HIMACHAL PRADESH TECHNICAL UNIVERSITY
HAMIRPUR

Syllabus

for

MCA (Master of Computer Applications)

As per National Education Policy (NEP-2020)

(w.e.f. the Academic Year 2023-2024)

Department of Master of Computer Applications

School of Computer Science and Engineering

Approved by the Board of Studies

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H.P. Technical University
Hamirpur - 177 001, HP

1. Preamble

M.C.A is named as Master of Computer Applications. The syllabus for this program is framed under National Education Policy (NEP) with core, elective (discipline specific and value added) and other interdisciplinary courses incorporated as its components following the University Grants Commission (UGC) guidelines. The Department of M.C.A also tried to revise the curriculum in alignment with National Education Policy-2020 and UGC Quality Mandate for Higher Education Institutions-2021. With NEP-2020 in background, the revised curricula articulate the spirit of the policy by emphasizing on integrated approach to learning; innovative pedagogies and assessment strategies; multidisciplinary and cross-disciplinary education; creative and critical thinking; ethical and Constitutional values through value-based courses. The NEP also enables the students to select subjects as per their interest. Also, diverse lab experiments as well as field visits/demonstrations allow students to understand the fundamental aspects of the subject. The curriculum of MCA is designed to meet the growing demand of qualified professionals in the field of ICT. Furthermore, continuous assessment is an integral part of the NEP, which will facilitate systematic and thorough learning towards better understanding of the subject.

2. Program Objectives (POs)

M.C.A comprises of the core subjects like Database System, Computer Architecture and System, networking, and data structures, core programming languages like C, C++, Java, web programming, Android, and Python. Students also get exposure to advanced topics like cyber security, mobile software, IoT, data science etc. Elective papers help students to have an exposure in IoT, image Processing Big Data and Information Security related subjects. The curriculum for MCA Program of study has been designed with total minimum credits of 94 for two years and credits of 52 for one year. Program has been designed not only to make students job ready but also dedicated to create an entrepreneurship skills and competency amongst them through the process of innovation. Apply the knowledge of mathematics and computing fundamentals to various real-life applications for any given requirement. Design and develop applications to analyse and solve all computer science related problems. This is accomplished through the following learning goals and objectives:

- **Knowledge of mathematics and computing fundamentals.** Apply the knowledge of mathematics and computing fundamentals to various real-life applications for any given requirement.
- **Design and develop applications**. Design and develop applications to analyse and solve all computer science related problems.
- **Effective Communication.** Students will use various forms of business communication, supported by effective use of appropriate technology, logical reasoning, and articulation of ideas. Graduates are expected to develop effective oral and written communication especially in business applications, with the use of appropriate technology (business presentations, digital communication, social network platforms and so on).
- **Leadership and Teamwork.** Students will acquire skills to demonstrate leadership roles at various levels of the organization and leading teams. Graduates are expected to collaborate and lead teams across organizational boundaries and demonstrate leadership qualities, maximize the usage of diverse skills of team members in the related context.
- **Global Exposure and Cross-Cultural Understanding.** Graduate will be able to demonstrate a global outlook with the ability to identify aspects of the global business and Cross -Cultural Understanding.
- **Integrate and apply efficient tools.** Integrate and apply efficiently the contemporary IT tools to all computer applications.
- **Designing innovative methodologies**. Create and design innovative methodologies to solve complex problems for the betterment of society.

- **Applying inherent skills**. Apply the inherent skills with absolute focus to function as a successful entrepreneur.
- **Social Responsiveness and Ethics**. Students will demonstrate responsiveness to contextual social issues/ problems and exploring solutions, understanding ethics, and resolving ethical dilemmas. Demonstrate awareness of ethical issues and can distinguish ethical and unethical behaviours.

3. Program Learning Outcomes (PLOs)

The main outcomes of the M.C.A program are given here. At the end of the program a student is expected to have:

- An understanding of the theoretical foundations and the limits of computing.
- An ability to adapt existing models, techniques, algorithms, data structures, etc. for efficiently solving problems.
- An ability to design, develop and evaluate new computer-based systems for novel applications which meet the desired needs of industry and society.
- Understanding and ability to use advanced computing techniques and tools.
- An ability to undertake original research at the cutting edge of computer science & its related areas.
- An ability to function effectively individually or as a part of a team to accomplish a stated goal.
- An understanding of professional and ethical responsibility.
- An ability to learn independently and engage in life-long learning.
- An ability to communicate effectively with a wide range of audience.

4. Curriculum Structure

MCA degree program will have a curriculum with Syllabi consisting of following type of courses:

- **Core Course:** A course which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
- **Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of the study is referred to as Discipline Specific Elective.
- **Value addition, Skill Enhancement & Inter Departmental Elective Course:** Generally, a course which can be chosen from a pool of courses, and which may be very specific or specialized or advanced or supportive to the discipline/interdepartmental subject of study or which provides an extended scope, or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's values/proficiency/skill is called an Elective Course. These courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills and to improve the employability skills of students.

5. Scheme of Examination

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The pass percentage in each subject will be 40%.

- **Theory Examination**
  Irrespective of credits, each paper will be of 100 marks (60 marks for theory exam and 40 marks for internal assessment) and duration of paper will be 3 hours.
- **Practical Examination**
  Each paper will be of 100 marks (60 marks for external practical exam and 40 marks for internal assessment) and duration of paper will be 3 hours.
- **Project Report/Dissertation**
  The Project Report/Dissertation will be evaluated by the internal panel and external examiner from the panel approved by the university authority/evaluation branch, HPTU, Hamirpur. The Head of the Department will

assign a guide/supervisor to each candidate for his/her project/Dissertation work. The candidate shall be required to maintain his/her project diary (logbook) of work in the organization or under the Guide. Each student will be required to give presentations on his/her project work/Dissertation work. Each student is required to submit three copies of his/her project reports to the Department after completion of the project work, which will be evaluated by external examiner. Most of the students are expected to work on a real-life project/Research, preferably in some industry/Research and Development Laboratories/Educational Institution/Software Company. The student can formulate a project problem/Research problem with the help of her/his Guide and submit the synopsis/Research proposal of the same in the college within 10 days at the starting of Major Project. Approval of the Synopsis /Research proposal is mandatory which will be evaluated by an internal examiner appointed by respective college Principal or Director or university. If approved, the student can commence working on it and complete it by using the latest versions of the software packages/Research Tools for the development of the project/Dissertation.

- **Instruction for paper setter**

  In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and the candidate is required to attempt at least one question from each unit. Question number nine will be compulsory, which will be of short answer type questions with 6 to 8 parts, covering entire syllabus. In all, five questions are to be attempted. The question paper for the end semester examination may have any one of the following patterns:
  Section A (UNIT I) Two questions of long answer type of which one is to be attempted for 12 Marks.
  Section B (UNIT II) Two questions of long answer type of which one is to be attempted for 12 Marks.
  Section C (UNIT III) Two questions of long answer type of which one is to be attempted for 12 Marks.
  Section D (UNIT IV) Two questions of long answer type of which one is to be attempted for 12 Marks.
  Section E (Compulsory) 6 to 8 short answer type questions for 2 to 1.5 marks each and total for 12 Marks.
  Total marks (A + B + C + D+ E) 12+ 12 + 12 +12+12 = 60 marks

End Semester Examination (ESE)

For the theory course, the question paper for the final examination will consist of five sections-A, B, C, D & E. Sections A, B, C, D will have two questions each from the corresponding units I, II, III & IV of the syllabus. Section E will be compulsory and will have short answer type questions covering the whole syllabus. Each question will be of 12 or 8,4 or 6,6 marks. The candidates will attempt five questions in all, i.e.one question each from sections A, B, C, D, and the compulsory question from section E. The question paper is expected to contain problems with a minimum weightage of 25% of the total marks from each unit.

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Template for End Semester Examination (4,3,2 credits)

Roll No:…. **Total Pages…….**

Month-Year (June-2023)

M.C.A Examination

Code

Title

Semester-X (NEP)

Time: 3 Hours **Max. Marks: 60**

The candidates shall limit their answers precisely within the answer book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt five questions in all by selecting one question from each section A, B, C and D. Section-E is compulsory.

SECTION – A

(1x12 or 8,4 or 6,6)

1.

2.

SECTION – B

(1x12 or 8,4 or 6,6)

3.

4.

SECTION – C

(1x12 or 8,4 or 6,6)

5.

6.

SECTION – D

(1x12 or 8,4 or 6,6)

7.

8.

SECTION – E (Compulsory)

(6×2=12)

9.

(a-f)

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Periodical Examination (PE)

During one semester, there will be two periodical examinations for theory and practical subjects. The question paper will consist of three sections A, B and C having a total of 20 marks. Section A will be compulsory and will have short answer type questions consisting of five parts, each with one mark covering the syllabus mentioned. Sections B and C willcontain descriptive type questions of five and ten marks respectively. Sections B and C will have two questions and the candidates will attempt three questions in all, i.e., one question each from sections B and C. Section-A iscompulsory.

Template for Periodical Examination (4,3,2 credits)

Roll No:……. **Total Pages…..……**

Month-Year (June-2023)

M.C.A. Examination

Code

Title

Semester-X (NEP)

Time: 1.5 Hours **Max. Marks: 20**

Note: Attempt three questions in all by selecting one question from each section B and C. Section-A is compulsory.

SECTION – A (Compulsory)

(8x1=8)

1. (a-e)

SECTION – B

(6)

2.
3.

SECTION – C

(6)

4.
5.

6. Purposed Subject Code System

Each subject code is denoted by alpha-numerals, alphabets before hyphen indicates course name and four numerals after hyphen indicates level, semester, and subject number respectively.

- For Example: MCA-6209
- First three alphabets “MCA” is degree indicator.
- First number “6” defines the Level. 6 for level 6 subject and 7 for level 7.
- Second number “2” defines the semester.
- Third and fourth number are for subject number.

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7. Assessment & Evaluation

- **IA-Internal Assessment (Theory)**

  Periodical Examination (PE) -I and Periodical Examination (PE) -II = Weightage of **20** Marks (Average of PE-I and PE-II).

  Teacher's Assessment (Assignment discussion/ presentation /overall behaviour) = 15 Marks

  Attendance = 05 Marks

Sr. No.	Percentage of Lecture Attended	Marks Awarded
1	From 75% to 80%	01
2	Above 80% to 85%	02
3	Above 85% to 90%	03
4	Above 90% to 95%	04
5	Above 95%	05

Total (IA) = 10 + 10+ 15+ 5 = 40 for all courses

- **IA-Internal Assessment (Practical)**
  Periodical Examination (PE) (Written/Presentation & Viva-Voce) = **20**
  Teacher's Assessment (Lab performance /Work Performance + Report/File Work) = **15**
  Attendance = **05**

- **EA-External Assessment (Theory)**
  ESE-End-Semester Examination = 60 for all courses.
  Total marks for theory evaluation = (20 + 15 + 05 + 60 =100) for all courses.

- **External Assessment (Practical)**
  ESE-End-Semester Examination (written script, performance, External viva-voce etc.) = **60**
  Total marks for practical evaluation = 20+20+60 =100

Template for- IA-Internal Assessment (Theory)

HIMACHAL PRADESH TECHNICAL UNIVERSITY
Master of Computer Applications , School of Computer Science & Engineering
AWARD SHEET THEORY (INTERNAL ASSESSMENT)

Name of the Institution:			**Distribution of Marks**					**Total Marks**
Programme:			**Periodical Examinations**		**Teacher Assessment** Assignment discussion/ presentation/ Quizzes/Overall behaviour		**Attendance**	
Subject:		**Sub. Code:**						
Branch:		**Semester:**	1st Periodical Examination	2nd Periodical Examination				
MAX. MARKS:		**MIN. MARKS:**						
Sr. No.	**University Roll No.**	**Name of Student**	**10**	**10**	**15**		**05**	**40**

Name of Internal Examiner — Head of Dept — Head of the Institution

Signature……..…… Signature……..... Signature…….....

