational Linguistics and Speech Recognition”, Second Edition, Prentice Hall of India.
2. Christopher D. Manning and HinrichSchütze, “Foundations of Statistical Natural Language Processing” MIT Press.

Reference Book:

1. James Allen, “Natural Language Understanding”, Benjamin/Cummings.
2. Frederick Jelinek, “Statistical Methods for Speech Recognition”, MIT Press.

MCA-E05: Cyber Security

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The main objective of this course is to understand the different types of malware and security breaches and develop effective prevention methods which will increase overall security. They will also understand the basic concepts associated with Cyber Security and what are the needs to stay secure.

UNIT-I

Cyber security Fundamentals: Introduction to Cyberspace, Cyber security, need of cyber security.Types of Malware:Worms, Viruses, Spyware, Trojans.Cyber Security Breaches:Phishing, Identity Theft, Harassment etc.

UNIT-II

Types of Cyber Attacks: Password Attacks, Denial of Service Attacks, Passive Attack, Penetration Testing.

Prevention Tips: Craft a Strong Password, Two-Step Verification, Download with care, Question Legitimacy of Websites.

UNIT-III

Cryptography and Network Security: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography.

UNIT-IV

Cyber Forensics: Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.

Text Book:

1. William Stallings,"Cryptography and Network Security", Seventh Edition, Pearson.
2. " Introduction to Cyber Security", http://uou.ac.in/foundation-course

MCA-EO6: Cryptography and Network Security

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: The prime aim of this course is to provide the conceptual knowledge of cryptography & network security. This course will also enable the students to learn some tools and techniquesto secure the information of the real world.

UNIT-I

Classical Encryption Techniques: Symmetric Cipher Model, substitution Techniques, tranposition techniques, rotor machines, steganography.

Block Ciphers and the Data Encyption standards: Simplified DES, block cipher principles, the data encryption standard, the strength of DES, differential and linear cryptanalysis, blockcipher design principles, block cipher modes of operation.

Advanced Encryption Standard: Evaluation Criteria for AES, the AES cipher.

Contemporary symmetric ciphers: Triple DES, blowfish.

Confidentiality using symmetric encryption: Placement of Encryption function, traffic confidentiality, key distribution, and random number generation.

UNIT-II

Public key Encryption and Hash functions: Prime numbers, Fermat's and Euler's Theorems, testing for primality, the chinese remainder theorem, discrete logarithms.

Public key cryptography and RSA: Principles of Public key cryptosystems, the RSA algorithm.

Key Management other public key cryptosystems: Key management, diffie-Hallman key exchange, elliptic curve arithmetic, and elliptic curve cryptography.

UNIT-III

Message authentication and Hash function: Authentication

Requirements, Authentication functions, message authentication codes, hash functions, security of hash function and MACs.

Hash Algorithms: MD5 message digest algorithm, secure Hash algorithm, ripemd-160, HMAC.

Digital Signature and Authentication protocols: Digital signatures, Authentication protocols, and digital signature standard.

Authentication Applications: Kerberos, X.509 Authentication service.

UNIT-IV

Electronic Mail Security: Pretty Good privacy, S/MIME.

IP Security: IP Security overview, IP security architecture,authentication header, encapsulating security payload, combining security associations, key management.

Web Security: Web security considerations, Secure sockets layer and transport layer security, secure electronic transaction.

System security: Intruders, intrusion detection, and password management. Malicious software: Viruses and related threats, virus countermeasures. Firewalls: Firewall Design Principles, Trusted systems.

Text Books:

1. William Stallings "Cryptography and Network Security", Third Edition, Pearson.
2. W.Stallings, " Network security Essential : Applications & Standards", Sixth Edition, Pearson.

Reference Books:

1. Eric Maiwald" NetworkSecurity: A Preginner's Guide", Tata McGraw Hill.
2. Roberta Bragg, Mark Rhodes, Ousley& Keith Strassberg, "Network Security : The Complete Reference", Tata McGraw Hill.
3. Eric Maiwald, "Fundamentals of Network Security", Wiley India.

MCA-EO7 :Fundamentals of E-Governance, E-Business & E-Learning

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives:

- The objective of this course is to understand the fundamentals and applicability of Information and Communication Technology (ICT) in various fields such as Governance, Learning and Business.
- The course also provides introduction and detailed study of E Governance, E learning and E Business.
- The recent trends and developments in the fields of E Governance, E learning and E Business will be demonstrated to the students.

UNIT-I

E-Governance: Introduction, E-Governance & E-Government, Need for e-Governance, Measures, work plan and infrastructure for E-Governance, Scope,(types) of e-Governance, Objectives of e-Governance, Evolution of e-Governance, Phases of e-Governance, e-Governance Project Development Lifecycle, Software Development Lifecycle vs e-Governance Lifecycle. E Governance: international scenario, Challenges in e-Governance.

UNIT-II

E-Governance: Strategies for e-Governance in India, National e-Governance Plan, Mission Mode Projects conceptualized under NeGP: Central Government Category, State Government Category, Integrated Services Category, Components of NeGP: The Institutional Structure, The common Support Infrastructure, The Mission Mode Projects, Recent Initiatives in e-Governance in India: Government to citizen (G2C) initiatives, Government to business (G2B) initiatives, Government to Government (G2G) initiatives.

UNIT-III

E-Business: Introduction, Global Online Retail Spending: Statistics and Trends, E-business & E-commerce, E-business environment, E-marketplaces, E-business markets, Technical ingredients of e-business, Electronic business infrastructure, Potential benefits of E-business, Basic E-Commerce Strategies, E-business Types & Categories, Phases of e-Business Development, E-business technology, Technology Issues in Internet Commerce, E-commerce Security, M-Commerce.

UNIT-IV

E-Learning: what is learning, why e-learning, concept and definition, e-leaning basics, types of e-learning, computer based learning, internet based learning, completely online mode, the use of e-learning in education, advantages and disadvantages of e-learning, e-learning model-ADDIE model, MERRILL's principles of Instruction (MPI),GAGNE's nine events of instruction, e-learning components, e-learning content, E-Tutoring, E-Coaching, E-Mentoring, collaborative learning, virtual classroom, e-learning in India.

Text Books:

1. ParagKulkarni, SunitaJahirabadkar, PradipChande, "E Business",Oxford University Press
2. Dave Chaffey, "E-Business and E-Commerce Management: Strategy, Implementation and Practice", Pearson.

Reference Book:

1. Srinivasa H. Rajeshwari ,"E-Governance in India Concepts and Cases", AP Lambert Academic Publishing

MCA-C08: Artificial Intelligence

Credits: 4

L	T	P	Total
3	1	0	4

Course Objectives:

- To impart knowledge about Artificial Intelligence.
- To give understanding of the main abstractions and reasoning for intelligent systems.
- To enable the students to understand the basic principles of Artificial Intelligence in various applications

UNIT-I

Introduction to AI- Definitions, Goals of AI, AI Approaches, AI Techniques, Branches of AI, Applications of AI.

Problem Solving, Search and Control Strategies: General problem solving, production systems, control strategies forward and backward chaining,exhaustive searches depth first breadth first search.

Heuristic Search Techniques: Hill climbing, Branch and bound technique, Best first search & A* algorithm, Problemreduction & AO* algorithm.

UNIT-II

Game Playing - Overview, Mini-Max search procedure, Game playing with Mini-Max, Alpha-Beta pruning.

Learning Systems-Rote learning, learning from example: Induction, Explanation Based Learning (EBL), Discovery, Clustering, Analogy, Neural net and genetic Learning, Reinforcement learning.

Knowledge Representations: First order predicate calculus, skolemization, resolution principle & unification, interface mechanisms,horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency.

UNIT-III

Natural Language Processing - Introduction, Syntactic processing , Semantic and Pragmatic analysis.

Pattern Recognition - Introduction, Recognition and Classification Process, Learning Classification Pattern, Recognizing and Understanding Speech.

UNIT-IV

Expert Systems - Knowledge acquisition, Knowledge base, Working memory, Inference engine, Expert system shells, Explanation, Application of expert systems.

Fundamentals of Neural Networks -Research history, Model of artificial neuron, Neural networks architectures, Learning methods in neural networks, Single-layer neural network system, Applications of neural networks.

Fundamentals of Genetic Algorithms - Search optimization algorithm, Evolutionary algorithm, Encoding, Operators of genetic algorithm, Basic genetic algorithm.

Common Sense - Introduction, Formalization of common sense reasoning, Physical world, Common sense ontologies, Memory organization.

Text Books:

1. Norvig, P. Russel, and S. ”Artificial Intelligence. A modern approach”, Fourth Edition, Prentice Hall of India.

Reference Books:

1. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Prentice Hall of India.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”,Tata McGraw Hill.
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson.

MCA-EO9: Distributed Databases

Credits: 4

L	T	P	Total
3	1	0	4

Course Objective: This course will acquaint the students with the basics of Distributed databases, architectures of databases, query processing, various query optimization algorithms, transaction management & various approaches to control concurrency in distributed databases.

UNIT-I

Introduction: Distributed Data Processing, Distributed Database Systems, Promises of DDBSs, Complicating factors, Problem areas.

Distributed DBMS Architecture: Models-Autonomy, Distribution, Heterogeneity DDBMS Architecture – Client/Server, Peer to peer, MDBS.

UNIT-II

Data Distribution Alternatives: Design Alternatives–localized data, distributed data Fragmentation– Vertical, Horizontal (primary & derived), hybrid, general guidelines, correctness rules Distribution transparency–location, fragmentation, replication Impact of distribution on user queries–No Global Data Dictionary(GDD), GDD containing location information, Example on fragmentation.

Semantic Data Control: View Management, Authentication –database authentication, OS authentication, Access Rights, Semantic Integrity Control –Centralized & Distributed, Cost of enforcing semantic integrity.

UNIT-III

Query Processing: Query Processing Problem, Layers of Query ProcessingQuery Processing in Centralized Systems –Parsing & Translation, Optimization, Code generation, ExampleQuery Processing in Distributed Systems –Mapping global query to local, Optimization.

UNIT-IV

Distributed Transaction Management & Concurrency Control: Transaction management, Concurrency Control techniques, Distributed Deadlock–Detection, Prevention, Avoidance, and Recovery.

Text Books:

1. Ozsu, “Principles of Distributed Database Systems”, Third Edition, Pearson.
2. Rahimi&Haug, “Distributed Database Mangement Systems”, Wiley.

Reference Books:

1. Chanda Ray, “Distributed Database Systems”, Pearson.
2. Sachin Deshpande, “Distributed Databases”, Dreamtech.
3. Ceri ,Pelagatti, “Distributed Databases Principles and Systems”, Tata McGrahHill.
4. C.J. Date, “An Introduction to Database System, Vol I& II”, Addition Wesley.
5. Elmasari ,Navathe, “Fundamentals of Data Base Systems”, Addition Wesley.

MCA-HM1:Online Meeting and Web Conferencing Tools

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: To learn the usage of various online meeting and web conferencing tools.

UNIT-I

Introduction to Online Meetings: Online Meeting, host an Online Meeting, Advantages and Disadvantages of Online Meetings, Difference between Online Meeting and Online Events.

