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FUTURE UNIVERSITY, BAREILLY

(Established under the Uttar Pradesh Private Universities (Third Amendment) Act, 2024)

COURSE CURRICULUM

AND

EVALUATION SCHEME

MCA-AI

For the Students Admitted in Academic Session 2025-26

Effective From

Academic Session 2025-26

Prepared By

Board of Studies

Approved By

**Academic Council
Future University, Bareilly**

Published By

**Office of the Registrar
Future University, Bareilly**



(This Curriculum and Evaluation Scheme shall be applicable to all students admitted to the MCA-AI Programme from the Academic Session 2025-26 onwards and shall remain in force until amended or revised by the Academic Council of Future University, Bareilly.)



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COURSE CURRICULUM & EVALUATION SCHEME

**For
Master of Computer Application
MCA (AI)-2025**

FUTURE UNIVERSITY, BAREILLY (U.P.) INDIA



Board of Studies

*(Including Proceeding, Course Structure, Course Curriculum and
Evaluation Scheme)*

for

Master of Computer Application (AI)



(Effective from the Session: 2025-26)



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Agenda

1. To approve the minutes of the second BOS held on 29-03-2025.
2. To review and recommend the course structure and curriculum of Master of Computer Application in Artificial Intelligence on the basis of the recommendations of the second BOS for the session 2025-26, taking into consideration NEP 2020 guidelines.
3. To discuss the total credits to be taken for the program based on the decision taken in the meeting of all the Deans,
4. To assess the comprehensive and continuous evaluation and assessment of the students.
5. Any other item with the permission of the chair.

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Attendance Sheet -Board of Studies (2024/25 Batches)

Name of Faculty: Faculty of Computer Applications

Date: 29/03/2025

S. N.	Position	Designation	Proposed Name of member, Designation, Affiliation	Signature
1	Senior Faculty	Member	Dr. Abhishek Saxena, Dean, Faculty of Computer Application, Future University, Contact No. 8475010072, Email: abhisheksaxena@futureuniversity.in	
2	HOD	Chairperson	Dr. Jeelani, HOD, Department of Computer Application, Future University, Contact No. 8273303430, Email: jeelani@futureuniversity.in	
3	Senior Faculty	Member	Prof. (Dr.) Manish Kumar Singh, Professor, Faculty of sciences, Future University, Contact No. 8475010063, Email: mksingh@futureuniversity.in	
4	Senior Faculty	Member Secretary	Dr. Schephalika, Asso. Prof. Department of Computer Application, Future University, Contact No. 8532005079, Email: schephalika@futureuniversity.in	
5	Senior Faculty	Member	Mr. Udit Kumar Mishra, Asso. Prof. Department of Computer Application, Future University, Contact No. 9412606540, Email: uditmishra@futureuniversity.in	
6	Faculty	Member	Mr. Madhuresh Yadav, Asst. Prof. Department of Computer Application, Future University, Contact No. 8077461879, Email: madhureshkumaryadav@futureuniversity.in	
7	Faculty	Member	Mr. Mohd. Akif, Asst. Prof. Department of Computer Application, Future University, Contact No. 9198656460, Email: mohdakif@futureuniversity.in	
8	Faculty	Member	Mr. Tilak Kumar Rathour, Asst. Prof. Department of Computer Application, Future University, Contact No. 7037628213, Email: tilakrathour@futureuniversity.in	
9	Academic Expert (Member)	Member	Prof. (Dr.) Vinita Jindal, Professor, Dept of Computer science, Keshav Mahavidyalaya, University of Delhi, Contact No. 9810100377, Email: vjindal@keshav.du.ac.in	
10	Academic Expert (Member)	Member	Dr. Akhtar Hussain, Asso. Prof. Faculty of Computer Science & Information Technology, MJPRU, Bareilly, Contact No. 9319760019, Email: akhtarhusain@mipru.ac.in	
11	Industry Expert (Member)	Member	Mr. Sachin Saxena, Associate Consultant, TCS, Pune Office, Contact No. 7982696188, Email: connect.sachin01@gmail.com	

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Verified by

Head of Department
Department of Computer Application

Name Dr. Jeelani Date 29/3/2025 Sign Dr. Jeelani

Dr. Jeelani
HOD
Department of Computer Application
Future University, Bareilly

Dr. Jeelani
S
Dr. Jeelani
Dean
Faculty of Computer
Applications
Future University
Bareilly

Dr. Jeelani
Dr. Jeelani
Academic Council
Future University
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Ref No: FU/CA/2024-25/INV/01

Date: 07/03/2025

Department of Computer Application
Faculty of Applications
Future University, Bareilly

To,
Prof. Vinita Jindal
Professor
Department of Computer science
Keshav Mahavidyala,
University of Delhi, New Delhi

Subject: Invitation for Board of Studies (BoS) Meeting

Respected Prof. Vinita Jindal,

We are pleased to invite you to the upcoming **Board of Studies (BoS) Meeting** of the Department of Computer Application, scheduled on **March 29, 2025 at 9:30 AM**, to be held at **Auditorium**.