Date…….. Date…….. Date……

Template for-IA-Internal Assessment (Practical/Project/Seminar/Viva-Voce)

HIMACHAL PRADESH TECHNICAL UNIVERSITY

Master of Computer Applications , School of Computer Science & Engineering

AWARD SHEET PRACTICAL (INTERNAL ASSESSMENT)

(Practical/Project/Seminar/Viva-Voce)

Name of the Institution:			**Distribution of Marks**					
Programme:			**Periodical Examination**		**Teacher's Assessment** Lab /work performance Report/File work		**Attendance**	**Total Marks**
Subject:		**Sub. Code:**						
Branch:		**Semester:**	Written/Presentation	Viva-voce				
MAX. MARKS:		**MIN. MARKS:**						
Sr. No.	**University Roll No.**	**Name of Student**	**10**	**10**	**15**		**05**	**40**

Name of Internal Examiner — Signature……..…… Date……..……..…...

Head of Dept — Signature……..... Date……..

Head of the Institution — Signature……..... Date……..

Note: The distribution of marks for Institutional training, Internship, Survey, SWAYAM, MOOCs, NPTEL courses (if any) would be same as above.

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Template for-External Examination
(Practical/Project/Seminar/Viva-Voce)
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Master of Computer Applications, School of Computer Science & Engineering
(Practical/Project/Seminar/Viva-Voce)

Name of the Institute: …….

Programme: ……

Subject Name:…….. …… Subject Code:…….

Branch: ……..…… Semester ……

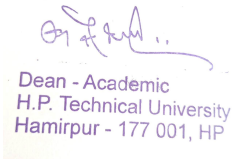
Max Marks …… Min. Marks:……

Sr. No.	University Roll No.	Name of Student	Marks in Figure	Marks in Words

Name of Internal Examiner: ……... External Examiner…….

Signature……..…….. Signature……..……..
Date……..……. Date……..…….

**Note: The distribution of marks would be on the basis of Work done/Task performance (20 marks), Performance (written/presentation) (20 marks) and viva-voce (20 marks), total=60 marks.*



8. Overall General Instructions

- Each paper will be of 100 marks (60 marks for external and 40 marks for internal) and the duration of paper will be 3 hours. The candidate shall be declared to have passed the examination if the candidate secures not less than 24 marks in the End Semester Examinations of each paper and secures not less than 16 marks in the Internal Assessment (IA) and overall aggregated marks is 40 in both the external and internal taken together.
- Each theory lecture per hour will be considered as one credit and two practical hours as one credit. For each theory course of 04 credits, there will be 4 lecture hours of teaching per week and for each theory course of 02 credits, there will be 2 lecture hours of teaching per week. For each practical course of 02 credits, there will be 04 lecture hours of teaching per week and for practical course of 04 credits, there will be 08 lecture hours of teaching per week. For the other course categories, the lecture hours per credit would be same as those of having theory subjects.
- In each semester, the students are required to perform at least ten experiments out of the listed experiments.
- For Seminar, Industrial Training, Research Project, Summer Internship, Survey, SWAYAM, MOOC, NPTEL; the internal and external assessment shall be same as that of theory/practical courses i.e., 100 (60 % ESE & 40 % IA) marks.
- The distribution of internal & external assessment for Project work, Seminar and other course categories will be same as that of Core Compulsory course/Discipline Specific Courses and also as per the format mentioned above. (Read all the instructions mentioned in each course content semester-wise)
- Teaching hours per semester for each 04-credit theory course will be minimum 60 hours and of 02 credit theory course will be minimum 30 hours.
- For Research project, Seminar/SWAYAM/MOOC/NPTEL/Industrial Internship/Survey, the time frame for the duration of classes, examination, format for writing the report and evaluation system will be as per the format given as well as may be decided by the Department/University itself or organizing/host/collaborative institutions time to time after the approval from BoS.
- On the basis of the interest/availability of the students from other departments, any other relevant course for the Inter-departments Course (ID) may be offered at the spot after the approval from Authority/Department.
- Students having the attendance below 75% in each course will not be allowed to appear in the final examination. The students having attendance lying between 70-75% may be allowed to submit the examination form and finally to appear in the examinations only after the approval from the Dean/concerned authority. Similarly, the students having attendance lying between 65-70% may be allowed to submit the examination form and finally to appear in the examinations only after the approval from the Vice-Chancellor only on the request basis.
- For Theory examinations (Internals), two examinations; Periodical Examination-I and Periodical Examination-II will be conducted and for the practicals and other course categories, only one periodical examination will be conducted-as the internal examination along with other parameters as mentioned in the instructions (mentioned above).
- Both the periodical examinations are mandatory. If, in any case, the student is not able to appear in any of the above examinations, then the option of Make-up Examination will be given to the student. For that, he/she has to report before that examination to the concerned teacher/head of the department. Within 3 days, he/she has to submit the documents related to the cause and finally get permission from the concerned Authority. After getting the permission, the student has to appear in the examination within 10 days with the weightage of 80% only. For example, if the student scoring 15 marks with the weightage of 100%, then he/she will be given 12 marks (80% weightage).
- Keeping in view the guidelines of NEP-2020, MCA is made inter- departmental in nature. It has been made mandatory by the university for the students at the PG level to opt at least one course of minimum 2 credits in first year.

- Duration: One year divided into two semesters. Total duration is of 02 years (04 semesters)
- Medium of instruction: English and Passing Standard: As mentioned in the Ordinance.
- In regard to maintain the record of the answer-sheets, after the completion of one year, all the used answer-sheets of internal examinations, project reports, practical note-books etc. would be allowed to disposed off.
- In regard to maintain the lab equipments, if any of the equipments not working properly may be allowed to send to the concerned companies (within and out-side the state) for repairing and may be allowed to disposed off/write off the damaged/old/not-in-use items like books, equipments, furniture and other appliances after the approval from the concerned authorities.

Subject Combinations Allowed for Master of Computer Applications
ProgramThe Details of Credit Distribution
School: School of Computer Science and Engineering
Program: Master of Computer Applications (M.C.A)

Core Courses (CC) (Theory & Practical's)			**Discipline Specific Elective Courses** (DSE)			**Value Addition Course (2 credits), Skill Enhancement Course (3 credits) General Elective (3 credits)** Seminar/Industrial Training/Summer Internship/Survey/SWAYAM/MOOC/NPTEL			**Inter Departmental (ID)**			**Project Report/Dissertation (Minor/Major)**		
9 Papers (Theory) of 3 credits each			**3 Papers (Theory) of 4 credits each**			**7 Papers (Theory)**			**1 Paper (Theory) of 2 Credits**					
Sem.	Papers	Credit	Sem.	Papers	Credit	Sem.	Papers	Credit	Sem.	Papers	Credit	Sem.	Papers	Credit
I	03	09	I	-	-	I	03	08	I	-	-	I	-	-
II	04	12	II	01	04	II	02	05	II	01	02	II	-	-
III	02	06	III	02	08	III	02	06	III	-	-	III	01	02
IV	-	-	IV	-	-	IV	-	-	IV	-	-	IV	01	16
08 Practical Labs														
Sem.	Papers	Credit												
I	03	06												
II	03	06												
III	02	04												
IV	-	-												
Credits = 43			**Credits = 12**			**Credits = 19**			**Credits = 02**			**Credits = 18**		
Total Credits = 94									**Total Marks = 3300**					

Note: For getting the degree to be awarded, the student has to pass all 94 credits (3300 marks) out of 94 credits (3300 marks).

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Scheme of Teaching and Examination
Master of Computer Applications (MCA)

Semester-I

Subject Code	Course Category	Subject Title/ Subject Name	Periods			Credits	Evaluation Scheme					Total
			L	T	P		ESE	Internal Assessment				
								PE	TA	A	Total	
MCA-6101	CC	Programming in C	3	0	0	3	60	20	15	05	40	100
MCA-6102	CC	Database Management Systems	3	0	0	3	60	20	15	05	40	100
MCA-6103	CC	Computer Organization and Architecture	3	0	0	3	60	20	15	05	40	100
MCA-6104	GE	Discrete Mathematical Structures	3	0	0	3	60	20	15	05	40	100
MCA-6105	SEC	Python Programming	3	0	0	3	60	20	15	05	40	100
UHV-6100	VAC	Universal Human Values and Professional Ethics	2	0	0	2	60	20	15	05	40	100
Labs												
MCA-6106P	CC Lab	Lab I: C Programming Lab	0	0	4	2	60	20	15	05	40	100
MCA-6107P	CC Lab	Lab II: DBMS Lab	0	0	4	2	60	20	15	05	40	100
MCA-6108P	SEC Lab	Lab III: Python Programming Lab	0	0	4	2	60	20	15	05	40	100
Total			**17**	**0**	**12**	**23**	**540**	**180**	**135**	**45**	**360**	**900**

Legends:	**CC -** Core Course	**ESE**-End Semester Examination
	SEC - Skill Enhancement Course	**PE** – Periodical Examination
	VAC – Value Addition Course	**TA -** Teacher's Assessment
	DSE - Discipline Specific Electives	**A –** Attendance
	GE – Generic Elective	**L –** Lecture
	ID - Inter Departmental Elective Course	**T –** Tutorial
	C – Compulsory	**P** – Practical

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Scheme of Teaching and Examination
Master of Computer Applications (MCA)

Semester-II

Subject Code	Course Category	Subject Title/ Subject Name	Periods			Credits	Evaluation Scheme					Total
			L	T	P		ESE	Internal Assessment				
								PE	TA	A	Total	
MCA-6201	CC	Data Structure using C	3	0	0	3	60	20	15	05	40	100
MCA-6202	CC	Java Programming	3	0	0	3	60	20	15	05	40	100
MCA-6203	CC	Operating System	3	0	0	3	60	20	15	05	40	100
MCA-6204	CC	Computer Networks	3	0	0	3	60	20	15	05	40	100
MCA-6205	SEC	Web Technologies (Node.js and MongoDB)	3	0	0	3	60	20	15	05	40	100
MCA-6206	DSE	DSE - I	4	0	0	4	60	20	15	05	40	100
IKS-6200	VAC	Indian Knowledge System	2	0	0	2	60	20	15	05	40	100
MCA ID-6201	ID	Inter Departmental Elective	2	0	0	2	60	20	15	05	40	100
Labs												
MCA-6207P	CC LAB	Lab IV: Data Structure using C Lab	0	0	4	2	60	20	15	05	40	100
MCA-6208P	CC LAB	Lab V: Java ProgrammingLab	0	0	4	2	60	20	15	05	40	100
MCA-6209P	SEC LAB	Lab VI: Web Technologies (Node.js and MongoDB) Lab	0	0	4	2	60	20	15	05	40	100
Total			**23**	**0**	**12**	**29**	**660**	**220**	**155**	**55**	**440**	**1100**

Legends:	**CC -** Core Course	**ESE**-End Semester Examination
	SEC - Skill Enhancement Course	**PE** – Periodical Examination
	VAC – Value Addition Course	**TA -** Teacher's Assessment
	DSE - Discipline Specific Electives	**A –** Attendance
	GE – Generic Elective	**L –** Lecture
	ID - Inter Departmental Elective Course	**T –** Tutorial
	C – Compulsory	**P** – Practical

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Departmental Electives University Wide Courses
Discipline Specific Electives- I

Sr. No.	Course Type	Subject Code	Subject Title/ Subject Name
1.	DSE	MCA- 6206 (i)	Artificial Intelligence
2.	DSE	MCA- 6206 (ii)	Mobile Computing and Wireless Networks
3.	DSE	MCA- 6206 (iii)	Information Security
4.	DSE	MCA- 6206 (iv)	Simulation and Modeling using MATLAB
5.	DSE	MCA- 6206 (v)	Theory of Computation

Inter - Departmental Electives University Wide Course

Basket of Inter- Departmental Elective courses			
Sr. No.	**Subject Code**	**Title of Subject/Subject Name**	**Credit**
1	MCA ID-6201 (i)	Search Engine Optimization	2
2	MCA ID-6201 (ii)	E – Commerce and Content Management System	2
3	MCA ID-6201 (iii)	Computer and Information Security	2
4	MCA ID-6201 (iv)	PC Assembly and Hardware	2