UNIT-II

Choosing the right tools and platform for Online Meetings, Study of Various Online Meeting tools and their usage.

UNIT-III

Introduction to Web conferencing: Web Conferencing, Web Conferencing users, Web Conferencing Working, Importance of web Conferencing in an Online Meeting, Tools Used for web Conferencing.

UNIT-IV

Study of various web conferencing tools: Zoom, ClickMeeting,GoToMeeting, Lifesize, Cisco Webex Meetings, BlueJeans Meetings, Skype and GoogleMeet.

Text Book:

1. Sue Spielman and Liz Winfeld arms, “The Web Conferencing”, Tata McGraw Hill.

Reference Book:

1. Firestone, Scott, ThiyaRamalingam, and Steve Fry, “Voice and Video Conferencing Fundamentals” Cisco Systems.

MCA-HM2:Google Tools

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: To learn the usage of various google tools.

UNIT-I

Google Tools For all-1: Android Auto, Android OS,Android TV,Calendar,Cardboard, Chrome, Chrome Web Store, Chrome book, Chrome cast, Connected Home,Contacts, Docs, Drive, Earth, Finance, Forms, Gboard, Gmail, Google Alerts, Google Assistant, Google Cast, Google Chat, Google Classroom, Google Cloud Print, Google Duo, Google Expeditions, Google Fi, Google Fit, Google Flights, Google Fonts.

UNIT-II

Google Tools For all-2: Google Groups, Google Meet, Google One, Google Pay, Google Photos, Google Play, Google Play Books, Google Play Games, Google Play Movies & TV, Google Play Music, Google Shopping, Google Street View, Hangouts, Keep, Maps, Messages, Nest Wifi, News, Pixel, Pixel Buds, Pixel book Go, Play Protect, Podcasts, Scholar, Search, Sheets,, Sites, Slides, Stadia, Tilt Brush, Translate, Voice, Waze, Wear OS by Google, YouTube, YouTube Kids, YouTube, YouTube TV.

UNIT-III

Google Tools For developers: App Testing, Cloud Computing, Devices, Engagement, Game Services, Growth, Maps + Location, Messaging + Notifications, Monetization, Monitoring, Payments, Sign in + Identity, Storage + Sync.

UNIT-IV

Google Tools For business: AdMob, AdSense, Analytics, Android, Blogger, Business Messages, Chrome Enterprise Data Studio, G Suite, Google Ads, Google Assistant, Google Cloud, Google Digital Garage, Google Domains, Google Enterprise Search, Google Manufacturer Center, Google Maps Platform, Google Marketing Platform, Google Merchant Center, Google My Business, Google Podcasts Manager, Google Shopping Campaigns, Google Trends, Google Web Designer, Optimize, Search Console, Shopping Actions, Surveys, Tag Manager,Waze Local.

Text Book:

1. Donna L. Baker,“How to Do Everything with Google Tool”, First Edition , Tata McGraw Hill.

MCA-HM3: Open Source Technologies

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: To learn various opensource technologies.

UNIT-I

Open source software: Features, advantages over proprietary software, examples, Freesoftware: concepts, features, Free software Vs Open Source software, Free software movements. Policies,GPL, Free OS, History and Features of Linux, Various flavours of Linux, Linux Kernel and Shell, GraphicalDesktops-GNOME, KDE, Linux File System and Directories.

UNIT-II

Apache Explained-Starting, Stopping and Restarting Apache-Modifying the Default Configuration -Securing Apache-Set User and Group -Consider Allowing Access to Local Documentation -Don't Allow public html Web sites-Apache control with .htaccess

UNIT-III

Open source database software: MySQL features MySQL data types: Numeric, date & time, string, Table creation in MySQL: insert, select, where clause, ordering the result ,like operator, Selecting Multiple tables: using join, using queries Modifying records: update command, replace command, delete command date & time functions in MySQL.

UNIT-IV

PHP: Introduction-General Syntactic Characteristics, PHP Scripting, Commenting your code, Primitives, Operations and Expressions, PHP Variables, Operations and Expressions Control Statement, Array, Functions, Basic Form Processing, File and Folder Access, Cookies, Sessions, Database Access with PHP

Text Books:

1. James Lee and Brent Ware ,"Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP", Dorling Kindersley(India) Pvt. Ltd, 2008.
2. Graham Glass, King Ablas, "Unix for Programmers and Users", Pearson Education

Reference Books:

1. RasmusLerdorfand Levin Tatroe, "Programming PHP", O'Reilly Publications.
2. Rem Card, Eric Dumas and Frank Mevel , "The Linux Kerne", Wiley.
3. SuchringJohn ,"MySQL Bible Steve", Wiley.

MCA-HM4: Research Ethics

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: To understand the philosophy of science and ethics, research integrity and publication ethics. To identify research misconduct and predatory publications.

UNIT-I

Introduction to philosophy: definition, nature and scope, concept, branches-Ethics: definition, moral philosophy, nature of moral judgements and reactions.

Ethics with respect to science and research -Intellectual honesty and research integrity -Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP) -Redundant Publications: duplicate and overlapping publications, salami slicing -Selective reporting and misrepresentation of data.

UNIT-II

Publication ethics: definition, introduction and importance -Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. -Conflicts of interest -Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types -Violation of publication ethics, authorship and contributor ship-Identification of publication misconduct, complaints and appeals -Predatory publisher and journals.

UNIT-III

Open access publications and initiatives -SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies -Software tool to identify predatory publications developed by SPPU -Journal finger / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer, Journal Suggester, etc

UNIT-IV

Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools.

Databases: Indexing databases, Citation databases: Web of Science, Scopus, etc

Research Metrics: Impact Factor of journal as per Journal Citations Report, SNIP, SJR, IPP, Cite Score - Metrics: h-index, g index, i10 Index, altmetrics.

Text Books:

1. K.S.Bordens and B.B. Abbott,“Research Design and Methods”, TataMcGraw Hill.
2. Paul Oliver , “The Student's Guide to Research Ethics”, Open University Press.

Reference Books:

1. Anderson B.H., Dursaton, and Poole M.,“Thesis and assignment writing”, Wiley.
2. KambadurMuralidhar, AmitGhosh Ashok Kumar Singhvi ,“Ethics in Science Education, Research and Governance”, Indian National Science Academy.
3. Nicholas H. Steneck, “Introduction to the Responsible Conduct of Research”, Office of Research Integrity.

MCA-HM5:IT Tools for Smart Work

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The main objective of this course is

- To impart knowledge of various tools, techniques and technologies that facilitates smart work.
- To make learns aware of various apps, websites that help them to handle their routine chores more efficiently.
- To help students to have knowledge of extending such tools and develop their own tools.

UNIT-I

Introduction of Learning, E-learning, need of e-learning, concept and definition, e-leaning basics, types of e-learning, computer based learning, internet based learning, completely online mode, the use of e-learning in education, advantages and disadvantages of e-learning, e-learning components, e-learning content, E-learning model-ADDIE model, MERRILL's principles of Instruction (MPI), virtual classroom, e-learning in India.

UNIT-II

E-learning Tools and Technologies: Communication Tools: E-mail, Instant Messaging (IM), Chat, Blogging, Collaboration Tools: Wiki, Social Bookmarking, Social Networking sites, Web Conferencing, Content Creation Tools/Authoring Tools: Adapt, Learning Activity Management System (LAMS), Delivery and Distribution Tools: Audio/Video streaming, Massive Open Online Course (MOOC), WebQuest, Learning Management System (LMS), Learning Content Management System (LCMS), E-learning Standards.

UNIT-III

IT tools for smart work in education: ePathsala, National Mission on Education through ICT (NME-ICT), epgpathsala, Youtube, National Program on Technology Enhanced Learning (NPTEL), education apps for India, IT tool for data mining, Big data analysis, IT tools for academic research.

UNIT-IV

IT tools for smart work in professional life: Search engine, best search engines of world, search engine optimization, search engine optimization tools, email, best email servers of world, Video conferencing, examples of best video conference apps, time management apps.

IT tools for smart work in personal life: Money saving tools, tools for productivity enhancement, tools for creative time saving, quick tools for everyday task, video calling apps, social media sites, Note taking tools, Lecturer capture and recording tools, drawing tools, presentation tools.

Text Books:

1. Hardy Bower," From Distance Education to E-Learning: Lessons Along the Way", Wiley.
2. HossenNajan," Distance Education and E Learning", Lambert Academic Publishing.

Reference Books:

1. Jiawei Han, MichelineKamber , Jian Pei Professor," Data Mining: Concepts and Techniques", The Morgan Kaufmann Series.

MCA-HM6:Personality Development & Job Orientation

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The main objective of this course is to provide knowledge of Presentation and Interview skills for job seeking.

UNIT-I

Presentation: Need and Importance of presentation, Types of Presentation, Parts of Presentation, Audience requirements, Rehearsals, Fear Overcome techniques, Pre-presentation preparation (On the day of Presentation), Question Handling during and after presentation. Presentation Tools: Types of Presentation tools, Importance and need of Presentation tools, Animation and other tools for presentation enhancement. Successful Presentation Secretes: Body Language, Positive Attitude, Eye contact, Anticipate the questions.

UNIT-II

Personality Development: Personality and its types, Attitude and its types, Attitude and Personality grooming techniques. Body Language: Body language and its reflection in Personality, Gesture and Posture, Confidence, Confidence building techniques. Group Discussion: GD and its types, Parts of GD (Initiation, Follow-up, Arguments and Conclusion), Role of listening and speaking, Do(s) and Don't(s) in GD, Pre-preparations for GD.

UNIT-III

Professional Resume writing: Resume, Parts of resume, Standard formats for professional resume, Questions based on resume, Do(s) and Don't(s) in resume writing. Profession Email drafting: Email,Parts of Email (Email-Address, Subject, CC, BCC and Text), Standard Email drafting, Attachments, Digital Signatures, Cover letter, Do(s) and Don't(s) in email drafting. Profession Letter drafting: Joining Letter(s), Letters to avail Casual Leave, Resignation Letter(s).

UNIT-IV

Interview and its types (HR, Technical, Telephonic, Online), Introduction and its types, Do(s) and Don't(s) in Introduction, Question based on your introduction, Analysis of SWOT, Hobbies and interests, Pre-preparations for interview, Do(s) and Don't(s) in Interview. Offer letter: Offer letters and its legal obligations, Things to check before signing any offer letter.

Text Books:

1. James Carole Martin, "Boost your Interview IQ", Tata McGraw Hill.
2. Barun K Mitra, "Personality Development and Soft Skills", Oxford University Press.

Reference Books:

1. Praveen Joe I.R., "Interview Skills and Group Discussions", Laxmi Publications.
2. S. Hundiwala, "Tricks and Techniques of Group Discussions", Arihant.
3. Laslie Rae, "The Sills of Interviewing", Jaico Publishing House.
4. PriyadarshiPatnaik, "Group Discussion and Interview Skills", Foundation Books.

MCA-HM7: IT and Cyber Laws in India

Credits: 2

L	T	P	Total
2	0	0	2

Course Objectives: The main objective of this course is to provide knowledge about Information Technology Act and Cyber Laws in India.