The meeting will focus on reviewing and updating the curriculum, discussing academic developments, and incorporating industry trends. Your valuable insights and expertise will be highly appreciated in shaping the academic framework.

Kindly confirm your availability at your earliest convenience. We look forward to your esteemed presence.

Best Regards,

(Dr. Jeelani)
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Ref No: FU/CA/2024-25/INV/01

Date: 07/03/2025

Department of Computer Application
Faculty of Applications
Future University, Bareilly

To,
Dr. Akhtar Husain
Associate Professor
Department of Computer science & IT,
Mahatma Jyotiba Phule Rohilkhand University, Bareilly

Subject: Invitation for Board of Studies (BoS) Meeting

Respected Dr. Akhtar Husain,

We are pleased to invite you to the upcoming **Board of Studies (BoS) Meeting** of the Department of Computer Application, scheduled on **March 29, 2025 at 9:30 AM**, to be held at **Auditorium**.

The meeting will focus on reviewing and updating the curriculum, discussing academic developments, and incorporating industry trends. Your valuable insights and expertise will be highly appreciated in shaping the academic framework.

Kindly confirm your availability at your earliest convenience. We look forward to your esteemed presence.

Best Regards,


(Dr. Jeelani)

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Ref No: FU/CA/2024-25/INV/01

Date: 07/03/2025

Department of Computer Application
Faculty of Applications
Future University, Bareilly

To,
Mr. Sachin Saxena
Associate Consultant
TCS, Pune

Subject: Invitation for Board of Studies (BoS) Meeting

Respected Mr. Sachin Saxena,

We are pleased to invite you to the upcoming **Board of Studies (BoS) Meeting** of the Department of Computer Application, scheduled on **March 29, 2025 at 9:30 AM**, to be held at **Auditorium**.

The meeting will focus on reviewing and updating the curriculum, discussing academic developments, and incorporating industry trends. Your valuable insights and expertise will be highly appreciated in shaping the academic framework.

Kindly confirm your availability at your earliest convenience. We look forward to your esteemed presence.

Best Regards,

(Dr. Jeelani)

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Board of Studies (MCA)

Name of Faculty: Faculty of Computer Application

S. N.	Position	Designation	Proposed Name of member, Designation, Affiliation
1	Senior Faculty	Member	Dr. Abhishek Saxena, Dean, Faculty of Computer Application, Future University, Contact No. 8475010072, Email: abhisheksaxena@futureuniversity.in
2	HOD	Chairperson	Dr. Jeelani, HOD, Department of Computer Application, Future University, Contact No. 8273303430, Email: jeelani@futureuniversity.in
3	Senior Faculty	Member	Prof. (Dr.) Manish Kumar Singh, Professor, Faculty of sciences, Future University, Contact No. 8475010063, Email: mksingh@futureuniversity.in
4	Senior Faculty	Member Secretary	Dr. Schephalika, Asso. Prof. Department of Computer Application, Future University, Contact No. 8532005079, Email: schephalika@futureuniversity.in
5	Senior Faculty	Member	Mr. Udit Kumar Mishra, Asso. Prof. Department of Computer Application, Future University, Contact No. 9412606540, Email: uditmishra@futureuniversity.in
6	Faculty	Member	Mr. Madhuresh Yadav, Asst. Prof. Department of Computer Application, Future University, Contact No. 8077461879, madhureshkumaryadav@futureuniversity.in
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8	Faculty	Member	Mr. Tilak Kumar Rathour, Asst. Prof. Department of Computer Application, Future University, Contact No. 7037628213, tilakrathor@futureuniversity.in
9	Academic Expert (Member)	Member	Prof. (Dr.) Vinita Jindal, Professor, Dept of Computer science, Keshav Mahavidyalaya, University of Delhi, Contact No. 9810100377, Email: vjindal@keshav.du.ac.in
10	Academic Expert (Member)	Member	Dr. Akhtar Hussain, Asso. Prof. Faculty of Computer Science & Information Technology, MJPRU, Bareilly, Contact No. 9319760019 Email: akhtarhusain@mjpru.ac.in
11	Industry Expert (Member)	Member	Mr. Sachin Saxena, Associate Consultant, TCS, Pune Office, Contact No. 7982696188, Email: connect.sachin01@gmail.com



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Chairperson



Academic Council
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Board of Studies (MCA)

Name of Faculty: Faculty of Computer Application

S. No	Particulars	Amount	Pack	Total
1	Remuneration	5000 (including TA for Local) (otherwise 5000 + TA)	03	18000
2	Lunch	200	11	2200
3	Snacks	100	11	1100
4	Mementoes	500	03	1500
5	Miscellaneous	-	-	500
			Grand Total	23,300