Post Graduate Diploma in Computer Applications and Specialization *Certificate will be awarded after completing first two semesters with minimum of* ***52 Credits*** *provided all electives passed and successful completion of 10 Credit bridge course of two-month duration, including at least 6 credit-specific internships.*

Bridge Course				
Subject Code	**Course Type**	**Subject Title/ Subject Name**	**Credits**	**Total Marks**
MCA-6210	C	Training / Internship Report and Viva-Voce	6	100
MCA-6211	C	MOOC /NPTEL/ Swayam Certification/Online Certification	4	100
Total			10	200

Note: *The bridge course Training / Internship will be based on MOOC /NPTEL/ Swayam Certification. After completion of Level 6 the candidate will have core knowledge of Computer Applications with its specialization.*

MOOC /NPTEL/ Swayam Certification/Online Certification		
Subject Code	**Course Type**	**Subject Title/ Subject Name**
MCA-6211(i)	C	Analytics Computing with Python
MCA-6211(ii)	C	Front End Web Design and development
MCA-6211(iii)	C	Big Data Analytics
MCA-6211(iv)	C	Digital Marketing

Scheme of Teaching and Examination
Master of Computer Applications (MCA)
Semester-III

Subject Code	Course Category	Subject Title/ Subject Name	Periods			Credits	Evaluation Scheme					Total
			L	T	P		ESE	Internal Assessment				
								PE	TA	A	Total	
MCA-7301	GE	Operational Research	3	0	0	3	60	20	15	05	40	100
MCA-7302	CC	Data Warehouse and Mining	3	0	0	3	60	20	15	05	40	100
MCA-7303	CC	Machine Learning	3	0	0	3	60	20	15	05	40	100
MCA-7304	SEC	Cloud Computing and Big Data	3	0	0	3	60	20	15	05	40	100
MCA-7305	DSE	DSE - II	4	0	0	4	60	20	15	05	40	100
MCA-7306	DSE	DSE - III	4	0	0	4	60	20	15	05	40	100
Labs												
MCA-7307P	CC LAB	Lab VII: Machine Learning	0	0	4	2	60	20	15	05	40	100
MCA-7308P	SEC LAB	Lab VIII: Cloud Computing and Big Data	0	0	4	2	60	20	15	05	40	100
MCA-7309	CC LAB	Lab IX: Innovative Project Identification	0	0	4	2	60	20	15	05	40	100
Total			**20**	**0**	**12**	**26**	**540**	**180**	**135**	**45**	**360**	**900**

Legends:	**CC -** Core Course	**ESE**-End Semester Examination
	SEC - Skill Enhancement Course	**PE** – Periodical Examination
	VAC – Value Addition Course	**TA -** Teacher's Assessment
	DSE - Discipline Specific Electives	**A –** Attendance
	GE – Generic Elective	**L –** Lecture
	IDE - Inter Departmental Elective Course	**T –** Tutorial
	C – Compulsory	**P** – Practical

Departmental Electives University Wide Courses
Discipline Specific Electives- II

Sr. No.	Course Type	Subject Code	Subject Title/ Subject Name
1.	CC	MCA- 7305(i)	Computer Vision
2.	CC	MCA- 7305(ii)	Application Deployment using Android
3.	CC	MCA- 7305(iii)	Ethical Hacking
4.	CC	MCA- 7305(iv)	Data Analysis Using R-Tool
5.	CC	MCA- 7205 (v)	Introduction of Quantum Computing

Discipline Specific Electives- III

Sr. No.	Course Type	Subject Code	Subject Title/ Subject Name
1.	CC	MCA- 7306(i)	Internet of Things (IoT)
2.	CC	MCA- 7306(ii)	Soft Computing
3.	CC	MCA- 7306(iii)	Compiler Design
4.	CC	MCA- 7306(iv)	Introduction to Blockchain
5.	CC	MCA- 7306(v)	Software Engineering

SCHEME OF TEACHING AND EXAMINATION
MASTER OF COMPUTER APPLICATIONS(MCA)

Semester-IV

Course Code	Course Type	Subject Title/ Subject Name	Credits	Total Marks
MCA-7401(A)	CC	**Innovative Project Design & Implementation (Industrial / In-House)**	**16**	
		(A). Synopsis		50
		(B). Mid Project Report		50
		(C). Project Seminars		50
		(D). Major Project Progress Report		50
		(E). Major Project Report		100
		(F). Major Project Viva-Voce		100
Total				**400**
or				
MCA-7401(B)	CC	**Research (Industrial / In-House)**	**16**	
		(A). Synopsis		50
		(B). Mid Research Report		50
		(C). Research Work Seminars (02)		50
		(D). Research Work Report		50
		(E). Research Work Report		100
		(F). Research Work Viva-Voce		100
Total				**400**

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HIMACHAL PRADESH TECHNICAL UNIVERSITY HAMIRPUR

Syllabus

for

MCA

(SEMESTER-I)

Amended as per NEP-2020

(w.e.f. the Academic Year 2023-2024)

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MCA-6101 Programming in C							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To cover the key features of the C language and its usage.
- To understand the C syntax and basic programming paradigms.

Unit I	**12 Lectures**
Programming Tools: Introduction to Programming, Characteristics of programming and stages in program development, Algorithms, Notations, Flowchart, and Types of programming methodologies. **Introduction of C:** Introduction, first C program, compilation and execution, C instructions, C Program Structure, Character Set, Identifiers and Keywords, Data Type- data range, size, Operator, Expressions. Unformatted and Formatted I/O function. Decision Control Structure, Loop Control Structure and Case Control Structure. Break, continue and goto statement. Storage Classes.	
Unit II	**12 Lectures**
Functions: Introduction, passing values between functions, scope rule of functions, calling convention, one dicey issue, function declaration and prototypes, call by value and call by reference. **Arrays:** array initialization, bounds checking, passing array elements to a function, pointers and arrays, array of pointers. Sorting and Searching, Character Arrays. **Pointer:** Declaration, Initialization, accessing values using pointers, Pointer expressions, and arithmetic, Operations on Pointers. Dynamic Memory Management functions, Pointers, and functions.	
Unit III	**12 Lectures**
Strings: Defining and Initializing strings, Reading and Writing strings, Processing of strings, String Library Functions -strcat(),strcpy(), strcmp(), strlen(), strrev().**Structures and Unions:** Structure declaration, definition, and initialization accessing structures in functions, Structures and Pointers, the array of structures, nested structures, Self-referential structures, and Unions.	
Unit IV	**12 Lectures**
File Structure: Categories of files, opening and closing files, file opening modes, Text, and binary files, Reading and writing in files, appending in files, Creating Header files, Preprocessor Directives, and Macros. **Miscellaneous Features:** Enumeratedata type, renaming data types with typdef, typecasting.	

Course Learning Outcomes (CLOs)

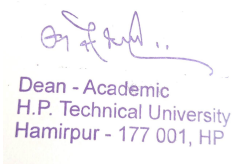
- The students would be Solve problems systematically and implement the solution in C language.
- The students would be able to develop programming skills.
- The students would be able to Develop the knowledge of how to learn a programming language which will help inlearning other computer languages in the curriculum.

Suggested Readings

- Yashwant Kanetkar, “Let us C”, BPB Publications.

Further References

- Mullis Cooper, “Spirit of C”, Jacob Publications.
- Kerninghan B.W. & Ritchie D. M., “The C Programming Language”, PHI Publications.



MCA-6102 Database Management Systems							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide conceptual as well as practical knowledge of Database, various methodologies and applications softwareused for data base management.

Unit I	**12 Lectures**
Database System Concepts and Architecture: Database applications, File Vs. DBMS approach, Purpose of database systems,Components of DBMS, Schemas and Instances, Three-Schema Architecture and Data Independence, Centralized and Client/Server Architectures. **Data Models:** Different Data Models, Entity-relationship model, constraints, ER Diagrams, ER Design issues, Weak entity sets, extended ER features, Relational Model: Constraints, Relational Database Schemas, Update Operations and Dealing with Constraint Violations.	
Unit II	**12 Lectures**
Relational Algebra: set operation, Selection and projection, renaming, Joins, Division **Relational Calculus**: Tuple relational Calculus, Domain relational calculus. **Normalization:** Functional Dependencies, Closer Method and Normalization, Types of Normalization. **SQL:** DDL and DML; Constraints, Queries, Insert, Delete and Update Statements, DCL/TCL, implementation of GRANT, REVOKE, ROLLBACK, COMMIT, SAVEPOINT, implementation of aggregate functions, Views, Stored Procedures and Functions, Database Triggers, SQL Injection.	
Unit III	**12 Lectures**
Transaction Management and Concurrency Control: Concept of Transaction, Transaction State, Implementation of atomicity and durability, concurrent execution, Serializability, Recoverability, Implementation of Isolation, testing for Serializability. **Concurrency Control:** Lock-based protocols, Timestamp based protocols, Validation based protocol. **Database security and recovery:** Database security requirements, Data Encryption, recovery and atomicity, recovery with concurrent transactions.	
Unit IV	**12 Lectures**
Distributed Databases: Distributed Databases, Data Fragmentation, Replication and Allocation Techniques, Semi Join, Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions. **Enhanced Data Models:** Temporal Database Concepts, Multimedia Databases, Deductive Databases, XML, and Internet Databases; Mobile Databases,Geographic Information Systems, Genome Data Management, Distributed Databases and Client-Server Architectures.	

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Course Learning Outcomes (CLOs)

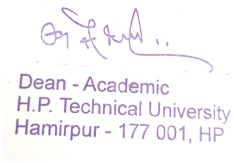
- The students will be able to understand the fundamentals of relational, object oriented and distributed databasesystems including data models, database architectures and database manipulations.
- Understand the theories and techniques in developing database applications and be able to demonstrate theability to build databases.

Suggested Readings

- Desai, B., "An Introduction to Database Concepts", Galgotia Publications, New Delhi.
- Elimsari and Navathe, "Fundamentals of Database Systems", Addison Wesley, New York.

Further References

- Date C.J., "An Introduction to Database Systems", Narosa Publishing House, New Delhi.
- Ullman, J.D, "Principals of Database Systems", Galgotia Publications, New Delhi.



MCA-6103 Computer Organization and Architecture							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide conceptual as well as practical knowledge about computer organization and architecture, instructionformat and actual data processing inside CPU.

Unit I	**12 Lectures**
Data Representation: Data Types, Number Systems and Conversion, Complements, Fixed Point Representation, Floating Point Representation, Error Detection Codes. **Computer Arithmetic**: Addition, Subtraction, Multiplication and Division Algorithms.	
Unit II	**12 Lectures**
Digital Logic Circuits and Components: Digital Computers, Logic Gates, Boolean Algebra, Map Simplifications, Combinational Circuits, Flip-Flops, Sequential Circuits, Integrated Circuits, Decoders, Multiplexers. **Register Transfer:** Register Transfer Language, Bus and Memory Transfers, Arithmetic, Logic, and Shift Micro-operations**.**	
Unit III	**12 Lectures**
Basic Computer Organization and Design: Stored Program Organization and Instruction Codes, Computer Registers. **Micro- programmed Control:** Control Memory, Address Sequencing, Design of Control Unit. **Central Processing Unit:** General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, RISC Computer.	
Unit IV	**12 Lectures**
Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA, Serial Communication. **Memory Hierarchy:** Main Memory, Auxillary Memory, Associative Memory, Cache Memory, Virtual Memory	

Course Learning Outcomes (CLOs)

- The students will be able to Know about the basic functioning of the various parts of the computer system fromhardware point of view and interfacing of various peripheral devices used with the system.
- Learn number system and various types of microoperations of processor.
- Learn the communication of various components through common bus.
- Learn how to design combinational and sequential circuits.

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Suggested Readings

- Morris M. Mano, “Computer System and Architecture”, PHI Publications.
- Stallings and Williams, “Computer Organization and Architecture”, Maxwell Macmillan.