UNIT-I

Introduction –Cyberspace vs. Physical space; Scope of Cyber Laws.

Components of Cyber Laws in India -Information Technology Act, 2000& 2008 with recent amendments; Relevant provisions from Indian Penal Code, Indian Evidence Act, Bankers Book Evidence Act, Reserve Bank of India Act, etc.

Information Technology Act –a brief overview; Documents or transactions to which IT Act shall not be applicable; meaning of Computer, Computer system and Computer network; E –commerce; E –governance; Concept of Electronic Signature; Concept of Cyber contraventions and Cyber Offences.

UNIT-II

E-Contract –legal provisions regulating the e –contract with special reference to the provisions of Information Technology Act, 2000& 2008 with recent amendments.

Copyright issues in Cyberspace –relevant provisions under Copyright Act, 1957 regulating copyright issues in Cyberspace; Online Software Piracy –legal issues involved; Analysis of sufficiency of provisions of Copyright Act to deals with Online Software Piracy.

Trademark issues in Cyberspace –Domain Name; Cybersquatting as a form of Domain Name dispute; Case law.

UNIT-III

Concept of Cyber Crimes – 'Cyber Contraventions' & 'Cyber Offences' "Study Of Some Specific Kinds Of Cyber Crimes"

- 'Unauthorised Access' & 'Accessing the Protected System'-meaning with reference to an idea of Cyber Hacking; the legal issues involved.
- Introducing Computer contaminant or virus –legal issues involved.
- Denial of Access to Authorised Person –e.g.-Denial of Service (DoS) Attacks; E mail bombing –legal issues involved.
- Web jacking, Web Defacement & Salami Attacks -legal issues involved.
- Cyber Defamation –meaning; applicability of provisions of IPC; penal liabilities.

UNIT-IV

Concept of Cyber Crimes – 'Cyber Contraventions' & 'Cyber Offences' "Study Of Some Specific Kinds of Cyber Crimes"

- Phishing –a kind of online fraud; meaning; legal issues involved with reference to applicable provisions from Information Technology Act, 2000 & 2008 with recent amendments.
- Cyber Stalking -meaning; elements; applicable provisions from Information Technology Act, 2000 & 2008 with recent amendments.
- Cyber pornography –meaning; relevant provisions from Constitution of India; relevant provisions from IPC; relevant provisions from IT Act; reported case law.
- Cyber Terrorism –meaning; various modes of committing Cyber terrorism; applicable provisions from IT Act.

Text Books:

1. RohasNagpal, "Fundamentals of Cyber Law", ASCL Publication.
2. AnirudhRastogi, "Cyber Law Law of Infromation Technology and Internet", LexisNexis Publication.

Reference Books:

1. Karnika Seth, "Computers, Internet and New Technology Laws-A comprehensive reference work with special focus on developments in India", LexisNexis Publication.
2. Apar Gupta, "Commentary on Information Technology Act-With rules, regulations, Orders, Guidelines and reports etc.", LexisNexis Publication.

MCA-SD1: Basics of Web Designing

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: After learning the course the students should be able to develop Websites using HTML and CSS.

UNIT-I

Web Design Principles: Basic principles involved in developing a web site, Planning process, Five Golden rules of web designing , Designing navigation bar , Page design , Home Page Layout, Design Concept. Basics in Web Design: Brief History of Internet, World Wide Web, need of web site, Web Standards, Audience requirement.

UNIT-II

Introduction to HTML: What is HTML, HTML Documents, Basic structure of an HTML document,creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags.

UNIT-III

Elements of HTML: Introduction to elements of HTML, working with Text, working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls.

UNIT-IV

Introduction to Cascading Style Sheets, Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class 5.8 Box Model(Introduction, Border properties, Padding Properties, Margin properties), CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Color, Creating page Layout and Site Designs.

Text Books:

1. Kogent Learning Solutions Inc., “HTML 5 in simple steps”, Dreamtech Press.
2. Steven M. Schafer, “HTML, XHTML, and CSS Bible”, Fifth Edition, Wiley.

Reference Books:

1. Ian Pouncey and Richard York, “Beginning CSS: Cascading Style Sheets for Web Design”, Fifth Edition, Wiley.
2. John Duckett, “Beginning HTML, XHTML, CSS, and JavaScript”, Wiley.

MCA-SD2:Network Administration

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: To learn basic knowledge and skills needed to configure, manage and troubleshoot the network infrastructure

UNIT-I

Introduction to Computer Networks: OSI & TCP/IP Model
Physical Media: UTP, Fiber and Wireless Media
LAN Architecture: 10/100/1000/10G Ethernet

UNIT-II

Switching & Routing: Layer 2 & Layer 3 switching; Routing; VLAN; Cisco L2 and L3 Switch Configuration
IP Addressing: IPv4 Addressing and Sub-netting; DHCP Configuration; IPv6
Wireless LAN: 802.11 a/b/g/n/ac WiFi; Access Point and Wireless Router configuration
Internet Architecture: ISP Architecture; DNS Resolution; BGP Routing; Content Mirroring

UNIT-III

Internet Applications: DNS; Web; Mail; Proxy; NTP
Perimeter Security: Firewall; UTM
Network Security: LAN and WLAN Security issues; IP Spoofing; Dictionary Attack; DoS

UNIT-IV

DDoS Attack; Rogue/Misconfigured/External APs
Network Troubleshooting: ping, traceroute, nslookup, dig, tcpdump
Network Monitoring: SNMP; MRTG

Text Books:

1. CCENT/CCNA ICND1 (Official Exam Certification Guide, Second Edition)By – Wendell Odom.
2. Hunt, Craig, “TCP/IP network administration”, Vol. 2. " O'Reilly Media, Inc.

Reference Book:

1. Bergstra, Jan and Mark Burgess eds,”Handbook of network and system administration”, Elsevier.

MCA-SD3: NoSQL Databases

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: After learning the course the students should be able to use NOSQL databases like MongoDB and other similar databases.

UNIT-I

Define what a NoSQL database is, Why we need NoSQL and how is it different from traditional databases. Learn about the various tools available such as MongoDB, Cassandra, HBase etc. Explore the principles of NoSQL using elementary examples in MongoDB.

UNIT-II

Develop an understanding of the available data models: value stores, document databases, column-family stores, graph databases. Understand the basic storage architecture in a distributed environment – column oriented databases, nested maps of key/value pairs, Hbase distributed storage architecture.

UNIT-III

The set of essential operations – CRUD refers to Create, Read, Update and Delete operations in the context of a NoSQL database environment. Practical experience of CRUD operations for document databases using MongoDB.

UNIT-IV

Developing Web Application with NOSQL and NOSQL Administration: Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP,NOSQL Database Administration.

Text Books:

1. ShashankTiwari, “Professional NoSQL”, John Wiley and Sons.
2. Pramod J. Sadalage, Martin Fowler, “NoSQL Distilled: A Brief Guide tothe Emerging World of Polyglot Persistence”, Addison-Wesley.

MCA-SD4: Introduction to Latex

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: The objective of this course is to create understanding of the LaTeX.

UNIT-I

Installation of the software LaTeX, Understanding Latex compilation Basic Syntax, Writing equations, Matrix, Tables.

UNIT-II

Page Layout – Titles, Abstract Chapters, Sections, References, Equation references, citation.
List making environments Table of contents, generating new commands, Figure handling numbering, List of figures, List of tables, Generating index.

UNIT-III

Packages: Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tiles listing.

UNIT-IV

Classes: article, book, report, beamer, slides. IEEEtran.
Applications to: Writing Resume, Writing question paper, Writing articles/ research papers.

Text Book:

1. Leslie Lamport, "LaTeX: A Document Preparation System, Second Edition",AddisonWesley.

Reference Book:

1. Frank Mittelbach, Michel Goossens, Johannes Braams, DavidCarlisle, Chris Rowley, "LaTeX Companion", Addison Wesley.

MCA-SD5: Linux & Shell Programming

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: To introduce the Unix/Linux operating system and shell programming basics.

UNIT-I

Linux Startup and Shell Programming: User accounts, accessing linux-starting and shutting process, Logging in and Logging out, Command line, simple command, Unix file system: Linux/Unix files, inodes and structure and file system related commands, Shell as command processor, shell variables, creating command substitution, scripts, functions, conditionals, loops, customizing

UNIT-II

Regular Expressions and Filters: Introducing regular expressions patterns, syntax, character classes, quantifiers, introduction to egrep, sed, programming with awk and perl

UNIT-III

The C/C++ Environment: The C compiler, vi editor, compiler options, managing projects, memory management, use of makefiles, dependency calculations, memory management-dynamic and static memory, building and using static and dynamic libraries, using ldd, soname, dynamic loader, debugging with gdb.

vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating shell scripts. Basic system administration in Linux/Unix

UNIT-IV

Processes in LinuxProcesses, starting and stopping processes, initialization processes, rc and init files, job control-at, batch, cron, time, network files, security, privileges, authentication, password administration, archiving, Signals and signal handlers, Linux I/O system.

Text Books:

1. Sumitabha Das,"Your Unix-The Ultimate Guide", Tata McGrahHill.
2. Behrouz A. Forouzan, Richard F. Gilberg: "UNIX and Shell Programming", Brooks/Cole-Thomson Learning.

Reference Books:

1. A.Martelli, A. Ravenscroft, S. Holden, "Python in a Nutshell", O'Reiley.
2. Guido van Rossum, "An Introduction to Python", Network Theory Ltd
3. John Goerzen,"Linux Programming Bible, IDG Books", New Delhi
4. Neil Matthew, Richard Stones,"Beginning Linux Programming", Wrox-Shroff
5. Welsh & Kaufmann,"Running Linux", O'Reiley.
6. Pooja Sharma,"Programming in Python", BPB Publications.

MCA-SD6: Python Programming

Credits: 2

L	T	P	Total
2	0	0	2

Course Objective: After learning the course the students should learn how to design Python applications. Students also learn the basic concepts like how to use lists, tuples, dictionaries, objects, functions, packages, files, inheritance and exception handling in Python programs.

UNIT-I

Introduction to Python Programming Language: History and Origin of Python Language, Installing Python, setting up Path and Environment Variables, Running Python, First Python Program. Python Data Types & Input/ Output: Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command. Operators and Expressions: Operators in Python, Expressions, Precedence, Associativity of Operators, Non Associative Operators.

UNIT-II

Control Structures: Decision making statements, Python loops, Python control statements. Python Native. Data Types: Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).

UNIT-III

Python Functions: Functions, Advantages of Functions, Built-in Functions, User defined functions,Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables. Python Modules: Module definition, Need of modules, creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages.

UNIT-IV

Exception Handling: Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python. File Management in Python: Operations on files (opening, modes, attributes, encoding, closing), read() & write() methods, tell() & seek() methods, renaming & deleting files in Python, directories in Python. Classes and Objects: The concept of OOPS in Python, Designing classes, Creating objects, Accessing attributes, Editing class attributes, Built-in class attributes, Garbage collection, Destroying objects.

Text Books:

1. R. S. Salaria, “Programming in Python”, Khanna Publishing.
2. A.Martelli, A. Ravenscroft, S. Holden, “Python in a Nutshell”, O’Reiley.