 Chairperson



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Minutes of Meeting (2nd Board of Studies (MCA))

Name of Faculty: Faculty of Computer Application

Date: 29-03-2025

Time: 11:30 AM

Venue: Board Room

Chairperson: Dr. Jeelani, Associate Professor

Panel of BoS Attendees:

S. N.	Position	Designation	Proposed Name of member, Designation, Affiliation
1	Senior Faculty	Member	Dr. Abhishek Saxena, Dean, Faculty of Computer Application, Future University, Contact No. 8475010072, Email: abhisheksaxena@futureuniversity.in
2	HOD	Chairperson	Dr. Jeelani, HOD, Department of Computer Application, Future University, Contact No. 8273303430, Email: jeelani@futureuniversity.in
3	Senior Faculty	Member	Prof. (Dr.) Manish Kumar Singh, Professor, Faculty of sciences, Future University, Contact No. 8475010063, Email: mksingh@futureuniversity.in
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The following are the details of the discussions held:

1. To minutes of the second BOS held on 29-03-2025 were approved by the members as no comments were received.
2. The proposed syllabus for Bachelor of Computer Application in Artificial Intelligence on the basis of the recommendations of the second BOS for the session 2024-25 and 2025-26, for all semesters was discussed and suggestions were given by the experts which were incorporated in the various placed.
3. The total credits to be taken for the program based on the decision taken in the meeting of all the Deans as 97 credits for teaching and 80 for award of degree was agreed in the meeting. Members suggested that 75% attendance should be mandatory for students to appear in the end semester examination.
4. After discussion it was agreed that all evaluations will be on 100 with 30 internal continuous evaluation and 70 end semester evaluation.
5. Any other item with the permission of the chair.
 - Course work and practical will have code as per the UGC suggestion for ABC purpose
 - Tutorial are not needed in practical subjects and should be removed
 - It was suggested that the University should follow the NCRF structure in all programs offered.
 - Practical credit shall be as per UGC norms.
 - UGC guidelines suggests for other Region language, and is not mentioning foreign languages as in the syllabus. College can reconsider the same.

The members appreciated the efforts of the faculty members in formulating the syllabus for 2024-25 academic batch and also 2025-26 academic batch.

HOD Computer Application informed the members that the syllabus for the year 2025-26 may need some corrections based on inputs from experts of the subject. BOS empowered the Dean Computer Applications to finalise the syllabus in consultation with subject experts and seek approval of the Academic Council when it meets next. Also, the modifications be informed the Board of Studies when it meets next.


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The meeting ended with a Vote of thanks to the external members who spared their valuable time and for the suggestions.



Dr. Jeelani

HOD, Computer Application
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Course Aim and Objectives:

Our mission is to establish ourselves as a leading worldwide institution of higher education, promoting research, innovation, and moral leadership while enabling students to lead sustainable development and social well-being.

Mission:

1. Provide a cutting-edge learning environment that combines innovative teaching strategies with thorough research.
2. Encourage moral leadership and provide kids the tools they need to become competent workers.
3. Expand knowledge and encourage long-term expansion.
4. Encourage the well-being of society by upholding the values of integrity and excellence.
5. Encourage a welcoming and dynamic learning environment that prepares students for issues facing the world.



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Program Outcomes (PO):

PO1	Develop the knowledge of computer and information technology concepts and principles in different domains.
PO2	Appreciate and apply mathematical organization, computing and domain information for the conceptualization of computing models from clear harms.
PO3	Skill to select recent computing tools, skills and techniques compulsory for original software solutions
PO4	Facility to apply and give expert principles and cyber systems in a universal monetary situation.
PO5	Identify the need for and enlarge the ability to appoint in permanent education as a Computing qualified.
PO6	Ability to job as a part or manages in various teams in multidisciplinary situations.
P07	Develop language proficiency to handle corporate communication demands.
PO8	Ability to understand the changes or future trends in the field of computer application.

Program Specific Outcome (PSO):

PSO1	In order to enhance programming skills of the young IT professionals, the concept of project development in using the technologies learnt during the semester has been introduced.
PSO2	To enhance knowledge in robotics, provide experimental hardware equipment for teaching the basics of robotics, robot dynamics and control, and robot system design and application.
PSO3	To enhance logical ability and programming concepts by implementing programming lab.
PSO4	Preparing students for future aspects by building and improving their creativity, social awareness, and general knowledge.
PSO5	Encouraging students to convert their start-up idea to reality by implementing.
PSO6	Ability to understand the changes or future trends in the field of computer application.
PSO7	Ability to identify, formulate, analyse and solve problems of programming using different languages.