Further References

- V. Rajaraman and Radha krishnan, “Introduction to Digital Computer Design”, PHI Publications.
- P. Pal Chowdhary, “Computer Organization and Design”, PHI Publications

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MCA-6104 Discrete Mathematical Structures							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide mathematical knowledge of statistics, probability, and number theory.

Unit I	**12 Lectures**
Mathematical Logic: Propositional and Predicate Logic, Propositional Equivalences, Normal Forms, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference. **Sets and Relations:** Sets, Description of a Set, Types of Sets, Subsets, Power Set, Venn Diagrams, Operation on Sets (Union, Intersection and Difference), Laws of Set Theory, Cartesian product of sets, Functions, Some functions, and their graphs (Identity, Polynomial, Modulus function and greatest integer function). One-One and onto functions.	
Unit II	**12 Lectures**
Counting, Mathematical Induction and Discrete Probability: Basics of Counting, Pigeonhole Principle, Permutations and Combinations, Inclusion- Exclusion Principle, Mathematical Induction, Probability, Bayes' Theorem. **Recursion:** Introduction to Recursion, Recurrence Relation, Solving Recurrence Relation, Linear Homogenous Recurrence Relation with constant coefficient and their solution	
Unit III	**12 Lectures**
Graph Theory: Simple Graph, Multi-graph, Weighted Graph, Paths and Circuits, Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, Planner graph, Graph Coloring, Bipartite Graphs, Introduction to Tree, Rooted Tree, and Binary Tree.	
Unit IV	**12 Lectures**
Spanning Tree and Group Theory: Spanning Tree, Minimum Spanning Tree, Kruskal and Prims Algorithms to find minimumspanning tree. **Group Theory:** Groups, Subgroups, Semi Groups, Product and Quotients of Algebraic Structures, Isomorphism, Homomorphism, Automorphism, Rings, Integral Domains, Fields, Applications of Group Theory.	

Course Learning Outcomes (CLOs)

- The student will be capable of using the mathematical methods and algorithms learnt for analyzing and solving problemsrelated to computer science.
- The student will get an overall view of concepts in probability and statistics.

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Suggested Readings

- Tremblay J.P. and Manohar R, “Discrete Mathematical Structure with Applications to Computer Science”.
- Kenneth H. Rosen, “Discrete Mathematics and its Applications”, McGraw Hill.
- Kolman, Dicreter, “Mathematical Structures”, Prentice Hall International.

Further References

- Liu C.L., “Elements of Discrete Mathematics”
- Murray Spiegel, John Schiller, R. Alu Srinivasan, Debasree Goswami, “Probability and Statistics”, McGraw HillEducation (India) Private Limited.

MCA-6105 Python Programming							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To introduce python programming language through its core language basics and program design techniques suitablefor modern applications

Unit I	12 Lectures
Introduction To Python: History of Python, Comparison of Python with other programming languages, Installation and Working with Python, Basics, Operators, Data Types, Python String, List and Dictionary Manipulations, Conditional and looping statements.	
Unit II	**12 Lectures**
Python Object Oriented Programming: class, object and instances Constructor, class attributes and destructors , Real time use of class in live projects ,Inheritance , overlapping and overloading operators, Multithreading **Python File Operation :** Reading config files in python ,Writing log files in python, Understanding read functions, read(), redline() and redlines(),Understanding write functions, write() and writelines(),Manipulating file pointer using seek ,Programming using file operations.	
Unit III	**12 Lectures**
Python Exception Handling: Avoiding code break using exception handling Safe guarding file operation using exception handling, Handling and helping developer with error code ,Programming using Exception handling, **GUI Programming:** Creating GUI component, Python Database Interaction SQL Database connection using python Creating and searching tables, Reading and storing config information on database , Programming using database connections .	
Unit IV	**12 Lectures**
Web Programming, Contacting User through Emails Using Python Installing smtp python module, sending email, readingfrom file and sending emails to all users addressing them directly for marketing. **Python Libraries:** Introduction to Scipy, NumPy and MatPlotLib Libraries.	

Course Learning Outcomes (CLOs)

- The students will be able to familiar with Python environment, datatypes, operators used in python.
- Compare and contrast Python with other programming languages.
- Learn the use of control structures and numerous native datatypes with their methods.
- Design user defined functions, modules and packages and exception handling methods.
- Create and handle files in python and learn object-oriented programming concepts.

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Suggested Readings

- James Payne, “Beginning Python Using python 2.6 and Python 3.1 “, Wiley Publication
- “Learning Python”, 5th edition, O’Reilly Publication.

Further References

- Paul Berry,2011, “Headfirst Python”. O’REILLY Media, Inc.
- Jeeva Jose and P. Sojan Lal, “Introduction to Computing and Problem Solving with Python”.

UHV-6100 Universal Human Values and Professional Ethics							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
2	0	0	2	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide mathematical knowledge of statistics, probability, and number theory.

Unit I	**8 lectures**
Introduction to Value Education: Right understanding, Relationship, and physical facility (holistic development and the role of education), Understanding value education, Self-exploration as the process for value education, Continuous happiness, and prosperity-the basic human aspirations exploring human consciousness, Happiness and prosperity-current scenario, Method to fulfil the basic human aspirations, Exploring natural acceptance.	
Unit II	**8 lectures**
Harmony in the Human Being: Understanding human being as the co-existence of the Self and the Body, distinguishing between the needs of the Self and the Body, Exploring the difference of needs of Self and Body, The Body as an instrument of the self-understanding, Harmony in the self-program to ensure Self-regulation and Health exploring harmony of Self with the Body.	
Unit III	**7 lectures**
Harmony in the Family and Society: Harmony in the family-the basic unit of human interaction, 'Trust'–the foundational value in relationship, Exploring the feeling of trust, 'Respect'–as the right evaluation, Exploring the feeling of respect and other feelings, Justice in human-to-human relationship, understanding harmony in the society, Vision for the universal human order, exploring systems to fulfil human goal.	
Unit IV	**7 lectures**
Ethics -definitional aspects, Nature of ethics, Scope of ethics, The philosophical basis of ethics, Family ethics, Ethics at theworkplace and professions, Relevance of ethics in society.	

Course Learning Outcomes (CLOs)

- Students will be able to understand the harmony in nature and existence and work out their mutually fulfillingparticipation in nature.
- Students will be able to relate ethical concepts and materials to ethical problems in specific professions andprofessionalism.
- Students will be made available to be aware of the types of ethical challenges.

Suggested Readings

- R R Gaur, R Asthana, G P Bagaria, The Textbook A Foundation Course in Human Values and Professional Ethics,2nd Revised Edition, Excel Books, New Delhi, 2019.
- R R Gaur, R Asthana, G P Bagaria, The Teacher's Manual Teachers' Manual for A Foundation Course in HumanValues and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019.
- R. R. Gaur, R. Sangal, G. P. Bhagaria, A Foundation Course in Value Education, Excel Books Publisher.

Further References

- Ek Parichaya, A Nagaraj, Amar Kantak, Jeevan Vidya, Jeevan Vidya Prakashan, 1999.
- A.N. Tripathy, 2003, Human Values, A Foundation Course in Human Values and Professional Ethics, New AgeInternational Publishers.
- Mohandas Karamchand Gandhi, The Story of My Experiments with Truth.

MCA-6106P Lab I: C Programming Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Course Objectives (COs)

- To introduce the students to the field of programming using C language.

Total Lab Hours: 40 (Max)

Suggested List of Practical

Topics:

1. Data Types and Operator
2. Input/output Functions
3. Decision making and Looping Statements
4. Functions and Functions Parameter Passing
5. Array and
6. Strings
7. Structures
8. Union
9. File Handling
10. Console Input/Output
11. File opening modes, string I/O in files,
12. Record I/O in files,
13. Text files and binary files,
14. Using argc and argv.
15. Enumerated data type.

Course Learning Outcomes (CLOs)

- The students will be able to develop adequate programming skills.
- Understand the logic building used in programming.
- Students should be able to write algorithms for solving various real-life problems.
- To convert algorithms into programs using C.

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MCA-6107P Lab II: DBMS Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Course Objectives (COs)

- To design and implement a database schema for a given problem domain.
- To define and manipulate databases through MySQL/Oracle and proficient in query handling by usingMySQL/Oracle.

Total Lab Hours: 40 (Max)

Suggested List of Practical

Topics:

1. Data Definition Language
2. Data Manipulation Language
3. Data Control Language
4. Transaction Control Language
5. Constraints
6. Clauses and Sub queries
7. Views
8. Stored Procedures and Functions
9. Database Triggers
10. SQL Injection.

Course Learning Outcomes (CLOs)

- The students will be able to Understand various queries and their execution.
- Populate and query a database using SQL DML / DDL commands.
- Declare and enforce integrity constraints on a database.
- Able to design new databases and modify existing ones for new applications and reason about the efficiency of the result.

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MCA-6108P Lab III: Python Programming Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Course Objectives (COs)

- To acquire programming skills in core python for developing desktop GUI applications, websites, and webapplications.

Total Lab Hours: 40 (Max)

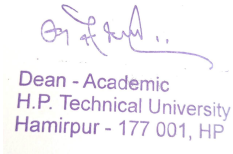
Suggested List of Practical

Topics:

1. Operators, Data Types, Python String, Conditional and looping
2. Object Oriented Programming
3. File Operation
4. Exception Handling
5. GUI Programming
6. Web Programming
7. Python Libraries
8. Python Database Interaction SQL Database

Course Learning Outcomes (CLOs)

- The students will be able to Solve simple to advanced problems using Python language.
- Develop Logic of various programming problems using numerous datatypes and control structures of Python.
- Implement different data structures.
- Implement modules and functions.
- Implement file handling.



HIMACHAL PRADESH TECHNICAL UNIVERSITY
HAMIRPUR

Syllabus

for

MCA

(SEMESTER-II)

Amended as per NEP-2020

(w.e.f. the Academic Year 2023-2024)

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MCA-6201 Data Structures Using C							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide conceptual as well as practical knowledge of Programming approach and data structures alongwith C language.

Unit I	**12 Lectures**
Data Structure: Definition, Basic Concepts, ADT, Type of data Structure. **Complexity of algorithms:** asymptotic notations for complexity, control structures. **Array:** Definition, searching, traversal, insertion, deletion operation, concatenation, and merging of two arrays, application, and implementation of Array. Memory Allocation, Single and Multidimensional Array, Addressing Scheme, Sparse Matrices, Polynomial representation.	
Unit II	**12 Lectures**
Link List: Dynamic memory Allocation, Single Linked and multiply linked list- Different operations, Circular linked lists, Linked lists as an ADT. **Stack and Queue**: Definition, representation, Operation, application and implementation, implementation of queues using sequential and linked representation. **Trees:** Forest, Binary Tree, Threaded Binary Tree, BinarySearch Tree, AVL Tree, B Tree, B+ Tree.	
Unit III	**12 Lectures**
Graphs: Terminology of graphs, Traversing, Shortest Path Algorithms, depth-first search, breadth-first search. Algorithmcomplexity, time-space trade-off between algorithms **Asymptotic notations:** Big- O, omega, theta.	
Unit IV	**12 Lectures**
Sorting and Searching: Selection sort, Bubble sort, Merge sort, Radix sort, Quick sort, Sequential search, linear and binary search, and their complexity.	

Course Learning Outcomes (CLOs)

- The students will be able to Implement various basic data structures and its operations.
- Use algorithmic foundations for solving problems and programming.
  Apply appropriate searching and/or sorting techniques for application development.

Suggested Readings

- T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford Stein. "Introduction to Algorithms, Prentice Hall India.
- Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++," Pearson.

Further References

- T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford stein, "Introduction to Algorithms", second edition, PrenticeHall India, 2009.
- Sara. Basse, Allen Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", Pearson

MCA-6202 Java Programming							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide conceptual as well as practical knowledge of Object-Oriented Programming approach and datastructures along with Java programming language tools.