Reference Books:

1. PoojaSharma,“Programming in Python”, BPB Publications.
2. R. NageswaraRao, “Core Python Programming”, Second Edition, Dreamtech.
3. Martin C. Brown, “Python - The complete Reference”, Tata McGraw Hill.

COURSE CONTENTS

MASTER OF COMPUTER APPLICATIONS (MCA)

DURATION - 03 YEARS

MCA-C09
Data Base Management System

UNIT-I

Basic Concepts: Entity, Relationship and its types, Components of a database, three level architecture of a DBMS, Database models.

File Organization: Serial, Sequential, Index Sequential and Direct file organization.

UNIT-II

Entity-Relationship Model: Entity Types, Entity Sets, Attributes & keys, Relationships, Relationships Types, Roles and Structural Constraints, Design issues, E-R Diagrams, Design of an E-R Database Schema, Reduction of an E-R Schema to Tables.

Relational Data Model: Relational model concepts, Integrity constraints over Relations, Relational Algebra – Basic Operations.

UNIT-III

SQL: DDL, DML, and DCL, views & Queries in SQL, Specifying Constraints & Indexes in SQL.

Relational Database Design: Functional Dependencies, Normalization.

UNIT-IV

Transaction Processing Concepts: Introduction to Transaction Processing, Transaction & System Concepts, Properties of Transaction, Schedules and Recoverability, Serializability of Schedules.

Concurrency Control Techniques: Locking Techniques, Timestamp ordering, Multiversion Techniques, Optimistic Techniques, Granularity of Data items.

Protection & Security.

Text Books:

- R. Elmasri and S. B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Addison Wesley.
- Ivan Bayross, "SQL, PL/SQL: The Programming Language of Oracle", Fourth Edition, BPB Publications.

Reference Books:

- R. Ramakrishnan and J. Gehrke, "Database Management Systems", Third Edition Tata McGraw Hill.
- A. Silberschatz, H. Korth and S. Sudarshan, "Database System Concepts",Sixth Edition, Tata McGraw Hill.

MCA-C10
DBMS Lab

UNIT-I
SQL: Data Types, Operators, DDL, DML, DCL, and TCL Commands.

UNIT-II
SQL: Integrity Constraints, Functions, Join, Indexes, Subqueries, Views.

UNIT-III
PL/SQL: Variables, Constants, Control Statements, Procedure, Functions.

UNIT-IV
PL/SQL: Cursor, Triggers, Exception Handling, Packages.

Text Books:

- Ivan Bayross, "SQL, PL/SQL: The Programming Language of Oracle", Fourth Edition, BPB Publications.

MCA-C11
Theory of Computations

UNIT-I

Introduction of Theory of Computation, Alphabet, Strings and their properties, Definition of an automation, Description of a finite Automation, Transition graph, transition function, Acceptability of a string by a Finite Automation, Deterministic and nondeterministic FSM'S, Equivalence of DFA and NDFA, Mealy & Moore machines, Minimization of finite automata.

UNIT-II

Chomsky classification of Languages, Languages and their relation, Languages and Automata, Regular sets, regular expression, Regular Grammars, Finite state machine and regular expression, Pumping lemma for regular sets, Application of pumping lemma, closure properties of regular sets.

Introduction to CFG, Context-free languages and Derivation Trees, Ambiguity in context-free Grammars, simplification of context-free Grammars, Normal forms for context-free Grammars – Chomsky normal form and Greiback normal form.

UNIT-III

Pushdown Automata: Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Pushdown automata and CFL, PDA corresponding to given CFG, CFG corresponding to a given PDA, Closure properties of CFL's.

UNIT-IV

Introduction, TM model Representation of Turing machines, languages acceptability of TM, Design of TM, Universal TM & Other modification, Church's hypothesis, Properties of recursive and Recursively enumerable languages.
Tractable and Untractable Problems: P, NP, NP complete and NP hard problems

Text Books:

- John E. Hopcroft, Jeffery Ullman,"Introduction to Automata theory, Langauges & computation" , Third Edition, Narosa Publishers.
- John C. Martin, "Introdution to Languages and Theory of Computation", Fourth Edition, Tata McGraw Hill.

Reference Books:

- K.L.P. Mishra & N. Chandrasekaran,"Theory of Computer Science", PHI Learning.
- Daniel I.A. Cohen,"Introduction to Computer Theory",Wiley India.
- Peter Linz, "An Introduction to Formal Languages and Automata", Jones & Bartlett.

MCA-C12
Analysis & Design of Algorithms

UNIT- I

Algorithms, designing algorithms, analyzing algorithms, asymptotic notations, Introduction to divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, merge sort, quick sort, strassen's matrix multiplication.

UNIT- II

Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum spanning trees, knapsack problem, job sequencing with deadlines, single source shortest path algorithm.

Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, multistage graph, reliability design, Floyd-Warshall algorithm.

UNIT- III

Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph coloring problem etc. Introduction to branch & bound method, examples of branch and bound method like travelling salesman problem etc. Meaning of lower bound theory and its use in solving algebraic problem.

UNIT- IV

Binary search trees, height balanced trees, 2-3 trees, B-trees, basic search and traversal techniques for trees and graphs (In order, preorder, postorder, DFS, BFS), NP-completeness.

Text Books:

- Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms", Second Edition, Universities Press.
- Cormen, T.H., Leiserson, C.E., Rivest, R.L. and Stein, C., "Introduction to Algorithms", Second Edition, Prentice Hall of India Pvt. Ltd.

Reference Books:

- A.V. Aho, J.E. Hopcroft and J.D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education.
- Sara Baase and Allen Van Gelder, "Computer Algorithms, Introduction to Design and Analysis", Third Edition, Pearson Education.
- S. Dasgupta, C. Papadimitriou & U. Vazirani, "Algorithms"; Tata McGraw Hill.
- Michael T Goodrich, Robarto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley India.

MCA-C13
Major Project

Project duration: Full semester (20 to 24 weeks)

Evaluation Criteria:

Type of Evaluation	Activity	Marks (%)
Internal Evaluation (25 %)	Based on the four interim progress reports	**25%**
External Evaluation (75%)	Project Report	**12.5%**
	Seminar/Presentation	**12.5%**
	Project Demo	**12.5%**
	Viva-Voce	**37.5%**
Total		**100%**

MCA-OC1
Compiler Design

UNIT-I

Introduction to Compiler & Lexical Analysis: Introduction of Compiler, Major data Structure in compiler, BOOT Strapping, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Lexical analysis: Input buffering , Specification & Recognition of Tokens, LEX.

UNIT-II

Syntax analysis: CFGs, Top down parsing, Brute force approach, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence parsing, LR parsers (SLR,LALR, LR).

UNIT-III

Syntax directed definitions: Construction of Syntax trees, Bottom up evaluation of S-attributed definition, L-attribute definition, Top down translation, Bottom Up evaluation of inherited attributes Recursive Evaluation, Analysis of Syntax directed definition.

Intermediate code generation: Declarations, Assignment statements, Boolean expressions, Case statements.

UNIT-IV

Type Checking & Run Time Environment: Type checking: type system, specification of simple type checker.

Run time Environment: storage organization, Storage allocation strategies, parameter passing, dynamic storage allocation, and Symbol table.

Introduction to Code optimization: sources of optimization of basic blocks, dead code elimination, loop optimization, Introduction to global data flow analysis, Code Improving transformations, peephole optimization.

Code Generation: Issues in the design of code generator, Basic block and flow graphs, Register allocation and assignment, DAG representation of basic blocks.

Text Books:

- A. V. Aho, M.S.Lam,R. Sethi, and J. D. Ullman, “Compilers: Principles, Techniques and Tools”, Second Edition, Pearson Education.
- V. Raghavan, “Principles of Compiler Design”, Tata McGraw Hill.

Reference Books:

- K.C. Louden, “Compiler Construction: Principles and Practice”, Cengage Learning
- A. C. Holub, “Compiler Design in C”, Prentice Hall Inc.

MCA-OC2
Artificial Intelligence

UNIT-I

Introduction to AI- Definitions, Goals of AI, AI Approaches, AI Techniques, Branches of AI, Applications of AI.

Problem Solving, Search and Control Strategies: General problem solving, production systems, control strategies forward and backward chaining, exhaustive searches depth first breadth first search.

Heuristic Search Techniques: Hill climbing, Branch and bound technique, Best first search & A* algorithm, Problem reduction & AO* algorithm.

UNIT-II

Game Playing - Overview, Mini-Max search procedure, Game playing with Mini-Max, Alpha-Beta pruning.

Learning Systems-Rote learning, learning from example: Induction, Explanation Based Learning (EBL), Discovery, Clustering, Analogy, Neural net and genetic Learning, Reinforcement learning.

Knowledge Representations: First order predicate calculus, skolemization, resolution principle & unification, interface mechanisms, horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency.

UNIT-III

Natural Language Processing - Introduction, Syntactic processing , Semantic and Pragmatic analysis.

Pattern Recognition - Introduction, Recognition and Classification Process, Learning Classification Pattern, Recognizing and Understanding Speech.

UNIT-IV

Expert Systems - Knowledge acquisition, Knowledge base, Working memory, Inference engine, Expert system shells, Explanation, Application of expert systems.

Fundamentals of Neural Networks -Research history, Model of artificial neuron, Neural networks architectures, Learning methods in neural networks, Single-layer neural network system, Applications of neural networks.

Fundamentals of Genetic Algorithms - Search optimization algorithm, Evolutionary algorithm, Encoding, Operators of genetic algorithm, Basic genetic algorithm.

Common Sense - Introduction, Formalization of common sense reasoning, Physical world, Common sense ontologies, Memory organization.

Text Books:

- Norvig, P. Russel, and S. ”Artificial Intelligence. A modern approach”, Fourth Edition, Prentice Hall of India.

Reference Books:

- Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Prentice Hall of India.
- Elaine Rich and Kevin Knight, “Artificial Intelligence”,Tata McGraw Hill.
- E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson.

MCA-OC3
Software Engineering

UNIT-I

Introduction: Introduction to software Engineering, Software characteristics, Software components, Software applications, Software Engineering Principles, Software metrics and measurement, monitoring and control. Software development life-cycle**,** Water fall model, prototyping model, Incremental model, Iterative enhancement Model, Spiral model.

Unit-II

Software Requirement Specification: Requirements Elicitation Techniques, Requirements analysis, Models for Requirements analysis, requirements specification, requirements validation.

System Design: Design Principles: Problem partitioning, abstraction, Top down and bottom up – design, structured approach. Functional versus object-oriented approach of design, design specification, Cohesiveness and Coupling. Overview of SA/SD Methodology, structured analysis, data flow diagrams, extending DFD to structure chart.

Unit-III

Software project Management: Project planning and Project scheduling. Software Metrics**:** Size Metrics like LOC, Token Count, Function Count. Cost estimation using models like COCOMO. Risk management activities.

Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, reliability models, Software quality, ISO 9000 certification for software industry, SEI capability maturity model.

Unit-IV

Testing: Verification and validation, code inspection, test plan, test case specification. Level of testing: Unit, Integration Testing, Top down and bottom up integration testing, Alpha and Beta testing, System testing and debugging. functional testing, structural testing, Software testing strategies.