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ORDINANCE AS PER UGC RULES AND REGULATIONS

For

Postgraduate Programme

Master of Computer Applications

(M.C.A.)

Effective from the session 2024-25

ORDINANCE No – 35

35.1 ACADEMIC PROGRAMME

MCA

35.2 ELIGIBILITY FOR ADMISSIONS TO MCA (FULL TIME) PROGRAM:

35.2.1 Admission to MCA First Year: The minimum qualifications for admission to MCA program will be as per eligibility certain as decided by Academic Council of Future University. Admission will be taken on the basis of Merit Future University Common Entrance Exam (FUCET).

35.2.2 For admission students of General category must secure 50% or above of marks in graduation (in any stream from recognized university) in case of General and OBC category. Relaxation up to 45% Is only of candidate who secure 45 % or above of marks in graduation (in any stream from recognized university)

35.2.3 The Academic Council of University shall have power to amend or repeal the eligibility criteria laid down.

35.3 DIRECT ADMISSION ON VACANT SEATS AT INSTITUTION / COLLEGE LEVEL:

35.3.1 The eligibility criteria for direct admission on seats remaining vacant in first year after entrance examination / counseling shall be such as may be notified from time to time by the University.

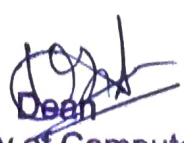
33.4 MCA PROGRAM:

MCA (Full Time) is 2 years Program

35.4.1 Curriculum Structure: The University follows a specialized credit based semester system. Every Program will have a specific curriculum for all semesters (Semester 1 to Semester 4 for full time MCA as approved by BoS/Academic Council of Future University.

35.4.2 Curriculum:

A For full time MCA program, the 2 year curriculum is divided into 4 semesters while


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include lectures, tutorials, practical, seminars, projects etc. in addition to industrial training/internship, educational tour etc. as defined in the scheme and instructions issued by the University from time to time.

- B The curriculum will also include such other curricular, co-curricular and extracurricular activities as may be prescribed by the University from time to time.

35.5 DURATION OF COURSE:

- 35.5.1 Total duration of the full time MCA Course shall be 2 years, each year comprising of two semesters. Each semester shall normally have teaching for the 90 working days or as prescribed by UGC/Future University from time to time.
- 35.5.2 The maximum time allowed for a candidate admitted in Ist semester for completing the course shall be 4 years for MCA (full time), failing which he/she shall not be allowed to continue his/her MCA. Degree.

35.6 ATTENDANCE:

- 35.6.1 Every student is required to attend all the lectures, tutorials, practicals and other prescribed curricular and co-curricular activities with minimum of 75% Attendance or specify as by concerned regulatory body.
- 35.6.2 The attendance can be condoned up to 15% on medical grounds or for other genuine reasons beyond the control of students by Head of Institution/college provided that he/she has been absent with prior permission of the Vice Chancellor of University for the reasons acceptable to him.
- 35.6.3 No student will be allowed to appear in the end semester examination if he / she do not satisfy the overall average attendance requirements of Clause Nos. 35.6.1, and 35.6.2 and such candidate(s) shall be treated as having failed due to detained and will be further governed by clause no. 35.6.2.
- 35.6.4 In each semester, the attendance shall be counted from the date of admission in the University or start of academic session whichever is later.
- 33.6.5 Notwithstanding any of the above provisions, under very special circumstances, the Hon'ble Vice Chancellor in consultation with Deans of the Faculty has the power to amend or condone all or any of the above said clauses or the prescribed percentage in the interest of the academics and the University.

33.7 EXAMINATION:

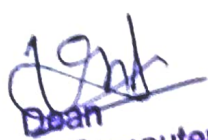

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- 33.7.1 The performance of a student in a semester shall be evaluated through continuous class assessment and end semester examination. The continuous assessment shall be based on assignments, Activities, Seminars and Internal Exams, quizzes/viva-voce, projects, presentations, attendance, etc. The marks for continuous assessment (Sessional marks) shall be awarded at the end of the semester by the subject teacher and forwarded to University through Head of Department/Head of Institution. The end semester examination shall comprise of written examination, Summer Training / viva voce.
- 35.7.2 The distribution of marks for sessional, end semester theory papers, Training Report and other examinations, seminar, project, industrial training/internship and general proficiency shall be as prescribed by the University.
- 35.7.3 The marks obtained in a subject shall consist of marks allotted in end semester theory paper, practical examination and sessional work. The grade will be awarded based on marks obtained as per Appendix I. The "F" grade denotes the failure in passing respective subjects and student has to make another attempt to pass the subject as per the provisions of this carry over Ordinance.
- 35.7.4 The minimum pass marks in each subject having sessional marks component shall be 40% (including sessional marks) with a minimum of 30% marks in the end semester examination of respective subject. If there is no provision of sessional marks in any subject, the minimum pass marks in that subject shall be 40% in the end semester examination.
- 35.7.5 Unfair means: Cases of unfair means shall be dealt as per the rules of the University.