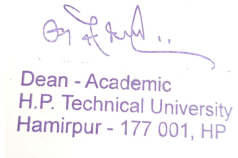
Unit I	**12 Lectures**
Introduction: Object Oriented Programming, History and Basics of Java, JDK, JRE, JVM, Java Data Types, Operator, basic of Java and its fundaments, conditional & looping, working with arrays and strings, String, String Buffer, and String Builder classes. **Introduction of Classes:** Fundamental of Classes and Methods, Constructors, Overloading Methods.	
Unit II	**12 Lectures**
Extending Classes and Inheritance: Fundamental of Inheritance, Type of Inheritance, Interfaces, implementing multiple inheritance using interface, built in package, creating own package. **Exception Handling:** Exception Handling basics, try, catch and finally, throw and throws clause. **Multithreading Programming:** implementing multithreading, life cycle of a thread,thread communication, suspending, resuming, deadlock and stopping threads, handling exceptions during multithreading.	
Unit III	**12 Lectures**
Working with Abstract Windows Toolkit: Creating GUI in Java Using AWT, Working with Frame and Text, GUI Components, Menus and Layout Managers. **Java Swings:** Java Foundation Classes, Hierarchy of Java Swing classes, Swing components, JButton class, JRadioButton class, JTextArea class, JComboBox class, JTable class, JColorChooser class, JProgressBar class, JSlider class.	
Unit IV	**12 Lectures**
Event Handling: Introduction, Event Classes, and Listener Interfaces. **Accessing Databases with JDBC:** Installing MySQL,Setting up a MySQL User Account, Manipulation Databases with JDBC, RowSet Interface, ResultSet.	

Course Learning Outcomes (CLOs)

- The students will be able to learn about object-oriented programming language and database programmingusing java.
- To handle abnormal termination of program using exception handling.
- To design user interface using swing.
- To develop applications using multithreading

Suggested Readings

- R. Nageswara Rao, "Core Java an integrated approach", Dreamtech Press.
- Paul Deitel, Harvery Deitel, "Java How to Program", PHI New Delhi.



Further References

- The Complete Reference JAVA by Herbert Schildt, TMH Publication.
- Beginning JAVA, Ivor Horton, WROX Public.

MCA-6203 Operating System							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide conceptual as well as practical knowledge about Operating system (Windows and Linux).

Unit I	**12 Lectures**
Basics of Operating Systems: Operating System Structure, Operations and Services, Types, System Calls, Operating System Design and Implementation, System Boot. **Process Management:** Process control block, Context switching, Process Scheduling and Operations. **Threads:** Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.	
Unit II	**12 Lectures**
CPU Scheduling: Introduction, Types of scheduling, Scheduling Criteria and Algorithms, Thread Scheduling, Multiple Processor Scheduling, Real-Time CPU Scheduling. **Deadlocks:** Deadlock Characterization, Methods for handling deadlocks, Deadlock Prevention, Deadlock avoidance, Recovery from Deadlock. **Inter-process Communication:** Communication in Client–Server Systems, Process Synchronization, Critical-Section Problem, Peterson's Solution, Semaphores, Synchronization.	
Unit III	**12 Lectures**
Memory Management: Contiguous Memory Allocation, Swapping, Paging, Segmentation, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files. **Disk Management:** Disk structure, disk scheduling, FCFS scheduling, SSTF scheduling, SCAN scheduling, **Security:** Protection, Access Matrix, Access Control, System and Network Threats.	
Unit IV	**12 Lectures**
Linux Operating Systems: Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output; Inter-process Communication, Network Structure**. Windows Operating Systems:** Design Principles, System Components, Terminal Services and Fast User Switching; File System, Networking.	

Course Learning Outcomes (CLOs)

- The students will be able to Discuss the evaluation of operating systems.
- Explain different resource managements performed by operating system.
- Describe the architecture in terms of functions performed by different types of Operating system.
- Analyze the performance of different algorithms used in design of operating system components.

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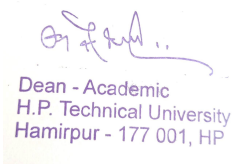
Suggested Readings

- .Silberschatz, Galvin, “Operating System Concepts”, Addison Wesley Publishing Company.
- Tanenbaum, A.S., “Modern Operating System”, Prentice Hall of India Pvt. Ltd.

Further References

- William Stallings, “Operating Systems”, Macmillan Publishing Company.
- Deitel H.M., “An Introduction to Operating System”, Addison Wesley Publishing Company.



MCA-6204 Computer Networks							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide knowledge about various protocols and layers used in Computer Networks and basics of variouscommunication mechanisms used to send and receive data.

Unit I	**12 Lectures**
Introduction: Data Communication, Network Components. **OSI Reference Model**: Layered architecture, Functions of layers,TCP/IP reference model, Comparison of OSI & TCP/IP models. Internet, frame relay, ATM, Ethernet, Wireless LAN. **Physical layer**: Theoretical basis for data communications, bandwidth limited signals, maximum data rate of a channel, Public switched telephone networks, mobile telephone system.	
Unit II	**12 Lectures**
Data Link and Mac Layer: Design issues, framing techniques, Flow control, Error Control, **Data link Control and Protocols**: Simplest Protocol, Stop-and-Wait Protocol, Stop-and-Wait ARQ, Go-Back-N ARQ, and Selective Repeat ARQ Protocol, HDLC Protocol, and PPP Protocol, Multiple Access Random Access, Controlled Access, Channelization, **IEEE standards**: 802.3,802.4, 802.5, 802.11, 802. 15.	
Unit III	**12 Lectures**
Network and transport Layer: Network layer design issues, Routing algorithms-shortest path routing, flooding, distance vector routing, link state routing, hierarchical routing, broadcast routing, multicast routing, routing for mobile hosts, **Congestion Control algorithms**: congestion prevention policies, congestion control in virtual circuit and datagram sub-networks, definitionof quality of service.	
Unit IV	**12 Lectures**
Internetworking: Tunneling, internet-work routing, fragmentation, Network layer in Internet: IP protocol, IP Address, OSPF,BGP, Internet multicasting, Mobile IP, Ipv6. **Transport Layer**: Concept of transport service, elements of transport protocols, a simple transport protocol, Remote procedure call, **Application layer services protocols**: DNS, SMTP, FTP, TELNET, HTTP, WWW. Case study: Study of various network simulators, Network performance analysis using NS2.	

Course Learning Outcomes (CLOs)

- The students will be able to familiar with different Network Models.
- Understand different network technologies and their application.
- Update with different advanced network technologies that can be used to connect different networks.

Suggested Readings

- . Kanti Swarup, P.K. Gupta and Manmohan, “Operations Research”, Sultan Chand & Sons. New Delhi.
- V.K. Kapoor, “Operation Research”, Sultan Chand and sons, New Delhi.

Further References

- H.A. Taha, “Operation Research - An Introduction”, Macmillan Publications.
- S.D. Sharma, “Operation Research”, Kedar Nath Ram Nath and Company, Meerut.

MCA-6205 Web Technologies (Node.js and MongoDB)							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide conceptual as well as practical knowledge of web-development Languages and web-designing tools.

Unit I	**12 Lectures**
Introduction: Internet, Internet Protocol, HTML, HTML Tags, Introduction to HTML5, New elements, Video/DOM, Audio, Drag and Drop, Canvas/SVG, App Catch, SSE and Tags. Styling Pages (CSS), CSS Properties, Box Model. **Introduction to server:** Types of Servers, Types of virtual server, Installing and configuring Web server (Apache/Tomcat/Glassfish/IIS). **Introduction to Java Script:** Basic functions, validating form using JavaScript, Enhancing form with JavaScript, JavaScript Libraries.	
Unit II	**12 Lectures**
Introduction: Node Js: Advantages, Disadvantages, How Node Js works, Node JS, Node.js Process Model, Traditional web server & its limitations, Install Node.js on Windows, Working in REPL, Node JS Console, **Node Js Modules:** Functions, Buffer, Module, Core Modules, Local Modules, Module Types & Modules Exports **Node Package Manager:** What is NPM, Installing Packages Locally, adding dependency in package json, installing package globally, Updating packages. **Creating Web Server:** Creating Web Server, Handling http requests, Sending Requests.	
Unit III	**12 Lectures**
Introduction to File System: Fs. read File, writing a File, writing a file asynchronously, opening a file, Deleting a file. **Debugging Node JS Application:** Core Node JS Debugger. **Event Handling:** Event Emitter class, returning event emitter, Inheriting Events, Serving Stating Files, Middleware and Firmware and its working.	
Unit IV	**12 Lectures**
Database connectivity: Introduction of MongoDB, Installing MongoDB, creating a Local Database, **CRUD: Creating Documents, CRUD:** Updating Documents, CRUD: Deleting Documents, Using Compass App for CRUD Operations, creatinga Hosted Database, Connecting to Our Hosted Database.	

Course Learning Outcomes (CLOs)

- The students will be able to learn about basic HTML and CSS.
- Learn about various servers.
- Learn JavaScript to program the behaviour of web pages.
- Design and develop web applications using Node.js.
- Create and connect mongo DB to web applications.

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Suggested Readings

- Robert Sebesta, “Programming with World Wide web” Pearson.
- John Duckett, “Beginning with HTML, XHTML, CSS and JavaScript” Wiley Wrox

Further References

- Deitel and Deitel, “XML How to Program”, Pearson.
- Shroff, “Dreamweaver CS6 the Missing Manual”, Publishers and Distributors.

MCA-6206(i) Artificial Intelligence							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
4	0	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To introduce core topics of knowledge representations, reasoning, and learning, all from the perspective ofprobabilistic method, natural language Processing etc.

Unit I	**15 Lectures**
Approaches to AI: Turing Test and Rational Agent Approaches; State Space Representation of Problems, Heuristic Search Techniques, Game Playing, Min-Max Search, Alpha Beta Cutoff Procedures. **Knowledge Representation:** Logic, Semantic Networks, Frames, Rules, Scripts, Conceptual Dependency and Ontologies, Expert Systems, Handling Uncertainty in Knowledge.	
Unit II	**15 Lectures**
Planning: Components of a Planning System, Linear and Non-Linear Planning; Goal Stack Planning, Hierarchical Planning,STRIPS, Partial Order Planning. **Natural Language Processing:** Grammar and Language; Parsing Techniques, Semantic Analysis and Pragmatic's.	
Unit III	**15 Lectures**
Multi Agent Systems: Agents and Objects; Agents and Expert Systems; Generic Structure of Multi-agent System, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies, Agent Development Tools**.**	
Unit IV	**15 Lectures**
Genetic Algorithms (GA): Encoding Strategies, Genetic Operators, Fitness Functions and GA Cycle; Problem Solving using GA. **Artificial Neural Networks (ANN):** Supervised, Unsupervised and Reinforcement Learning; Single Perceptron, Multi-Layer Perceptron, Self-Organizing Maps, Hopfield Network.	

Course Learning Outcomes (CLOs)

- The students will be able to gain a historical perspective of AI and its foundation.
- Understand basic concepts of AI, early developments in this field, basic knowledge representation, problem solvingand learning methods of AI.

Suggested Readings

- . Nils J. Nilson, "Principles of Artificial Intelligence", Narosa Publishing Co.
- B. Yegnanrayana, "Artificial Neural Networks", PHI Publication.

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Further References

- E. Rich and K. Knight," Artificial Intelligence", Tata McGraw Hill.
- E. Charnaik and D. McDermott," Introduction to artificial Intelligence", Addison- Wesley Publishing.

MCA-6206(ii) Mobile Computing and Wireless Network							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
4	0	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To identify the basics problems, strengths and current trends of mobile computing.