Software Maintenance: Structured Vs unstructured maintenance, Maintenance Models, Configuration Management, Reverse Engineering, Software Re-engineering.

Text Books:

- K. K. Aggarwal & Y. Singh, "Software Engineering", Second Edition, New Age International Publishers.
- Pankaj Jalote, "Software Engineering", Wiley India.

Reference Books:

- Roger S. Pressman, "Software Engineering- A Practitioner's Approach", Tata McGraw Hill.
- Rajib Mall, "Fundamentals of Software Engineering", PHI Learning Pvt. Ltd.

MCA-OC4
Modeling and Simulation

UNIT-I

Physical Modeling: Concept of system and environment, continuous and discrete system, linear and nonlinear system, stochastic activities, static and dynamic models, principles used in modeling, Basic simulation modeling, Role of simulation in model evaluation and studies, Advantages and Disadvantages of simulation. Modeling of systems, Iconic, analog and Mathematical Modeling.

UNIT-II

Computer Based System Simulation: Technique of simulation, Monte Carlo method, experimental nature of simulation, numerical computation techniques, calumnious system models, analog and hybrid simulation, feedback systems, Buildings simulation models- Financial Model for an office Building, Sensitivity analysis for office building Model.

UNIT-III

System Dynamics Modeling: Identification of problem situation, Exponential Growth Model and Decay Model, Logistic Curve, System Dynamic Diagrams, Simulation of System Dynamics- Waiting Times in Single Server Queuing System.

UNIT-IV

Probability Concepts In Simulation: Stochastic variables, discrete and continuous probability functions, Distributed Random numbers, generation of random numbers Uniform and Non Uniform Random numbers, variance reduction techniques-Introduction, Common Random numbers-Rationale, Applicability and Synchronization.

Simulation Software: Introduction, Comparison of Simulation Package with Programming Languages, Classification of Simulation Software, Desirable Software features, Basics of General Purpose Simulation Package-ARENA, Study of SIMULA.

Text Books:

- G. Gorden, “System simulation”,Second Edition , Prentice Hall of India.
- Averill M Law “ Simulation Modeling and Analysis”, Fifth Edition, Tata McGraw Hill.

Reference Books:

- Seila, Ceric and Tadikamalla “ Applied Simulation Modeling”, Cengage Learning.
- Severance, ” System Modelling & Simulation : An Introduction”, John Wiley.
- Allan Carrie, "Simulation and Modeling" Tata McGraw Hill.

MCA-OC5
Java Programming

UNIT-1

Object oriented programming, features of java, general structure of java program, sample program, lexical issues, data types, variables, type conversion and casting, arrays & strings, operators and expressions, controls statements.

String handling: String class, String class constructors, String class methods, StringBuffer class, StringBuffer class constructors, StringBuffer class methods.

UNIT-II Class

fundamentals & objects, Methods, constructors, this keyword, garbage collection, overloading methods & constructors, using object as arguments, returning objects, recursion, nested and inner classes, inheritance, using super, method overriding, dynamic method dispatch, using abstract classes, using final with inheritance.

Interfaces: Defining interfaces, extending interfaces, implementing interfaces, accessing interface variables.

UNIT-III

Packages: Introduction, java API packages, Using system packages, naming conventions, creating packages, accessing a package, using a package, adding a class to a package.

Multithreading: Introduction, crating threads, creating multiple threads, thread priorities, synchronization, in thread communication, suspending, resuming and stopping threads.

Exception handling: Introduction, exception types, uncaught exceptions, using try, catch, throw and throws, java‘s built in exceptions, creating own exception subclasses.

Applets programming: introduction, applet architecture, an applet Skelton, the HTML APPLET tag, passing parameters to applet.

UNIT-IV

Collections: Array List, Linked List, collections Methods, Stack, Sets, Maps.

Java Swings: Java Foundation Classes, Hierarchy of Java Swing classes, Swing components (Container: Window, Frame ,Dialog, Panel and Applet; JComponent: JLabel, JList, JTable, JComboBox, JSlider, JMenu, Abstract Button, JButton).

Text book:

- Herbert Schildt, “The Complete Reference”, Eleventh Edition, Tata McGraw Hill.

Reference Books:

- Cay S. Horstmann, Gary Cornell,” Core Java”, Pearson.
- R. NageswaraRao, “Core Java an integrated approach”, Dreamtech Press.
- James R. Levenick , “Simply JAVA :An Introduction to JAVA programming”, Firewall Media Publication, New Delhi.
- E. Balaguruswamy,” Programming with Java”, Tata McGraw Hill.

MCA-OC6
Java Programming Lab

UNIT-1

Practical implementation of Object oriented programming, features of java, general structure of java program, sample program, lexical issues, data types, variables, type conversion and casting, arrays & strings, operators and expressions, controls statements.

String handling: String class, String class constructors, String class methods, StringBuffer class, StringBuffer class constructors, StringBuffer class methods.

UNIT-II

Practical implementation of Class fundamentals & objects, Methods, constructors, this keyword, garbage collection, overloading methods & constructors, using object as arguments, returning objects, recursion, nested and inner classes, inheritance, using super, method overriding, dynamic method dispatch, using abstract classes, using final with inheritance.

Interfaces: Defining interfaces, extending interfaces, implementing interfaces, accessing interface variables.

UNIT-III

Practical implementation of Packages: Introduction, java API packages, Using system packages, naming conventions, creating packages, accessing a package, using a package, adding a class to a package.

Multithreading: Introduction, crating threads, creating multiple threads, thread priorities, synchronization, in thread communication, suspending, resuming and stopping threads.

Exception handling: Introduction, exception types, uncaught exceptions, using try, catch, throw and throws, java‘s built in exceptions, creating own exception subclasses.

Applets programming: introduction, applet architecture, an applet Skelton, the HTML APPLET tag, passing parameters to applet.

UNIT-IV

Practical implementation of Collections: Array List, Linked List, collections Methods, Stack, Sets, Maps.

Java Swings: Java Foundation Classes, Hierarchy of Java Swing classes, Swing components (Container: Window, Frame ,Dialog, Panel and Applet; JComponent: JLabel, JList, JTable, JComboBox, JSlider, JMenu, Abstract Button, JButton).

Text book:

- Herbert Schildt, “The Complete Reference”, Eleventh Edition, Tata McGraw Hill.

Reference Books:

- Cay S. Horstmann, Gary Cornell,” Core Java”, Pearson.
- R. NageswaraRao, “Core Java an integrated approach”, Dreamtech Press.
- James R. Levenick , “Simply JAVA :An Introduction to JAVA programming”, Firewall Media Publication, New Delhi.
- E. Balaguruswamy,” Programming with Java”, Tata McGraw Hill.

MCA-E01
Cryptography and Network Security

UNIT-I

Classical Encryption Techniques: Symmetric Cipher Model, substitution Techniques, tranposition techniques, rotor machines, steganography.

Block Ciphers and the Data Encyption standards: Simplified DES, block cipher principles, the data encryption standard, the strength of DES, differential and linear cryptanalysis, blockcipher design principles, block cipher modes of operation.

Advanced Encryption Standard: Evaluation Criteria for AES, the AES cipher.

Contemporary symmetric ciphers: Triple DES, blowfish.

Confidentiality using symmetric encryption: Placement of Encryption function, traffic confidentiality, key distribution, and random number generation.

UNIT-II

Public key Encryption and Hash functions: Prime numbers, Fermat's and Euler's Theorems, testing for primality, the chinese remainder theorem, discrete logarithms.

Public key cryptography and RSA: Principles of Public key cryptosystems, the RSA algorithm.

Key Management other public key cryptosystems: Key management, diffie-Hallman key exchange, elliptic curve arithmetic, and elliptic curve cryptography.

UNIT-III

Message authentication and Hash function: Authentication

Requirements, Authentication functions, message authentication codes, hash functions, security of hash function and MACs.

Hash Algorithms: MD5 message digest algorithm, secure Hash algorithm, ripemd-160, HMAC.

Digital Signature and Authentication protocols: Digital signatures, Authentication protocols, and digital signature standard.

Authentication Applications: Kerberos, X.509 Authentication service.

UNIT-IV

Electronic Mail Security: Pretty Good privacy, S/MIME.

IP Security: IP Security overview, IP security architecture,authentication header, encapsulating security payload, combining security associations, key management.

Web Security: Web security considerations, Secure sockets layer and transport layer security, secure electronic transaction.

System security: Intruders, intrusion detection, and password management. Malicious software: Viruses and related threats, virus countermeasures. Firewalls: Firewall Design Principles, Trusted systems.

Text Books:

- William Stallings "Cryptography and Network Security", Third Edition, Pearson.
- W.Stallings, " Network security Essential : Applications & Standards", Sixth Edition , Pearson.

Reference Books:

- Eric Maiwald " Network Security : A Preginner's Guide", Tata McGraw Hill.
- Roberta Bragg, Mark Rhodes, Ousley & Keith Strassberg, "Network Security : The Complete Reference", Tata McGraw Hill.
- Eric Maiwald, "Fundamentals of Network Security", Wiley India.

MCA-E02
Cloud and Fog Computing

UNIT-I

Overview of Computing Paradigms: Recent Trends in Computing: Distributed Computing, Cluster Computing, Grid Computing, Utility Computing, Cloud Computing, Evolution of Cloud Computing: Migrating into a Cloud

Cloud Computing Basics: Cloud Computing Overview; Characteristics; Applications; Benefits; Limitations; Challenges, SOA; Cloud Computing Service Models: Infrastructure as a Service; Platform as a Service; Software as a Service, Cloud Computing Deployment Models: Private Cloud; Public Cloud; Community Cloud; Hybrid Cloud, Major Cloud Service providers.

UNIT-II

Virtualization Concepts: Overview of Virtualization Technologies, Types of Virtualization, Benefits of Virtualization, Hypervisors VM Provisioning & Migration: VM Lifecycle, VM Provisioning Process, VM Migration Techniques

Scheduling in Cloud: Overview of Scheduling problem, Different types of scheduling, Scheduling for independent and dependent tasks, Static vs. Dynamic scheduling, Optimization techniques for scheduling.

UNIT-III

Cloud Storage: Overview; Storage as a Service, Benefits and Challenges, Storage Area Networks(SANs), Case Study of Amazon S3.

Cloud Security: Infrastructure Security: Network Level Security, Host Level Security and Application Level Security; Data Security: Data Security & Privacy Issues; Identity & Access Management; Legal Issues in Cloud Computing

UNIT-IV

Mobile Cloud Computing: Overview of Mobile Cloud Computing, Advantages, Challenges, Using Smartphones with the Cloud, Offloading techniques - their pros and cons, Mobile Cloud Security.

SLA Management: Overview of SLA, Types of SLA, SLA Life Cycle, SLA Management Process.

Text Books:

- Rajkumar Buyya, James Broberg, AndrzejGoscinski, " Cloud Computing: Principles and Paradigms", Wiley.
- Barrie Sosinsky, "Cloud Computing Bible", Wiley.