35.8 EVALUATION

- 35.8.1 A student who score O to P shall be considered as passed. If a student secured "F" grade, he/she has to reappear for the examination.
- (a) For a Pass in a Project Reports / Viva voce examination / Comprehensive Viva Voce, a student shall secure a minimum of 50 % marks of the maximum marks prescribed by the University Examination in the relevant Practical/ Internship / Project/ Viva voce marks i.e. Minimum Passing Grade is "E"
- 35.8.2 The student who do not satisfy the condition 35.8.1 or the student who remains absent shall be deemed to have failed in that subject and may reappear for the University examination in the subsequent examinations. However, the sessional marks awarded to the student at previous attempt in the concerned subject will be carried forward.
- 35.8.3 The student who passes a course of a semester as per 35.8.1 shall not be allowed to appear for the same again, unless he/ she opts for abandoning of result as per


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35.8.4 – 35.8.8.

35.8.4 A student may at his/her desire opt to abandon his/her performance of a semester in following manner.

- (a) A student may opt to abandon his/her performance only in university examination of the semester.
- (b) A student may opt to abandon his/her total performance of the semester which includes performance in university examination and sessional marks.
- (c) A student may opt to abandon his/her performance in university examination of any or both semester of the same academic year only.
- (d) A student shall be allowed to abandon the performance only once during the entire course of study.
- (e) Performance of a semester once abandoned cannot be claimed again

35.8.5 The student who opts to abandon the performance of a semester as per clause 35.8.4, shall abandon performance in all the courses of that semester irrespective of the fact whether the student passed or failed in any subject of that semester. However, in case of 4th semester performance in project shall not be abandoned.

35.8.6 The student, who opts to abandon the total performance of the semester including sessional marks, has to take readmission for the relevant semester. Readmission to the first semester in such cases shall not be considered as fresh admission i.e. the student will continue to have the same University Roll Number, which was allotted earlier.

35.8.7 The student, who opted to abandon his / her performance only in the University examination of a semester and does not desire readmission, shall be permitted to re-appear for examination of all the subjects of the semester in the subsequent examination as an Ex Student. However, the sessional marks obtained by the student in the abandoned semester shall be retained.

35.8.8 Such student who opted to abandon the performance in final year are eligible for the award of Class and Distinction at the MCA degree level, but are not eligible for the award of ranks.

35.8.9 A student shall be declared to have completed the program of MCA degree, provided the student has undergone the stipulated course work as per the regulation

33.9 ELIGIBILITY FOR PROMOTION

35.9.1 There shall not be any restriction for promotion from an odd semester to the next even semester.


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35.9.2 For promotion from first year to II year (III semester) the student has to secure at least 55 % in the first year (combining I and II semester) including theory and practical credits.

35.9.3 The result of the semester shall be declared pass only on securing P or above grades in all subjects and minimum semester Grade Point Average (SGPA) is 5.

35.10 CARRYOVER EXAMS

35.10.1(a) A candidate who do not satisfy the requirements of clause 35.8.1(a) will be required to reappear in those theory paper/ practical during respective end semester exams in which he/she failed.

(b) A student shall be required to exercise his/ her choice of minimum theory papers in which he/ she desires to appear in the theory examination for improvement to fulfill the requirement of clause 35.9.3.

35.10.2 All carryover examinations shall be held only with end semester examination.

35.11 READMISSION IN THE UNIVERSITY:

A candidate may be allowed for re- admission provided he/she satisfies one of the following conditions:

35.11.1 A candidate is declared fail.

35.11.2 A candidate did not appear in a semester examination/or he/she was not granted permission to appear in the examination.

35.11.3 A candidate has been detained by the institute and subsequently has been permitted to take re admission.

35.11.4 A candidate as an ex-student passed the examination of the academic year or qualified for carry over system.

35.11.5 A candidate promoted with carry over subject and he/she opted for readmission.

35.12 COURSES:

35.12.1 There will be two type of courses.

(i) Core Courses: This is the course which is to be compulsorily studied by a students as a core requirement to complete the requirement of a program in a said discipline of study.


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- (ii) Elective Course: This is course which can be chosen from the pool of papers .It may be supportive to the discipline/domain /providing extended scope/enabling an exposure to some other discipline /domain/nurturing student proficiency.
- (iii) Mandatory Course
- (iv) Foundation Course

35.12.2 The minimum number of students to be registered for an elective to be offered shall not be less than 20 % of the enrolled students.

35.12.3 The student may be permitted to opt for change of elective subject till 15 days before the date of commencement of the III semester, as per the calendar of the University

35.13 COMPUTATION OF SGPA AND CGPA

As per Appendix I.