Unit I	**15 Lectures**
Introduction: issues in mobile computing, overview of wireless telephony: cellular concept, GSM, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS. **Wireless LAN Overview:** MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications.	
Unit II	**15 Lectures**
Mobile IP: WAP Architecture, protocol stack, application environment, applications. Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks. **Introduction to Adhoc networks:** definition,characteristics, applications. Characteristics of Wireless channel, Adhoc Mobility Models: - Indoor and outdoor models.	
Unit III	**15 Lectures**
MAC Protocols: design issues, goals, and classification. Contention based protocols-with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15.	
Unit IV	**15 Lectures**
Routing: Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energy aware routing algorithm, Hierarchical Routing, **End-End Delivery and Security Transport layer:** Issues in designing-Transport layer classification, adhoc transport protocols.	

Course Learning Outcomes (CLOs)

- The students will be able to understand the interface of mobile computing systems to hardware and networks.
- Design applications on mobile computing systems interacting with servers and database systems.

Suggested Readings

- Frank Adelstein, S.K.S. Gupta, Golden G. Richard III, and Loren Schwiebert, "Fundamentals of Mobile andPervasive Computing", McGraw-Hill Professional.
- David Taniar, "Mobile Computing: Concepts, Methodologies, Tools, and Applications".

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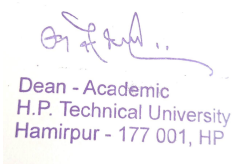
Further References

- Feng Zhao, Leonidas Guibas “Wireless Sensor Networks-An Information Processing Approach”. MorganKauffman.
- Siva-RAM-Murthy, Ad-Hoc Wireless Networks - Architectures and Protocols, Addison-Wesley.



MCA-6206(iii) Information Security							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
4	0	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide an understanding of principle concepts, major issues, technologies and basic approaches in Informationsecurity.

Unit I	**15 Lectures**
Introduction: Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, Security Architecture for Open Systems, Computer Security Trends, Computer Security Strategy. **Computer Security Technology and Principles:** Cryptographic Tool, Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management	
Unit II	**15 Lectures**
Practical Application: Encryption of Stored Data, User Authentication, Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication. **Access Control:** Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, Example: UNIX File Access Control, Role-Based Access Control.	
Unit III	**15 Lectures**
Database Security: The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Database Encryption. **Denial-of Service Attacks:** Denial-of-Service Attacks, Flooding Attacks, Distributed, Denial-of-Service Attacks, Application-Based, Bandwidth Attacks, Reflector and, Amplifier Attacks, Defenses Against.	
Unit IV	**15 Lectures**
Physical and Infrastructure Security: Overview, Physical Security Threats, Physical Security Prevention and MitigationMeasures, Recovery from Physical Security Breaches. **Example:** A Corporate Physical Security Policy, Integration of Physicaland Logical Security.	

Course Learning Outcomes (CLOs)

- The students will be able to be familiar with how threats to an organization are discovered analyzed, anddealt with.
- Familiar with advanced security issues and technologies.

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Suggested Readings:

- Computer Security: Principles and Practice 2nd Edition, By W. Stallings, Prentice Hall.
- Information Security: Principles and Practice, By M. Stamp, Wiley.

Further References:

- Principles of Information Security, By M.E. Whitman and H.J. Mattord, Course Technology.
- Computer Security: Art and Science, By M. Bishop, Addison Wesley.

MCA-6206(iv) Simulation and Modeling Using MATLAB							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
4	0	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide conceptual as well as practical knowledge of various simulation and modeling tools and techniques.

Unit I	**15 Lectures**
Introduction: Definitions of Modeling and Simulation, when to apply these techniques, Its Applications, Terminology & Components, Discrete vs. Continuous time, Process flow in simulation study. **Simulation Examples:** Queuing systems, Communications networks General Principles: Event - driven simulation, World Views, List processing.	
Unit II	**15 Lectures**
Simulation software: History, Selection process, Simulation in High Level Language (C, C++, Pascal, Fortran), Simulation packages (MATLAB/Simulink), Interpreted vs. compiled simulators, Future trends. **Statistical models:** Terminology and Concepts, Useful Statistical Models. **Distributions Queuing models:** Characteristics, Performance Measures, Steady-State Behavior, Networks of Queues.	
Unit III	**15 Lectures**
Random Number Generation: Properties of Random Numbers, Generation of Pseudo-Random Numbers, Testing for Randomness, Pitfalls. **Random Variate Generation:** Inverse Transform, Direct Transform, Convolution, Accept-Reject Input Modelling: Collecting Data, Identifying Distribution, Histograms, Parameter Estimation, Goodness-of-Fit, Selecting Input Model without Data.	
Unit IV	**15 Lectures**
Verification and Validation of Simulation Models: Model Building, Verification, and Validation, Verification of Simulation Models, Calibration and Validation of Models. **Output Analysis:** Types of Simulations with Respect to Output Analysis, Stochastic Nature of Output Data, Measures of Performance.	

Course Learning Outcomes (CLOs)

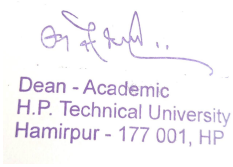
- The students will be able to understand various simulation software.
- Understand the verification and validation of simulation model.

Suggested Readings:

- Agam Kumar Tyagi, "MATLAB and Simulink for Engineers", Oxford University.
- Bansal/Goel/Sharma," MATLAB and its Applications in Engineering", Pearson India.

Further References:

- Brian R. Hunt, “A Guide to MATLAB for Beginners and Experienced Users”, Cambridge.
- Y. Kirani Singh, “MATLAB Programming”, PHI.



MCA-6206(v) Theory of Computation							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
4	0	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To provide conceptual as well as practical knowledge of Automata theory and various other theories used incomputation.

Unit I	**15 Lectures**
Introduction to theory of computation: Finite state automata – description of finite automata, Properties of transition functions, Designing finite automata, NFA, 2-way finite automata, equivalence of NFA and DFA, Mealy and Moor machine.	
Unit II	**15 Lectures**
Finite automata with epsilon move, Minimization of FSA. Regular sets and regular grammars, regular expressions, pumping lemma for regular languages, closure properties of regular sets and regular grammars, Application of finite automata, Decision algorithms for regular sets, Chomsky classification of languages.	
Unit III	**15 Lectures**
CFGs, Derivation trees, ambiguity, simplification of CFLs, normal forms of CFGs, pumping lemma for CFGs, decision algorithms for CFGs, designing CFGs, PDA – formal definition, examples of PDA, PDA and CFG, Chomsky.	
Unit IV	**15 Lectures**
Turing machines: basics and formal definition: Language acceptability by TM, examples of TM, variants of TMs – multitape TM, NDTM, Universal Turing Machine, offline TMs, Equivalence of single tape and multitape TMs, recursive and recursively enumerable languages, decidable and undecidable problems – examples, halting problem.	

Course Learning Outcomes (CLOs)

- The students will be able to understand the basic ideas of Theory of Computation.
- Understand the formal Grammar and its types.

Suggested Readings

- Hopcroft and Ullman., Introduction to Automata Theory, Languages and Computation. 2nd ed., PearsonEducation.
- Zvi Kohai., Switching and Finite Automata Theory, Tata McGraw Hill

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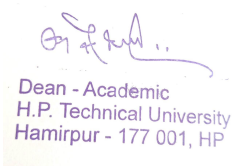
Further References

- Manna, Mathematical theory of computation –McGraw Hill
- Peter Linz., Introduction to Formal Languages and Automata Theory, NarosaPublishing., 1997.



IKS-6200 Indian Knowledge System							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
2	0	0	2	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs):

- To equip the students with the knowledge and understanding related to Indian knowledge systems, origin,evolution, and the approaches used in ancient and modern times.
- To promote the youths to do research in the various fields of Bhāratīya knowledge system.

Unit I	**08 Lectures**
Bhāratīya Civilization and Development of Knowledge System: Genesis of the land, On the trail of the Lost River, Discovery of the Saraswatī River, The Saraswatī-Sindhu civilization, Traditional knowledge system, The introduction to Vedas, Main Schools of Philosophy (6+3), Ancient education system, The Takṣaśilā University, The Nālandā University, Alumni, Knowledge export from Bhārata.	
Unit II	**08 Lectures**
Arts, Literature and Scholars: Art, Music, and Dance, Naṭarāja– A masterpiece of Bhāratīya Art, Literature, Life and works of Agastya, Lopāmudrā, Ghoṣā, Vālmīki, Patañjali, Vedavyāsa, Yājňavalkya, Gārgī, Maitreyī, Bodhāyana, Caraka, Suśruta, Jīvaka, Kaṇāda, Patañjali, Kauṭīlya, Pāṇini, Thiruvalluvar, Āryabhaṭa, Varāhamihira, Bhāskarācārya, Mādhavācārya.	
Unit III	**08 Lectures**
Engineering, Science and Management: Engineering, science and technology in the Vedic Age, Post-Vedic period and Saraswatī-Sindhu civilization, Concept of matter, life and universe, Bhāratīya Kāla-gaṇanā, Concepts of Zero, Pi and number system, Vedic Mathematics, Āyurveda, Astronomy in India, Agriculture in India, Water Management in India, Trades in Ancient India, Seals, Coins and Marine Technology.	
Unit IV	**06 Lectures**
Cultural Heritage and Indian Traditional Practices: Temple architecture in ancient India, Sculptures, Theatre, Drama and Martial arts traditions, Fairs and festivals, Yoga, Integrated approach to healthcare, Approaches and strategies to the protection and conservation of environment.	

Course Learning Outcomes (CLOs)

- The students will be able to understand and appreciate the rich heritage that resides in our traditions.
- The students will be able to improve mindfulness and more maturity leading to an effective process of learning.
- The students will be able to create awareness amongst the youths about the true history and rich culture of the country.

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Suggested Readings

- Bhag Chand Chauhan, IKS: The Knowledge of Bharata, Garuda Prakashan, 2023.
- Pradeep Kohle et. Al. Pride of India- A Glimpse of India's Scientific Heritage edited by Sanskrit Bharati, 2006.
- Keshav Dev Verma, Vedic Physics, Motilal Banarsidass Publishers, 2012.
- Suresh Soni, India's Glorious Scientific Tradition, Ocean Books Pvt. Ltd., 2010.
- Sibaji Raha, et al, History of Science in India Volume-1, Part-I, Part-II, Volume VIII, National Academy ofSciences, India and The Ramkrishna Mission Institute of Culture, Kolkata, 2014.

MCA- 6207P Lab IV: Data Structures Using C Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Course Objectives (COs)

- To design and implement various algorithms of data structure.

Total Lab Hours: 40 (Max)

Suggested List of Practical

Topics:

- Array
- Stack
- Link Lists (linear, circular, doubly linked, inverted)
- Queues (Simple, Circular Queue, Priority Queue)
- Different Trees, Binary Search Trees
- Graph Implementation, Graph traversals
- Different File Organization
- Sorting and Searching

Course Learning Outcomes (CLOs)

- The students will be able to Implement various basic data structures and its operations.

MCA- 6208P Lab V: Java Programming Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Course Objectives (COs)

- To implement java applications and programs with both Command line and GUI.

Total Lab Hours: 40 (Max)

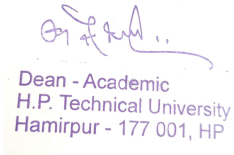
Suggested List of Practical

Topics:

1. Operators, Control Structure and looping, Array and String
2. Classes and Methods, Constructors, Overloading Methods
3. Exception Handling
4. Extending Classes and Inheritance
5. Working with Abstract Windows Toolkit
6. Java Swings
7. Multimedia Applications
8. Event Handling
9. Event Classes and Listener Interfaces
10. Accessing Databases with JDBC

Course Learning Outcomes (CLOs)

- The students will be able to develop applications to solve real world problems using Java.
- Implement core java program to solve simple problems.



MCA-6209P Lab VI: Web Technologies (Node.js and MongoDB) Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Course Objectives (COs)

- To design web pages by using HTML, JavaScript, Node.js and MongoDB.

Total Lab Hours: 40 (Max)

1. Basic to design Form in HTML
2. Styling Pages
3. Installing and configuring Web Servers
4. Design form in JavaScript
5. Event Handling in JavaScript
6. Install Node.js on windows.
7. Installing Mongo DB
8. Creating hosted database
9. Connecting to our hosted database

Course Learning Outcomes (CLOs)

- The students will be able to learn about basic HTML and CSS.
- Learn about various servers.
- Learn JavaScript to program the behavior of web pages.
- Design and develop web applications using Node.js.
- Create and connect mongo DB to web applications.