Reference Books:

- Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw Hill.
- Judith Hurwitz, Robin Bloor, Marcia Kaufman,Fern Halper, "Cloud Computing for Dummies", Wiley.
- BorkoFurht, Armando Escalante , "Handbook of Cloud Computing", Springer.

MCA-E04
Image Processing

UNIT-I

Introduction: The role of Computer Vision, applications, successes, research issues; its relationship to natural vision, basic image properties. Digital image representation, fundamental steps in image processing, elements of digital image processing systems digitization, Display and recording devices.

UNIT-II

Digital Image fundamentals: A simple Image model. Sampling and quantization, Relationship between pixel, imaging geometry, image transformation, introduction to fourier transformation, Discrete fourier transformation, fast fourier transformation.

UNIT-III

Image Enhancement: Histogram processing, image subtraction, image averaging, smoothing filters, sharpening filters, enhancement in frequency domain, low pass filtering, high pass filtering.

UNIT-IV

Image Encoding & Segmentation: Segmentation, detection of discontinuation by point detection, line detection, edge detection. Edge linking & Boundary Detection: Local analysis, global by Hough transform & Global by graph theoretic techniques.

Image Representation and Description: Chain codes, polygonal approximation, signatures, boundary segments, boundary descriptors, regional descriptors, introduction to image understanding. Motion Tracking , Image differencing, Feature matching, Optic flow.

Text Book:

- Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Fourth Edition, Addison-Wesley.

Reference Book:

- Anil K. Jain, "Fundamentals of digital image processing", Prentice Hall of India.

MCA-E05
Machine Learning

UNIT-I

Overview and Introduction to Bayes Decision Theory: Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class conditional probability distributions,Examples of classifiers bayes optimal classifier and error, learning classification approaches.

Linear machines: General and linear discriminants, decision regions, single layer neural network, linear separability, general gradient descent, perceptron learning algorithm, mean square criterion and widrow-Hoff learning algorithm; multi-Layer perceptrons: two-layers universal approximators, backpropagation learning, on-line, off-line error surface, important parameters.

UNIT-II

Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3 algorithm criterion, C4.5 algorithm continuous test nodes, confidence, pruning, learning with incomplete data.

Instance-based Learning: Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability

UNIT-III

Machine learning concepts and limitations: Learning theory, formal model of the learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension, fundamental algorithm independent concepts, hypothesis class, target class, inductive bias, occam's razor, empirical risk, limitations of inference machines, approximation and estimation errors, Tradeoff.

UNIT-IV

Machine learning assessment and Improvement: Statistical model selection, structural risk minimization, bootstrapping, bagging, boosting.

Support Vector Machines: Margin of a classifier, dual perceptron algorithm, learning nonlinear hypotheses with perceptron kernel functions, implicit non-linear feature space, theory, zero-Bayes, realizable infinite hypothesis class, finite covering, margin-based bounds on risk, maximal margin classifier.

Text Books:

- E. Alpaydin, “Introduction to Machine Learning”, Prentice Hall of India.
- T. M. Mitchell, “Machine Learning”, Tata McGraw-Hill.

Reference Books:

- C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer.
- R. O. Duda, P. E. Hart, and D.G. Stork, “Pattern Classification”, John Wiley and Sons.
- Vladimir N. Vapnik, “Statistical Learning Theory”, John Wiley and Sons.

MCA-E06
Big Data Analytics

UNIT-I

Introduction to Big Data: Platform – Traits of Big data -Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - ReSampling - Statistical Inference - Prediction Error.

UNIT-II

Data Analysis: Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.

UNIT-III

Mining Data Streams: Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.
Frequent Itemsets And Clustering: Mining Frequent Item sets - Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream – Clustering Techniques – Hierarchical – K-Means – Clustering High Dimensional Data – CLIQUE and PROCLUS – Frequent Pattern based Clustering Methods – Clustering in NonEuclidean Space – Clustering for Streams and Parallelism.

UNIT-IV

Frameworks And Visualization: MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications - Analytics using Statistical packages-Approaches to modeling in Analytics – correlation, regression, decision trees, classification, association Intelligence from unstructured information-Text analytics-Understanding of emerging trends and technologies-Industry challenges and application of Analytics.

Text Books:

- Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer.
- Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press.

Reference Books:

- Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & Sons.
- Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons.
- Pete Warden, “Big Data Glossary”, O’Reilly.

MCA-E07
Internet of Things

UNIT-I

Introduction to IoT: Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs.

UNIT-II

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

M2M vs IoT An Architectural Overview–Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. Reference Architecture and Reference Model of IoT

UNIT-III

IoT Reference Architecture- Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. Constraints affecting design in IoT world-Introduction, Technical design Constraints.

Domain specific applications of IoT: Home automation, Industry applications, Surveillance applications, Other IoT application.

UNIT-IV

Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT.

Text Books:

- Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-onApproach)”, First Edition, VPT
- Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, First Edition, Academic Press.

Reference Books:

- Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications.
- Cuno Pfister, “Getting Started with the Internet of Things”, O’Reilly .

MCA-E09
Soft Computing

UNIT-I

Introduction, Soft Computing concept explanation, brief description of separate theories. Neural Networks and Probabilistic Reasoning; Biological and artificial neuron, neural networks and their classification. Adaline, Perceptron, Madaline and BP (Back Propagation) neural networks. Adaptive feed forward multilayer networks. Algorithms: Marchand, Upstart, Cascade correlation, Tilling. RBF and RCE neural networks. Topologic organized neural network, competitive learning, Kohonen maps.

UNIT-II

CPN , LVQ, ART, SDM and Neocognitron neural networks. Neural networks as associative memories(Hopfield, BAM). Solving optimization problems using neural networks. Stochastic neural networks, Boltzmann machine.

UNIT-III

Fundamentals of fuzzy sets and fuzzy logic theory, fuzzy inference principle. Examples of use of fuzzy logic in control of real-world systems.

UNIT-IV

Fundamentals of genetic programming, examples of its using in practice. Genetic Algorithms Applications of GA's – Class.

Text Books:

- Cordón, O., Herrera, F., Hoffman, F., Magdalena, L," Genetic Fuzzy systems", World Scientific Publishing Co. Pte. Ltd
- Kecman, V."Learning and Soft Computing", The MIT Press.

Reference Books:

- Mehrotra, K., Mohan, C., K., Ranka, S. "Elements of Artificial Neural Networks", The MIT Press.
- Munakata, T, "Fundamentals of the New Artificial Intelligence" ,Springer.

MCA-E10
Cyber Laws

UNIT-I

Introduction –Cyberspace vs. Physical space; Scope of Cyber Laws.

Components of Cyber Laws in India - Information Technology Act, 2000 & 2008 with recent amendments; Relevant provisions from Indian Penal Code, Indian Evidence Act, Bankers Book Evidence Act, Reserve Bank of India Act, etc.

Information Technology Act –a brief overview; Documents or transactions to which IT Act shall not be applicable; meaning of Computer, Computer system and Computer network; E –commerce; E –governance; Concept of Electronic Signature; Concept of Cyber contraventions and Cyber Offences.

UNIT-II

E-Contract –legal provisions regulating the e –contract with special reference to the provisions of Information Technology Act, 2000 & 2008 with recent amendments.

Copyright issues in Cyberspace –relevant provisions under Copyright Act, 1957 regulating copyright issues in Cyberspace; Online Software Piracy –legal issues involved; Analysis of sufficiency of provisions of Copyright Act to deals with Online Software Piracy.

Trademark issues in Cyberspace –Domain Name; Cybersquatting as a form of Domain Name dispute; Case law.

UNIT-III

Concept of Cyber Crimes – 'Cyber Contraventions' & 'Cyber Offences' "Study Of Some Specific Kinds Of Cyber Crimes"

- 'Unauthorised Access' & 'Accessing the Protected System'-meaning with reference to an idea of Cyber Hacking; the legal issues involved.
- Introducing Computer contaminant or virus –legal issues involved.
- Denial of Access to Authorised Person –e.g.-Denial of Service (DoS) Attacks; E mail bombing –legal issues involved.
- Web jacking, Web Defacement & Salami Attacks -legal issues involved.
- Cyber Defamation –meaning; applicability of provisions of IPC; penal liabilities.

UNIT-IV

Concept of Cyber Crimes – 'Cyber Contraventions' & 'Cyber Offences' "Study Of Some Specific Kinds of Cyber Crimes"

- Phishing –a kind of online fraud; meaning; legal issues involved with reference to applicable provisions from Information Technology Act, 2000 & 2008 with recent amendments.
- Cyber Stalking -meaning; elements; applicable provisions from Information Technology Act, 2000 & 2008 with recent amendments.
- Cyber pornography –meaning; relevant provisions from Constitution of India; relevant provisions from IPC; relevant provisions from IT Act; reported case law.
- Cyber Terrorism –meaning; various modes of committing Cyber terrorism; applicable provisions from IT Act.

Text Books:

- RohasNagpal, "Fundamentals of Cyber Law", ASCL Publication.
- Anirudh Rastogi, "Cyber Law Law of Infromation Technology and Internet", Lexis Nexis Publication.

Reference Books:

- Karnika Seth, "Computers, Internet and New Technology Laws-A comprehensive reference work with special focus on developments in India", LexisNexis Publication.
- Apar Gupta, "Commentary on Information Technology Act-With rules, regulations, Orders, Guidelines and reports etc.", Lexis Nexis Publication.

MCA-E14
Software Testing and Quality Assurance

UNIT-I

Introduction: Software Failures, Testing Process, Program and Software, Verification and Validation, Fault, Error, Bug and Failure, Test, Test Case and Test Suite, Deliverables and Milestones, Alpha, Beta and Acceptance Testing, Quality and Reliability, Testing, Quality Assurance and Quality Control, Static and Dynamic Testing, Testing and Debugging, Limitations of Testing, The V Shaped Software Life Cycle Model, Graphical Representation, Relationship of Development and Testing Parts

Functional Testing: Boundary Value Analysis – Robustness Testing, Worst-Case Testing, Robust Worst-Case Testing, Applicability; Equivalence Class Testing – Creation of Equivalence Classes, Applicability; Decision Table Based Testing – Parts of the Decision Table, Limited Entry and Extended Entry Decision Tables, 'Do Not Care' Conditions and Rule Count, Impossible Conditions, Applicability; Cause-Effect Graphing Technique – Identification of Causes and Effects, Design of Cause-Effect Graph, Use of Constraints in Cause-Effect Graph, Design of Limited Entry Decision Table, Writing of Test Cases, Applicability

UNIT-II

Structural Testing: Control Flow Testing – Statement Coverage, Branch Coverage, Condition Coverage, Path Coverage; Data Flow Testing – Define/Reference Anomalies, Definitions, Identification of du and dc Paths, Testing Strategies Using du-Paths, Generation of Test Cases; Slice Based Testing – Guidelines for Slicing, Creation of Program Slices, Generation of Test Cases; Mutation Testing – Mutation and Mutants, Mutation Operators, Mutation Score