35.14 CONVERSION OF GRADE IN TOPER CENTAGE:

Conversion formula for the conversion of GPA into Percentage is $CGPA \text{ Earned} \times 10 =$ Percentage of marks scored. Illustration: $CGPA \text{ earned } 7.15 \times 10 = 71.5 \%$

35.15 AWARD OF DIVISION AND RANKS:

Division and CGPA shall be awarded only after the eighth and final semester examination based on integrated performance of the candidate for all the eight semesters (six semesters for lateral entry) as per following details.

- (a) After successful completion of credits as decided in BoS/Academic Council, a student shall be eligible to get under graduate degree in engineering/technology.
- (b) The student shall be awarded **First division with Distinction** Degree only if he/she secures 7.50 or above CGPA and passed each subject of that degree program in single attempt without any grace marks and without any gap.
- (c) A candidate who qualifies for the award of the degree by securing P or above grades in all subjects of all the semesters (eight semesters/six semesters) as applicable, and secures CGPA less than 7.5 and greater than or equal to 6.5 shall be declared to have passed the examination in FIRST DIVISION.
- (d) All other candidates who qualify for the award of degree by securing P or above grades in all subjects of all semesters (eight semesters/six semesters as applicable) and secures CGPA below 6.5 and greater than or equal to 5.0 shall be declared to have passed the examination in SECOND DIVISION.


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If two students get the same *CGPA*, the tie should be resolved by considering the number of times a student has obtained higher *SGPA*; but, if it is not resolved even at this stage, the number of times a student has obtained higher grades like O, A⁺, A, B⁺, B, C etc shall be taken into account in rank ordering of the students in a program.

The Gold, Silver and any other Medals as decided by the university shall be awarded to students falls in the top ranks of various courses as per university rules.

35.16 SCRUTINY AND REVALUATION

35.16.1 Scrutiny shall be allowed in only theory papers.

35.16.2 Revaluation of theory/practical papers is permitted only with certain conditions as laid down by university.

35.17 AWARD OF SESSIONAL MARKS

Award of Sessional marks for theory subjects, shall be awarded as will be prescribed and at present the break-up of sessional marks shall be as follows:

- (a) Theory Subjects: (i) Class test which will comprise 20 % of total theory marks with two mid-term tests of equal weightage. (ii) Teacher Assessment Tutorial/Assignment/Quizzes/ Attendance comprise 10% of total theory marks.
- (b) Make-up test may be held only for those students who could not appear in any one of midterm class test due to genuine reasons for which the prior permission from the Dean of Faculty was taken. Make up test shall ordinarily be held about two weeks before the semester examination. The syllabus for the make-up test shall be the whole syllabus covered by the subject teacher upto that time.

35.18 AWARD FOR SUMMER TRAINING PROJECT REPORT:

Each student has to successfully complete a following project for the award of MCA degree as approved in BoS.

35.18.1 Summer Training Project Report

1. At the end of second semester examination, it is mandatory for every student of MCA to undergo on-the-job practical training in any manufacturing, service or financial organization. The training will be of 6 to 8 weeks duration. The college/institute will facilitate this compulsory training for students.

    
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2. The student, after the completion of training will submit a report to the College/Institute which will form part of third semester examination. However, the report must be submitted by the end of Semester

35.19 AWARD FOR RESEARCH PROJECT REPORT:

In fourth semester, the candidates will have to submit a Research Project Report on a problem /topic (from the specialization areas) to be assigned by the department MCA under the supervision of a core faculty member of the department.

Note: Both Summer Training Report & Research Project Report shall be treated as project work and remuneration shall be paid as notified by university from time to time in respect of project evaluation.

35.20 CANCELLATION OF ADMISSION:

The admission of a student at any stage of study shall be cancelled if:

- (i) He /She is not found qualified as per University/State Government norms and guidelines or the eligibility criteria prescribed by the University.
- (ii) He / She is found unable to complete the course within the stipulated time as prescribed in clause 35.2 or
- (iii) He / She is found involved in creating indiscipline in the Institution /College or in the University.

The Academic Council shall have the power to relax any provision provided in the ordinance in any specific matter /situation subject to the approval of Executive Council of the University & such decision(s) shall be reported to the Chancellor of the University.

The Academic Council of Future University shall have the authority to amend, modify, or replace any provision of this Ordinance from time to time in order to ensure compliance with the regulations, guidelines, and directives issued by the statutory and regulatory bodies such as the University Grants Commission (UGC) and other competent authorities.