MCA-6210 Training / Internship Report and Viva)							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2 Months	6	Minimum Marks: 40	Minimum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions: For External Examiner: 60% marks (60 marks) will be awarded based on practical implementation and Internship Report in final practical examination and remaining 40% marks (40 marks) will be awarded based on viva-voceand written script.

MCA- 6211 MOOC/NPTEL /Swayam Certification/Online Certification							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2 Months	4	Minimum Marks: 40	Minimum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions: For External Examiner: 60% marks (60 marks) will be awarded based on practical implementation and Internship Report in final practical examination and remaining 40% marks (40 marks) will be awarded based on viva-voceand written script.

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MCA-6211(i) Analytics Computing with Python							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
4	0	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To analyse different types of data using Python.

Unit I	**15 Lectures**
Python Fundamentals for Data Analysis: Python data structures, Control statements, Functions, Object Oriented programming concepts using classes, objects and methods, Exception handling, Implementation of user-defined Modules andPackage, File handling in python.	
Unit II	**15 Lectures**
Data Understanding and Preprocessing: Knowledge domains of Data Analysis, understanding structured and unstructureddata, Data Analysis process, Dataset generation, Importing Dataset: Importing and Exporting Data, Basic Insights from Datasets, Cleaning and Preparing the Data: Identify and Handle Missing Values.	
Unit III	**15 Lectures**
Data Processing and Visualization: Data Formatting, Exploratory Data Analysis, Filtering, and hierarchical indexing using Pandas. Data Visualization: Basic Visualization Tools, Specialized Visualization Tools, Seaborn Creating and Plotting Maps	
Unit IV	**15 Lectures**
Mathematical and Scientific applications for Data Analysis: NumPy and SciPy Package, Understanding and creating N-dimensional arrays, Basic indexing and slicing, Boolean indexing, Fancy indexing, Universal functions, Data processing using arrays, File input and output with arrays.	

Course Learning Outcomes (CLOs)

- The students will be able to prepare data for analysis, perform simple statistical analysis, create meaningful datavisualizations, and predict future trends from data.

Suggested Readings

- David Ascher and Mark Lutz, Learning Python, Publisher O'Reilly Media.
- Reema Thareja, "Python Programming using Problem Solving approach", Oxford University press.
- Wes Mckinney "Python for Data Analysis", First edition, Publisher O'Reilly Media.

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Further References

- Allen Downey, Jeffrey Elkner, Chris Meyers, Learning with Python, Dreamtech Press
- David Taieb," Data Analysis with Python: A Modern Approach "1st Edition, Packt Publish

MCA-6211(ii) Front End Design and Development							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
4	0	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To design various interactive websites, user interactive applications using HTML, CSS, and JavaScript.

Unit I	**15 Lectures**
Introduction: Internet, Internet Protocol, HTML, HTML Tags, Introduction to HTML5, New elements, Video/DOM, Audio, Drag and Drop, Canvas/SVG, App Catch, SSE and Tags. Styling Pages (CSS), CSS Properties, Box Model. Introduction to Dreamweaver: Dreamweaver tools, Image Processing Tools.Frames, Working with Hyperlinks, Images and Multimedia,Working with Forms, and controls.	
Unit II	**15 Lectures**
Styling Pages (CSS): Introduction, CSS Properties, Box Model. XML: XML Schema, Custom Markup Language. Introductionto server: Types of Servers, Types of virtual server, **Installing and configuring Web** server (Apache/Tomcat/Glassfish/IIS.	
Unit III	**15 Lectures**
Introduction to Java Script: Basic functions, validating form using JavaScript, Enhancing form with JavaScript, JavaScriptLibraries.	
Unit IV	**15 Lectures**
PHP: Overview of server-side scripting, phpinfo (), Form handling, File handling, cookies, Session Tracking; Database access using PHP and MySQL: Connecting to database-server, selecting database, creating query, reading records from database,storing records in database.	

Course Learning Outcomes (CLOs)

- The students will be able to construct responsive website using HTML, CSS, and JavaScript.
- To connect a web application to backend server data.

Suggested Readings

- Robert Sebesta, "Programming with World Wide web" Pearson.
- John Duckett, "Beginning with HTML, XHTML, CSS and JavaScript" Wiley Wrox

Further References

- Deitel and Deitel, "XML How to Program", Pearson.
- Shroff, "Dreamweaver CS6 the Missing Manual", Publishers and Distributors.
- "Adobe Dreamweaver CS room In a Book", Person.
- "Photoshop CC The Missing Manual", Shroff Publishers and Distributors.

MCA-6211(iii) Big Data Analytics							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
4	0	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To make students comfortable with tools and techniques required in handling large number of datasets**.**

Unit I	**15 Lectures**
Introduction to Big Data and Hadoop: Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analyzing Data with Unix tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere Big Insights and Big Sheets.	
Unit II	**15 Lectures**
HDFS (Hadoop Distributed File System): The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro, and **File-Based Data structures**. Map Reduce: Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce FeaturesValues.	
Unit III	**15 Lectures**
Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators**. Hive:** Hive Shell, Hive Services, Hive Megastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. **HBase:** HBasics, Concepts, Clients, Example, HBase Versus RDBMS. Big SQL.	
Unit IV	**15 Lectures**
Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.	

Course Learning Outcomes (CLOs)

- To Understand the Big Data Platform and its analytics in the real world.
- Analyze the Big data framework like Hadoop to efficiently store and process big data to generate analytics.

Suggested Readings

- Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reily Media.
- Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley.

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Further References

- Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer.
- Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC Press.

MCA-6211(iv) Digital Marketing

Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
4	0	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- Being SMART (specific, measurable, achievable, relevant and time related so that people can withstand againstcompetitors.
- To provide conceptual as well as practical knowledge of Automata theory and various other theories used in computation.

Unit I	**15 Lectures**
HTML: Introduction, HTML5, Audio Elements, Video Elements, Organizing Elements. **Scripting Documents:** Dynamic Document content, Document properties, Legacy DOM, Document Collections, Overview of the W3C DOM, traversing a Document, Finding Elements in a Document, modifying a Document, Adding Content to a Document Example.	
Unit II	**15 Lectures**
Cascading Style Sheets and Dynamic HTML: Overview of CSS, CSS for DHTML Scripting inline Styles, Scripting computed styles, Scripting CSS Classes, Scripting Style Sheets, Java Script, and XML: Obtaining XML Documents, Manipulating XML with the DOM API, Transforming XML with XSLT querying XML with X path, Serializing XML, Example, XML and Web services.	
Unit III	**15 Lectures**
Search Engine Optimization (SEO): Searching Engine Marketing, Search Engine Optimization, Measuring SEO Success, Mapping with SEO Journey, Search Advertising: Online Advertising Payment Models, Search Advertising (Desktop & Mobile Devices), Planning & Executing a search Advertising Camping, Strategic Implications of Advertising on the search Network.	
Unit IV	**15 Lectures**
E-Mail Marketing: E-Mail Marketing in India, what is E-Mail Marketing? E-Mail Marketing Strategy, Executing E-MailMarketing, Internet Marketing: Internet Marketing Strategy, Content Marketing, Content Marketing in India.	

Course Learning Outcomes (CLOs)

- The students will be able to explain about web pages with basic HTML tags using CSS and XML
- Demonstrate advanced practical skills in common digital marketing tools such as SEO.

Suggested Readings

- The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable OnlineCampaigns, Ian Dodson, Wiley, 2016
- Programming the World Wide Web, Robet W Sebesta, Pearson, 8th edition, 201

Further References

- Fundamentals of Digital Marketing, Second Edition, Pearson Paperback, 2019.
- Internet Marketing- A Practical approach in the India Context by Moutusy Maity, Oxford.
- Java Script: The Definite Guide David Flanagan, O' Reilly Publisher.

MCA ID-6201 (i) Search Engine Optimization

Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
2	0	0	2	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To learn the basic concepts of paid advertising, social media, and other online platforms can generate traffic to websites, most of the online traffic is driven by search engines.

Unit I	**08 Lectures**
Internet & SEO Basics: Definition, Domain, Knowledge of World Wide Web, Difference between Portals and Search Engines, Types of SEO Techniques, Black Hat Technique & White Hat Technique, Working of Search Engine, Various SEO Tools, Website Design SEO guidelines.	
Unit II	**08 Lectures**
SEO Research & Analysis: Market Research, Keyword Research & Analysis, Keyword Opportunity, Competitors Website Analysis, SWOT Analysis of Website, Tools available for keyword research, Ways to choose best keywords, Website analysis using various SEO Tools.	
Unit III	**07 Lectures**
On Page SEO: On page optimization, SEO Page Title, Meta Description, Meta Keywords, Headings, Optimized Domain, Canonical Tag, Meta Tags, SEO Images, SEO internal link, Site Map, Hidden Text, Web Hosting, SEO 301 Redirect, SEO 404error.	
Unit IV	**07 Lectures**
Off Page SEO: Off Page Optimization, SEO Page Rank, Link Popularity, SEO Directory Submission, Social Bookmarks Submission, Blog Submission, Article Submission, Search Engine Submission, RSS Feed Submission.	

Course Learning Outcomes (CLOs)

- The students will be able to define search engine marketing.
- Describe the history of search engine marketing.
- Identify the elements of search engine marketing plan.
- Generate keywords that are highly relevant to Web site.

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Suggested Readings

- Eric Enge, Stephan Spencer, Rand Fishkin, Jessie C Stricchiola, "The Art of SEO: Mastering Search EngineOptimization", O'Reilly Media, October,2009.
- Jerri L. Ledford, "SEO: Search Engine Optimization Bible", 2nd Edition, Wiley India, April 2009

MCA ID-6201 (ii) E–Commerce and Content Management System

Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
2	0	0	2	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To help students to understand E-commerce issues for providing a secure and effective method of conducting a business and the use of e-commerce in competing markets.

Unit I	**08 Lectures**
Introduction to Electronic Commerce: Potential benefits & limitations of E-Commerce, Traditional Commerce vs. E- Commerce vs M-Commerce, Different E-Commerce Models (B2B, B2C, C2C, P2P), E-Commerce applications, Social Networks, Auctions & Portals, Legal and Ethical issues in E-Commerce.	
Unit II	**08 Lectures**
Introduction to Electronic Data Interchange: Types of EDI, Benefits of EDI Overview of Electronic Payment system, Types of Electronic payment schemes (Credit cards, Debit cards, Smart cards, Internet banking), Issues in Electronic payment systems Web Based Marketing and Communications: Online Advertising, E-Mail Marketing, Online Catalogs, Social Marketing and Targeted Marketing, Techniques and Strategies	
Unit III	**07 Lectures**
WWW concepts: Client/Server Computing, Web Servers and Clients, Web Browsers, Protocols and Ports, IP Address, Domains & DNS, URL, A Systematic approach to Website creation, creating interactive and dynamic web pages, Factors in E-Commerce Website design, Web and Database integration, Website Optimization strategiesE-Commerce security, threats, managing security issues through internet security protocols and standards, and Firewall.	
Unit IV	**07 Lectures**
Review of HTML: HTML tags; text formatting; text styles; lists: ordered, unordered and definition lists; layouts; adding graphics; tables; linking documents; images as hyperlinks; frames and layers; data collection using forms. CSS: Introduction, consistent web designing using CSS. Java Script: Introduction, DOM, documents, forms, statements, functions, objects, client- side Interactive web page design, input validation, event handling PHP: Introduction, server-side dynamic programming,MYSQL database access.	

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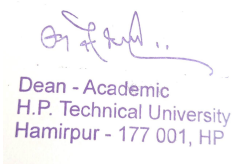
Course Learning Outcomes (CLOs)

- The students will be able to identify and apply relevant problem-solving methodologies.
- Design components, systems and/or processes to meet required specifications for a web presence.
- Be aware of the ethical, social, and security issues of information systems.
- Communicate effectively in ways appropriate to the discipline, audience, and purpose.