Software Verification: Verification Methods – Peer Reviews, Walkthroughs, Inspections, Applications; Software Requirements Specification (SRS) Document Verification – Nature of the SRS Document, Characteristics and Organization of the SRS Document, SRS Document Checklist; Software Design Description (SDD) Document Verification – Organization of the SDD Document, SDD Document Checklist; Source Code Reviews – Issues Related to Source Code Reviews, Checklist of Source Code Reviews; User Documentation Verification – Review Process Issues, User Documentation Checklist; Software Project Audit – Relevance Scale, Theory and Practice Scale, Project Audit and Review Checklist

UNIT-III

Creating Test Cases from Requirements and Use Cases: Use Case Diagram and Use Cases – Identification of Actors, Identification of Use Cases, Drawing of Use Case Diagram, Writing of Use Case Description; Generation of Test Cases from Use Cases – Generation of Scenario Diagrams, Creation of Use Case Scenario Matrix, Identification of Variables in a Use Case, Identification of Different Input States of a Variable, Design of Test Case Matrix, Assigning Actual Values to Variables; Guidelines for generating validity checks – Data Type, Data Range, Special Data Conditions, Mandatory Data Inputs, Domain Specific Checks; Strategies for Data Validity – Accept Only Known Valid Data, Reject Known Bad Data, Sanitize All Data; Database Testing

Selection, Minimization and Prioritization of Test Cases for Regression Testing: What is Regression Testing – Regression Testing Process, Selection of Test Cases; Regression Test Cases Selection – Select All Test Cases, Select Test Cases Randomly, Select Modification Traversing Test Cases; Reducing the Number of Test Cases – Minimization of Test Cases, Prioritization of Test Cases; Risk Analysis – What is Risk, Risk Matrix; Code Coverage Prioritization Technique – Test Cases Selection Criteria, Modification Algorithm, Deletion Algorithm

Software Testing Activities: Levels of Testing – Unit Testing, Integration Testing, System Testing, Acceptance Testing; Debugging – Why Debugging is so Difficult, Debugging Process, Debugging Approaches, Debugging Tools; Software Testing Tools – Static Software Testing Tools, Dynamic Software Testing Tools, Process Management Tools; Software Test Plan

UNIT-IV

Object Oriented Testing: What is Object Orientation – Classes and Objects, Inheritance, Messages, Methods, Responsibility, Abstraction, Polymorphism, Encapsulation, What is Object Oriented Testing – What is a Unit, Levels of Testing; Path Testing, Activity Diagram, Calculation of Cyclomatic Complexity, Generation of Test Cases; State Based Testing – What is a State Machine, State Chart Diagram, State Transition Tables, Generation of Test Cases; Class Testing – How Should We Test a Class, Issues Related to Class Testing, Generating Test Cases

Metrics and Models in Software Testing: Software Metrics – Measure, Measurement and Metrics, Applications, Categories of Metrics – Product Metrics for Testing, Process Metrics for Testing; Object Oriented Metrics Used in Testing – Coupling Metrics, Cohesion Metrics, Inheritance Metrics, Size Metrics; What Should We Measure During Testing – Time, Quality of Source Code, Source Code Coverage, Test Case Defect Density, Review Efficiency; Software Quality Attributes Prediction Models – Reliability Models, An Example of Fault Prediction Model in Practice, Maintenance Effort Prediction Model

Automated Test Data Generation: What is Automated Test Data Generation – Test Adequacy Criteria, Static and Dynamic Test Data Generation; Approaches to Test Data Generation – Random Testing, Symbolic Execution, Dynamic Test Data Generation; Test Data Generation using Genetic Algorithm – Initial Population, Crossover and Mutation, Fitness Function, Selection, Algorithm for Generating Test Data; Test Data Generation Tools

Text Book:

1. Yogesh Singh , “Software Testing” , Cambridge University Press.

Reference Books:

1. Paul C. Jorgensen, “Software Testing: A Craftsman’s Approach”, Fourth Edition, CRC Press.
2. Boris Beizer, “Software Testing Techniques”, Second Edition, Dreamtech Press.
3. A.P. Mathur, “Fundamentals of Software Testing”, Pearson.
4. S. Desikan & G. Ramesh, “Software Principles and Practices”, Pearson.
5. G.J. Myers, T. Badgett, C. Sandler, “The Art of Software Testing”, Third Edition, Wiley India.

MCA-E18
Distributed Database

UNIT-I

Introduction: Distributed Data Processing, Distributed Database Systems, Promises of DDBSs, Complicating factors, Problem areas.

Distributed DBMS Architecture: Models-Autonomy, Distribution, Heterogeneity DDBMS Architecture – Client/Server, Peer to peer, MDBS.

UNIT-II

Data Distribution Alternatives: Design Alternatives–localized data, distributed data Fragmentation– Vertical, Horizontal (primary & derived), hybrid, general guidelines, correctness rules Distribution transparency–location, fragmentation, replication Impact of distribution on user queries–No Global Data Dictionary(GDD), GDD containing location information, Example on fragmentation.

Semantic Data Control: View Management, Authentication –database authentication, OS authentication, Access Rights, Semantic Integrity Control –Centralized & Distributed, Cost of enforcing semantic integrity.

UNIT-III

Query Processing: Query Processing Problem, Layers of Query ProcessingQuery Processing in Centralized Systems –Parsing & Translation, Optimization, Code generation, ExampleQuery Processing in Distributed Systems –Mapping global query to local, Optimization.

UNIT-IV

Distributed Transaction Management & Concurrency Control: Transaction management, Concurrency Control techniques, Distributed Deadlock–Detection, Prevention, Avoidance, and Recovery.

Text Books:

- Ozsu, “Principles of Distributed Database Systems”, Third Edition, Pearson.
- Rahimi & Haug, “Distributed Database Mangement Systems”, Wiley.

Reference Books:

- Chanda Ray, “Distributed Database Systems”, Pearson.
- Sachin Deshpande, “Distributed Databases”, Dreamtech.
- Ceri , Pelagatti, “Distributed Databases Principles and Systems”, Tata McGrah Hill.
- C.J. Date, “An Introduction to Database System, Vol I & II”, Addition Wesley.
- Elmasari , Navathe, “Fundamentals of Data Base Systems”, Addition Wesley.

MCA-E23
Operational Research

UNIT-I

Introduction of operation research. LP Formulations, Graphical method for solving LP's with 2 variables, Simplex method, Duality theory in linear programming and applications, Integer linear programming, dual simplex method

UNIT-II

Transportation problem, Assignment problem. Dynamic Programming: Basic Concepts, Bellman's optimality principles, Dynamics programming approach in decision making problems, optimal subdivision problem. Sequencing Models: Sequencing problem, Johnson's Algorithm for processing n jobs through 2 machines, Algorithm for processing n jobs through 3 or more machines, Processing 2 jobs through n machines.

UNIT-III

Project Management: PERT and CPM : Project management origin and use of PERT, origin and use of CPM, Applications of PERT and CPM, Project Network, Diagram representation, Critical path calculation by network analysis and critical path method (CPM), Determination of floats, Construction of time chart and resource labelling, Project cost curve and crashing in project management, Project Evaluation and review Technique (PERT).

UNIT-IV

Queuing Models: Essential features of queuing systems, operating characteristics of queuing system, probability distribution in queuing systems, classification of queuing models, solution of queuing M/M/1: ∞ /FCFS,M/M/1 : N/FCFS, M/M/S : ∞/FCFS, M/M/S : N/FCFS

Inventory Models: Introduction to the inventory problem, Deterministic Models, The classical EOQ (Economic Order Quantity) model, Inventory models with deterministe demands (no shortage & shortage allowed), Inventory models with probabilistic demand, multiitem determinise models.

Text Books:

- B.E. Gillet, "Introduction to Operation Research: Computer Oriented Algorithmic approach", Tata McGraw Hill.
- S.D. Sharma, "Operations Research", Kedar Nath Ram Nath Publication, Meerut, India.

Reference Books:

- P.K. Gupta & D.S. Hira, "Operations Research", S. Chand & Co.
- J.K. Sharma, "Operations Research: Theory and Applications", Mac Millan.
- S.S. Rao "Optimization Theory and Application", Wesley Eastern.
- Tata Hamdy, A "Operations Research - An Introduction", Prentice Hall of India.
- H. A. Taha, "Operations Research: An Introduction", Pearson.

MCA-OE1
Computer Graphics

UNIT-I

Introduction: Survey of computer Graphics and its applications; Interactive and passive graphics; display processors; Graphic Devices: Display systems-refresh CRTs, raster scan and random scan monitors, Grey shades, Interlacing, beam penetration shadow mask monitors, lookup tables, plasma panel, LED and LCD monitors, VGA and SVGA resolutions; Hard copy Devices-printers, plotters; Interactive Input Devices.

UNIT-II

Drawing Geometry: Coordinate system; resolution; use of the homogeneous coordinate system; scan conversion: symmetrical DDA, simple DDA, Bresenham's line drawing algorithm, Circle drawing using DDA and polar coordinates, Bresenham's circle drawing algorithm, generation of an ellipse. Curve Drawing

UNIT-III

2-D Transformations: Translation; rotation; scaling; mirror reflection; shearing; zooming; panning; input techniques-pointing, positioning, rubber band methods and dragging; tweening, Morphing. Graphic operations: Clipping-line clipping using Sutherland-Cohen and midpoint sub- division algorithm, Liang Barsky Line clippers algorithm, polygon clipping; window and viewport; windowing transformation; Filling algorithms.

UNIT-IV:

3-D Graphics: 3D modelling of objects; 3D display techniques; coordinate system; 3D transformation matrices for translation, scaling and rotation; parallel projection; perspective projection; Hidden-surface removal - Z-buffer, back face, scan-line, depthsorting, area subdivision; Shading - modelling light intensities, Gouraud shading, Phong shading.

Text Books:

- D.D. Hearn, M.P. Baker, and W.R. Carithers, “Computer Graphics with OpenGL”, Fourth Edition, Prentice Hall of India.

Reference Books:

- A. Klinger, K.S. Fu, and T.L. Kunii, “Data Structures, Computer Graphics, and Pattern Recognition”, Academic Press.
- S. Marschner, and P. Shirley, “Fundamentals of Computer Graphics”, CRC Press.
- G. Enderle, K. Kansy, and G. Pfaff, “Computer Graphics Programming: GKS—The Graphics Standard”, Springer Science & Business Media.
- J.D. Foley, F.D. Van, A. Van Dam, S.K. Feiner, J.F. Hughes, E. Angel, and J. Hughes, “Computer Graphics: Principles and Practice”, Addison-Wesley Professional.

MCA-OE3
Mobile Computing

Unit-I:
Wireless Networks: Introduction, Applications, History of Wireless Communication. Electromagnetic Spectrum, Radio Propagation Mechanisms, Characteristics of the Wireless Channel, Modulation Techniques, Multiple Access Techniques, Voice Coding, Error Control.
Wireless LANS and PANS: Introduction, Fundamentals of WLANs, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, HomeRF.

Unit-II:
Wireless WANS AND MANS: Introduction, Cellular Concept, Cellular Architecture, The First-Generation Cellular Systems, The Second-Generation Cellular Systems, The Third-Generation Cellular Systems, Wireless in Local Loop, Wireless ATM.

Unit-III:
Wireless Internet: Introduction, Mobile network Layer, Mobile IP, Route optimization, Handoffs, IPv6 Advancements, IP for Wireless domains, Security in Mobile IP, Mobile Transport layer, TCP in Wireless Domain, Optimizing Web over Wireless.