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Department of Computer Application
Master of Computer Application
Evaluation Scheme

Future University											
Master of Computer Application (MCA) AI (Postgraduate Regular)											
Course Structure/ Degree Award Checklist 2025-2027											
Program Name:			Master of Computer Application (MCA) Specialization in AI							Program Code: 05	
Total Credit of Program: 87											
Semester-I											
			Theory	Week			Evaluation Scheme		Total	Credit	
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE			
1	Major Core Course	MCA5101	Fundamental of Computers & Emerging Technologies	3	0	0	30	70	100	3	
2	Skill Enhancement Course	UCC1102	AI for Everyone	3	0	0	30	70	100	3	
3	Major Core Course	MCA5103	Web Development Technologies	3	0	0	30	70	100	3	
4	Minor Course	MCA5105	Discrete Mathematics	3	0	0	30	70	100	3	
5	Major Core Course	MCA5107	Python Programming	3	0	0	30	70	100	3	
6	Major Core Course	MCA5109	Introduction to Cyber Security	3	0	0	30	70	100	3	
7	Multidisciplinary	UCC1101	IKS-I (Indian Knowledge System - I)	1	0	0	50	0	50	1	
Practical											
1	Major Core Course	MCA5172	Web Development Technologies Lab	0	0	2	50	50	100	1	
2	Major Core Course	MCA5173	Python Programming Lab	0	0	2	50	50	100	1	
			TOTAL	19	1	4	330	520	850	21	


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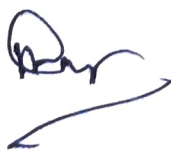
Semester -II

SN.	Course Category	Course Code	Theory	Week			Evaluation Scheme		Total	Credit
			Course Title	L	T	P	CA	EE		
1	Minor Course	MCA5201	Operating Systems	3	0	0	30	70	100	3
2	Major Core Course	MCA5202	Data Structures & Analysis of Algorithms	3	0	0	30	70	100	3
3	Major Core Course	MCA5203	Relational Database Management Systems	3	0	0	30	70	100	3
4	Major Core Course	MCA5204	Introduction to Artificial Intelligence	3	0	0	30	70	100	3
5	Minor Course	MCA5205	Computer Based Numerical Techniques	3	0	0	30	70	100	3
6	Ability Enhancement Course	MCA5206	AI for Developers	3	0	0	30	70	100	3
7	Major Core Course	MCA5208	Introduction to Machine Learning	3	0	0	30	70	100	3
8	Skill Enhancement Course	LSM5202	LSM-I (Life Skills & Mentoring – I)	0	0	0	0	0	0	0
Practical										
1	Major Core Course	MCA5274	Data Structure Using Python Lab	0	0	2	50	50	100	1
2	Major Core Course	MCA5271	RDBMS Lab	0	0	2	50	50	100	1
3	Major Core Course	MCA5273	Machine Learning Lab	0	0	2	50	50	100	1
			TOTAL	21	0	6	360	640	1000	24


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Semester -III										
			Theory	Week			Evaluation Scheme		Total	Credit
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE		
1	Minor Course	MCA6311	Computer Networks	3	0	0	30	70	100	3
2	Major Core Course	MCA6312	Software Engineering	3	0	0	30	70	100	3
3	Major Core Course		Domain Specific	3	0	0	30	70	100	3
4	Major Core Course	MCA6303	Advance Java Programming	3	0	0	30	70	100	3
5	Minor Course	MCA6313	Remedial Mathematics (Theory) OR	3	0	0	30	70	100	2
		MCA6314	Principal of Management							
6	Major Core Course		Domain Specific	3	0	0	30	70	100	3
7	Skill Enhancement Course	MCA6315	Industrial Training-1	0	0	0	0	0	0	0
Practical										
1	Major Core Course	MCA6372	Advance Java Programming Lab	0	0	2	50	50	100	1
2	Major Core Course	MCA6374	Mini Project	0	0	4	50	50	100	2
			TOTAL	21	0	6	280	520	800	20


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Semester -IV										
			Theory	Week			Evaluation Scheme		Total	Credit
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE		
1	Minor Course	MCA6409	Computer Graphics	3	0	0	30	70	100	3
2	Major Core Course		Domain Specific	3	0	0	30	70	100	3
3	Major Core Course		Domain Specific	3	0	0	30	70	100	3
5	Minor Course	MCA6401	Research Methodology	3	0		30	70	100	3
6	Value Added Course	MCA6408	MOOC-IV	Self-Paced Learning					100	3
7	Skill Enhancement Course	MCA6415	Digital Marketing	2	0	0	30	70	100	2
8	Skill Enhancement Course	MCA6411	Industrial Training-2	0	0	0	0	0	0	0
Practical										
1	Major Core Course	MCA6473	Computer Graphics Lab	0	0	2	50	50	100	2
2	Major Core Course	MCA6472	Project	0	0	8	100	150	250	4
			TOTAL	15	0	10	330	570	1100	23