Suggested Readings:

- E-Commerce Essentials Kenneth Laudon and Carol Traver Pearson.
- Frontiers of Electronic Commerce Ravi Kalakota, Andrew B.Whinston - Addison Wesley Publication.
- E-Commerce, Fundamentals and Applications Henry Chan, Raymond Lee, Tharam Dillon, and ElizabethChang Wiley India Publication.



MCA ID-6201(iii) Computer and Information Security

Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
2	0	0	2	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C,D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To be aware of principles and protocols of internetwork, Understand the basic issues in information security, the concept of ciphers and cryptography, various ciphers, digital signatures and email security policies, malicious software, and their remedies.

Unit I	**08 Lectures**
Introduction of IT: Network security, Goals of Network Security, cryptography and its types, ciphers and their types, steganography, Data Encryption Standard, RSA algorithm, key distribution protocols.	
Unit II	**08 Lectures**
Software Security: Vulnerabilities, Attacks, and Countermeasures, Privileged programs (SetUID programs) and vulnerabilities, Buffer Overflow vulnerability and attack, Return-to-libc attack, Race Condition vulnerability and attack, Format String vulnerability and attack, Input validation, Shellshock attack.	
Unit III	**07 Lectures**
Web Security: Vulnerabilities, Attacks, and Countermeasures, Same Origin Policy, Cross-Site Scripting Attack, Cross-Site Request Forgery Attack, SQL-Injection Attack, Click-Jacking Attack, Web Tracking, Web Proxy, and Firewall.	
Unit IV	**07 Lectures**
Smartphone Security, Access control in Android operating system, Rooting Android devices, Repackaging attacks, Attacks on apps, Whole-disk encryption, Hardware protection: Trust Zone.	

Course Learning Outcomes (CLOs)

- The students will be able to develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks, and representative applications.
- Gain familiarity with prevalent network and distributed system attacks, defences against them, and forensics to investigate the aftermath.
- Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today. Develop an understanding of security policies (such as authentication, integrity, and confidentiality), as well as protocols to implement such policies in the form of message exchanges.

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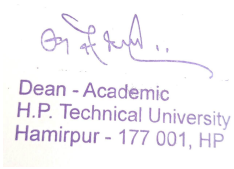
Suggested Readings

- Computer Security: Hand on approach Wenliang Du Pearson.
- Computer and Information Security Handbook John R. Vacca Kindle Edition.
- The Art of Deception: Controlling the Human Element of Security Kevin D. Mitnick John Wiley & Son.



MCA ID-6201 (iv) PC Assembly and Hardware

Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
2	0	0	2	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Guidelines for setting Question Paper: Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D, E. Sections A,B,C and D will have 2 questions of 12 marks each and Section E has short answer type questions consisting of six parts of 02 marks each. The candidates will attempt five questions in all, i.e. one question each from sections A,B,C, D and the complusory question from section E. In the question paper, the questions avialable in sections A.B,C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and Section-E will covered the whole syllabus.

Course Objectives (COs)

- To become skill enhanced in PC Assembly and Hardware devices.

Unit I	**08 Lectures**
Brief history of computer based on Hardware. Computer system modules/ components and its operations, need of hardware and software for computer to work, different hardware components within a computer and connected to a computer as peripheral devices, different processors used for personal computers and notebook computers.	
Unit II	**08 Lectures**
Perform installation, configuration, and upgrading of microcomputer/ computer: Hardware and software requirement,Assemble/setup microcomputer/ computer systems, accessory boards, types of motherboards, selection of right motherboard, Installation replacement of motherboard, troubleshooting problems with memory.	
Unit III	**07 Lectures**
Install/connect associated peripherals: Working of printers and scanners, Installation of printers and scanners, sharing a printer over a local area network, troubleshooting printer and scanner problems, troubleshooting hard drive problems. Drivers: Meaning, role and types.	
Unit IV	**07 Lectures**
Diagnose and troubleshooting of microcomputer/ computer systems hardware & software and other peripheral equipment.Approaches to solve a PC problem, troubleshooting a failed boot before the OS is loaded, different approaches to installing and supporting I/O device, managing faulty components. Booting and its types.	

Course Learning Outcomes (CLOs)

- The student will be able to Assemble and set up computer systems.
- Configure and install computers.
- Install, connect, and configure various peripheral devices.
- Diagnose and Troubleshoot issues in Computer Systems

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Suggested Readings:

- PC Hardware: The Complete Reference Eric Cole McGraw Hill.

Model Question Papers

[Total No. of Question] **[Total No. Pages =2]**

MCA 1st Semester Examination

Universal Human Values and

Professional Ethics

UHV-6100

Time: 3 Hours **Max. Marks: 60**

The candidates shall limit their answer precisely within the answer book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt five questions in all. Question no. 9 in Section E is compulsory. Rest attempt one each from the section A, B, C and D.

SECTION -A

1. What do you mean by value education? Explain the need of value education in technical and other professional institutions in India. (12)

OR

2. In the below cases what is basic aspiration? Justify your answer.

a) "I want to become a Computer Professor."
b) "I want to do research in Google Research Centre."
c) "I want to serve the Society."
d) "I want to earn a lot of money and fame" (12)

SECTION - B

3. What is our present attitude towards the Body? What are its consequences? Explain the programs to take care of the body. (12)

OR

4. Why is it important to study yourself? Explain the activities of imaging, analysing and selecting / tasting with diagram and with the help of an example, show how are they related. (12)

SECTION - C

5. Explain the feeling of care and guidance, glory, reverence, and gratitude. (12)

OR

6. Define affection. How does affection lead to harmony in the family? What is the role of physical facilities in the fulfilment of this feeling? (12)

SECTION - D

7. What are the values in interaction of human beings with the material things? Give one example of each. (12)

OR

8. What do you mean by the holistic alternative? What is the vision for the holistic alternative? (12)

SECTION- E

9. Explain the following:

(a) Self-exploration
(b) Happiness and Prosperity
(c) Self ('I') and Body
(d) Interconnected
(e) Mutual Fulfilment
(f) Holistic Alternative (2 x 6= 12)

END OF THE PAPER

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[Total No. of Question = 9] **[Total No. Pages =2]**

MCA 2nd Semester Examination

Data Structure Using C

MCA-6201

Time: 3 Hours **Max. Marks: 60**

The candidates shall limit their answer precisely within the answer book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt five questions in all. Question no. 9 in Section E is compulsory. Rest attempt one each from the Section A, B, C and D.

Section –A

1. (a)What is the difference between pointer to an array and array of pointers? (6)

(b)Explain the features of object-oriented programming. (6)

or

2. (a)What is the difference between call by value and call by reference? Explain with a suitable program. (6)

(b)Write a program in C++ or Java to search the minimum and the maximum element in an array? (6)

Section –B

3. (a) What is stack? Why is stack called LIFO data structure? (6)

(b) Write a program to convert the infix expression to prefix expression using C++ or Java. (6)

or

4. (a). Explain circular queue with its advantages. (6)

(b). Write a program to implement circular queue in Java or C++. (6)

Section –C

5. (a)What is a binary tree? Write a Java or C++program to implement binary search tree. (6)

(b)Prove that total number of edges of a complete binary tree with n-terminal node is 2(n-1). (6)

or

6. (a). Write a Java or C++ program to check whether undirected graph is connected using depth first searching. (6)

(b). Write a Java or C++ program to check whether directed graph is connected using breadth first searching. (6)

Section –D

7. (a)What is sorting? Define various sorting techniques. (6)

(b). Write the differences between linear search and binary search. (6)

or

8. (a). What is quick sort? Write its algorithm and efficiency. (6)

(b). What is heap sort? Sort the given data using heap sort. (6)

46, 25, 35, 49, 10, 92, 83, 32

Section –E

9. Explain the following:

a. Sparse arrays
b. Inverted list
c. Push & Pop
d. Binary search
e. Priority queue
f. Algorithm complexity (6x 2=12)

END OF THE PAPER

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[Total No. of Questions = 9] **[Total No. of Pages =1]**

MCA 2nd Semester Examination
Computer Networks
MCA- 6204

Time: 3 Hours **Max.Marks:60**

The candidates shall limit their answer precisely within the answer book (40 pages) issued to them and no supplementary/ continuation sheet will be issued.

Note: Attempt 5 questions in all. Question no.9 in section E is compulsory. Rest attempt one each from section A, B, C and D.

SECTION -A

1. Distinguish between TCP/IP and OSI reference model. Which model is more popular and why?
2. What are the different types of transmission technology? Explain different types of networks based on transmission technology. **(12)**

SECTION-B

3. How bit-oriented protocol HDLC is used for communication over point-to-point and multipoint links.
4. What is point-to-point protocol? How does point-to-point protocol work on Data link Layer? **(12)**

SECTION-C

5. Differentiate among Unicasting, Multicasting and Broadcasting.
6. Write a short note on Network Design issues. **(12)**

SECTION-D

7. Explain Q0S? What are the techniques used to improve QOS?
8. Draw and explain the relation between Network layer, Transport layer and Application Layer.**(12)**

SECTION-E

9. Short answer type question
   - **a.** Jitter
   - **b.** DNS
   - **c.** Telnet
   - **d.** Firewall
   - **e.** Modem **(6*2=12)**
   - **f.** Bus topology

[Total No. of Questions = 9] **[Total No. Pages =2]**

MCA 2nd Semester Examination
Discrete Mathematics
MCA- 6104

Time: 3 Hours **Max.Marks:60**

The candidates shall limit their answer precisely within the answer book (40 pages) issued to them and no supplementary/ continuation sheet will be issued.

Note: Attempt 5 questions in all. Question no.9 in section E is compulsory. Rest attempt one each from section A, B, C and D.

SECTION -A

1. (a) Out of 100 persons, 45 drink tea and 35 drink coffee. If 10 persons drink both, how many drink neither tea nor coffee?
(b) Define propositional and predicate logic.
(c) What are the properties for a relation to be an equivalence relation?

or

2. (a)In a lottery game, there are 2 winners for every 100 tickets sold. If a man buys 10 tickets what are the chances that he is a winner?
(b) Define fields and subgroups.
(c)Define nested quantifiers.

(3*4=12)

SECTION - B

3. (a) Explain pigeonhole principle in detail.
(b)Explain Inclusion - exclusion principle with theorems and example.
(c)Write difference between Integral domain and fields.

or

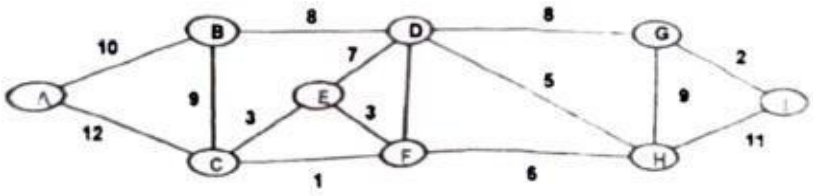
4. (a)Define mathematical induction.
(b) What are the various applications of permutation and combinations?
(c) A zip code contains 5 digits. How many different zip codes can be made with digits 0-9 if no digit is used more than once and the first digit is not 0? **(3*4=12)**

SECTION-C

5. (a)How can you check the connectivity of graph? Explain with algorithm and example?
(b)Explain the Konigsberg problem in detail.

or

6. (a) What is a spanning tree? Find the minimum spanning tree of the following graph.



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(b) Write a short note on:
Weighted graph and Bipartite graph. **(6,6)**

SECTION-D

7. (a)Define term optimization and explain mathematical model in detail.
(b) Write short note on
1 simplex method
2 dual simplex method

or

8. (a)Explain PERT-CPM in detail with diagram representation.
(b) Explain the procedure to find critical path calculation in detail. **(6,6)**

SECTION-E

9. Explain the following:
(a) Edges, Depth/Height, and level in trees.
(b) Indegree in graph
(c) Semigroups
(d) Symmetric relation
(e) Prefix codes. **(6*2=12)**

END OF PAPER