Unit-IV:
Ad Hoc Wireless Networks: Introduction. Issues in Ad Hoc Wireless Networks. Ad Hoc Wireless Internet. MAC Protocols for Ad Hoc Wireless Networks, Routing Protocols for Ad Hoc Wireless Networks, Security in Ad hoc wireless networks, Recent advances in Wireless Networks.

Text Book:
- C-Siva Ram Murthy & B S Majo, "Adhoc Wireless Networks, Architectures Protocols" , Pearson.
- Jochen Schiller "Mobile Communications", Pearson.

Reference Book:
- William C.Y Lee, "Mobile Communication Design Fundamental", John Wiley.
- William Stalling, "Wireless Communication and Network", Pearson Education.

MCA-HM1
Online Meeting and Web Conferencing Tools

UNIT-I

Introduction to Online Meetings: Online Meeting, host an Online Meeting, Advantages and Disadvantages of Online Meetings, Difference between Online Meeting and Online Events.

UNIT-II

Choosing the right tools and platform for Online Meetings, Study of Various Online Meeting tools and their usage.

UNIT-III

Introduction to Web conferencing: Web Conferencing, Web Conferencing users, Web Conferencing Working, Importance of web Conferencing in an Online Meeting, Tools Used for web Conferencing.

UNIT-IV

Study of various web conferencing tools: Zoom, ClickMeeting, GoToMeeting, Lifesize, Cisco Webex Meetings, BlueJeans Meetings, Skype and Google Meet.

Text Book:

- Sue Spielman and Liz Winfeld arms, "The Web Conferencing", Tata McGraw Hill.

Reference Book:

- Firestone, Scott, Thiya Ramalingam, and Steve Fry, "Voice and Video Conferencing Fundamentals" Cisco Systems.

MCA-HM3
Open Source Technology

UNIT-I

Open source software: Features, advantages over proprietary software, examples, Free software: concepts, features, Free software Vs Open Source software, Free software movements. Policies, GPL, Free OS, History and Features of Linux, Various flavours of Linux, Linux Kernel and Shell, Graphical Desktops- GNOME, KDE, Linux File System and Directories.

UNIT-II

Apache Explained-Starting, Stopping and Restarting Apache-Modifying the Default Configuration -Securing Apache-Set User and Group -Consider Allowing Access to Local Documentation -Don't Allow public html Web sites-Apache control with .htaccess

UNIT-III

Open source database software: MySQL features MySQL data types: Numeric, date & time, string, Table creation in MySQL: insert, select, where clause, ordering the result ,like operator, Selecting Multiple tables: using join, using queries Modifying records: update command, replace command, delete command date & time functions in MySQL.

UNIT-IV

PHP: Introduction-General Syntactic Characteristics, PHP Scripting, Commenting your code, Primitives, Operations and Expressions, PHP Variables, Operations and Expressions Control Statement, Array, Functions, Basic Form Processing, File and Folder Access, Cookies, Sessions, Database Access with PHP

Text Books:

- James Lee and Brent Ware , "Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP", Dorling Kindersley(India) Pvt. Ltd, 2008.
- Graham Glass, King Ablas, "Unix for Programmers and Users", Pearson Education

Reference Books:

- Rasmus Lerdorf and Levin Tatroe, "Programming PHP", O'Reilly Publications.
- Rem Card, Eric Dumas and Frank Mevel , "The Linux Kerne", Wiley.
- Suchring John ,"MySQL Bible Steve", Wiley.

MCA-HM4
Research Ethics

UNIT-I

Introduction to philosophy: definition, nature and scope, concept, branches-Ethics: definition, moral philosophy, nature of moral judgements and reactions.

Ethics with respect to science and research -Intellectual honesty and research integrity -Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP) -Redundant Publications: duplicate and overlapping publications, salami slicing -Selective reporting and misrepresentation of data.

UNIT-II

Publication ethics: definition, introduction and importance -Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. -Conflicts of interest -Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types -Violation of publication ethics, authorship and contributor ship-Identification of publication misconduct, complaints and appeals -Predatory publisher and journals.

UNIT-III

Open access publications and initiatives -SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies -Software tool to identify predatory publications developed by SPPU -Journal finger / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer, Journal Suggester, etc

UNIT-IV

Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools.

Databases: Indexing databases, Citation databases: Web of Science, Scopus, etc

Research Metrics: Impact Factor of journal as per Journal Citations Report, SNIP, SJR, IPP, Cite Score - Metrics: h-index, g index, i10 Index, altmetrics.

Text Books:

- K.S. Bordens and B.B. Abbott, “Research Design and Methods”, Tata McGraw Hill.
- Paul Oliver , “The Student's Guide to Research Ethics”, Open University Press.

Reference Books:

- Anderson B.H., Dursaton, and Poole M., “Thesis and assignment writing”, Wiley.
- Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi ,“Ethics in Science Education, Research and Governance”, Indian National Science Academy.
- Nicholas H. Steneck, “Introduction to the Responsible Conduct of Research”, Office of Research Integrity.

MCA-SD2
Network Administration

UNIT-I

Introduction to Computer Networks: OSI & TCP/IP Model
Physical Media: UTP, Fiber and Wireless Media
LAN Architecture: 10/100/1000/10G Ethernet

UNIT-II

Switching & Routing: Layer 2 & Layer 3 switching; Routing; VLAN; Cisco L2 and L3 Switch Configuration
IP Addressing: IPv4 Addressing and Sub-netting; DHCP Configuration; IPv6 Wireless LAN: 802.11 a/b/g/n/ac WiFi; Access Point and Wireless Router configuration
Internet Architecture: ISP Architecture; DNS Resolution; BGP Routing; Content Mirroring

UNIT-III

Internet Applications: DNS; Web; Mail; Proxy; NTP
Perimeter Security: Firewall; UTM
Network Security: LAN and WLAN Security issues; IP Spoofing; Dictionary Attack; DoS

UNIT-IV

DDoS Attack; Rogue/Misconfigured/External APs
Network Troubleshooting: ping, traceroute, nslookup, dig, tcpdump
Network Monitoring: SNMP; MRTG

Text Books:

- CCENT/CCNA ICND1 (Official Exam Certification Guide, Second Edition)By – Wendell Odom.
- Hunt, Craig, “TCP/IP network administration”, O'Reilly.

Reference Book:

- Bergstra, Jan and Mark Burgess eds,”Handbook of network and system administration”, Elsevier.

MCA-SD3

NoSQL

UNIT-I

Define what a NoSQL database is, Why we need NoSQL and how is it different from traditional databases. Learn about the various tools available such as MongoDB, Cassandra, HBase etc. Explore the principles of NoSQL using elementary examples in MongoDB.

UNIT-II

Develop an understanding of the available data models: value stores, document databases, column-family stores, graph databases. Understand the basic storage architecture in a distributed environment – column oriented databases, nested maps of key/value pairs, Hbase distributed storage architecture.

UNIT-III

The set of essential operations – CRUD refers to Create, Read, Update and Delete operations in the context of a NoSQL database environment. Practical experience of CRUD operations for document databases using MongoDB.

UNIT-IV

Developing Web Application with NOSQL and NOSQL Administration: Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP, NOSQL Database Administration.

Text Books:

- Shashank Tiwari, "Professional NoSQL", John Wiley and Sons.
- Pramod J. Sadalage, Martin Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley.

MCA-SD4

Introduction to Latex

UNIT-I

Installation of the software LaTeX, Understanding Latex compilation Basic Syntax, Writing equations, Matrix, Tables.

UNIT-II

Page Layout – Titles, Abstract Chapters, Sections, References, Equation references, citation.
List making environments Table of contents, generating new commands, Figure handling numbering, List of figures, List of tables, Generating index.

UNIT-III

Packages: Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tiles listing.

UNIT-IV

Classes: article, book, report, beamer, slides. IEEEtran.
Applications to: Writing Resume, Writing question paper, Writing articles/ research papers.

Text Book:

- Leslie Lamport, "LaTeX: A Document Preparation System, Second Edition", Addison Wesley.

Reference Book:

- Frank Mittelbach, Michel Goossens, Johannes Braams, David Carlisle, Chris Rowley, "LaTeX Companion", Addison Wesley.

MCA-SD5
Linux Programming

UNIT-I

Linux Startup and Shell Programming: User accounts, accessing linux-starting and shutting process, Logging in and Logging out, Command line, simple command, Unix file system: Linux/Unix files, inodes and structure and file system related commands, Shell as command processor, shell variables, creating command substitution, scripts, functions, conditionals, loops, customizing

UNIT-II

Regular Expressions and Filters: Introducing regular expressions patterns, syntax, character classes, quantifiers, introduction to egrep, sed, programming with awk and perl

UNIT-III

The C/C++ Environment: The C compiler, vi editor, compiler options, managing projects, memory management, use of makefiles, dependency calculations, memory management-dynamic and static memory, building and using static and dynamic libraries, using ldd, soname, dynamic loader, debugging with gdb.

UNIT-IV

Processes in Linux Processes, starting and stopping processes, initialization processes, rc and init files, job control-at, batch, cron, time, network files, security, privileges, authentication, password administration, archiving, Signals and signal handlers, Linux I/O system.

Text Books:

- Sumitabha Das, "Your Unix-The Ultimate Guide", Tata McGrah Hill.
- Behrouz A. Forouzan, Richard F. Gilberg: "UNIX and Shell Programming", Brooks/Cole-Thomson Learning.

Reference Books:

- A. Martelli, A. Ravenscroft, S. Holden, "Python in a Nutshell", O'Reiley.
- Guido van Rossum, "An Introduction to Python", Network Theory Ltd
- John Goerzen, "Linux Programming Bible, IDG Books", New Delhi
- Neil Matthew, Richard Stones, "Beginning Linux Programming", Wrox-Shroff
- Welsh & Kaufmann, "Running Linux", O'Reiley.
- Pooja Sharma, "Programming in Python", BPB Publications.

Detailed List of Experts/Examiners for Department of Computer Science and Informatics

1. **Prof. Manu Sood**, Department of Computer Science, HPU Shimla-5, Mob. No. : +91 94183 09596, Email ID : soodm_67@yahoo.com
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3. **Dr. Rakesh Kumar**, Head, Department of Computer Science & Engineering, Central University of Haryana, Mob. No. : +91 94163 27669, Email ID : rkdhiman@cuh.ac.in, hodcse@cuh.ac.in
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6. **Sh. Vivek choudhary**, Assistant Professor, GDC Dharmshala, Mob. No. : +91 94181 15445
7. **Dr. Sandeep Sood**, Associate Professor, Computer Applications, N.I.T. Kurukshetra, Haryana – 136119, Mobile: 09465204534 E-mail ID: san1198@gmail.com;sandeepsood@nitkkr.ac.in
8. **Dr. Kamlesh Dutta**, Department of Computer Science and Engineering, National Institute of Technology, Hamirpur – 177005
9. **Prof. Aman Sharma**, Professor, Computer Science Department, Himachal Pradesh University, Shimla. Mob. +91 9418491140 (M), Email ID: sharmaas1@gmail.com