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Semester -IV

SN.	Course Category	Course Code	Theory	Week			Evaluation Scheme		Total	Credit
			Course Title	L	T	P	CA	EE		
1	Minor Course	MCA6409	Computer Graphics	3	0	0	30	70	100	3
2	Major Core Course		Domain Specific	3	0	0	30	70	100	3
3	Major Core Course		Domain Specific	3	0	0	30	70	100	3
5	Major Core Course	MCA6401	Research Methodology	3	0		30	70	100	3
6	Minor Course	MCA6423	Digital Marketing	2	0	0	30	70	100	2
7	Skill Enhancement Course	MCA6417	Industrial Training-2	0	0	0	0	0	0	0
Practical										
1	Major Core Course	MCA6473	Computer Graphics Lab	0	0	2	50	50	100	2
2	Major Core Course	MCA6472	Project	0	2	8	100	150	250	6
			TOTAL	15	2	10	330	570	1000	22



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DOMAIN SPECIFIC ELECTIVES COURSES

S. No.	COURSE CODE	COURSE TITLE		L	T	P	Credits
Domain 1: AI & ML							
1	MCA6322	Neural Networks (EL-11)		3	0	0	3
2	MCA6323	Decision Support Systems (EL-12)		3	0	0	3
3	MCA6428	Fuzzy Logic (EL-13)		3	0	0	3
4	MCA6429	Natural Language Processing (EL-14)		3	0	0	3
Domain 2 – AI & DATA SCIENCE							
1	MCA6324	Big Data (EL-21)		3	0	0	3
2	MCA6325	Python Programming for Data Analytics (EL-22)		3	0	0	3
3	MCA6430	Statistics for Business Analytics (EL-23)		3	0	0	3
4	MCA6431	Data Mining and NoSQL Databases (EL-24)		3	0	0	3



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Syllabus

**MCA -AI
1stYear
Ist Semester**



MCA5101: FUNDAMENTAL OF COMPUTERS& EMERGING TECHNOLOGIES		
Course Outcome (CO)		
CO1	Demonstrate the knowledge of the basic structure, components, features and Generations of computers.	
CO2	Describe the concept of computer languages, language translators and construct Algorithms to solve problems using programming concepts.	
CO3	Compare and contrast features, functioning &types of operating system and computer networks.	
CO4	Demonstrate architecture, functioning &service of the Internet and basics of multimedia.	
CO5	Illustrate the emerging trends and technologies in the field of Information Technology.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction to Computer: Definition, Computer Hardware and Computer Software. Components: Hardware – Introduction, Input devices, Output devices, Central Processing Unit, Memory- Primary and Secondary Software - Introduction, Types – System and Application. Computer Languages: Introduction, Concept of Compiler, Interpreter & Assembler Problem solving concept: Algorithms– Introduction, Definition, Characteristics, Limitations, Conditions in pseudo-code, Loops in pseudo code.	8
II	Operating system: Definition, Functions, Types, Classification, Elements of command based and GUI based operating system. Computer Network: Overview, Types (LAN, WAN and MAN), Data communication, topologies.	8
III	Internet: Overview, Architecture, Functioning, Basic services like WWW, FTP, Telnet, Gopher etc., Search engines, E-mail, Web Browsers. Internet of Things (IoT): Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things.	8
IV	Block chain: Introduction, overview, features, limitations and application areas fundamentals of Block Chain. Crypto currencies: Introduction, Applications and use cases Cloud Computing: It nature and benefits ,AWS, Google, Microsoft& IBM Services	8
V	Emerging Technologies: Introduction, overview, features, limitations and application areas of Augmented Reality, Virtual Reality, Grid computing, Green computing, Big data analytics, Quantum Computing and Brain Computer Interface.	8
Suggested Readings: 1. Computer Fundamentals fourth edition by Pradeep K. Sinha and Priti Sinha BPB publications. 2. Computer Fundamentals by A. Goel, Pearson Education, 2010. 3. Discovering Computers 2016 (First Edition) Cengage Learning By Misty E. Vermaat; Susan L. Sebok; Steven M. Freund; Jennifer T. Campbell; Mark Frydenberg (Shelly Cashman Series) 4. Pearson India By M. Morris R. Mano 5. Fundamentals of Computer (First Edition- 2009) Publisher: McGraw-Hill by Balaguruswamy Computer Fundamentals (First Edition-2010) Publisher: Pearson by Anita Goel		

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MCA5107: PYTHON PROGRAMMING

Course Outcome (CO)

CO1	Understand and implement Python's syntax, variables, and basic data structures.	
CO2	Apply control structures and loops to solve programming problems.	
CO3	Create user-defined functions and use built-in modules effectively.	
CO4	Implement Object-Oriented Programming concepts using Python.	
CO5	Read from and write to files and handle exceptions in Python applications.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Python Programming: History and Features of Python, Python IDEs and setup (IDLE, Jupyter, PyCharm), Basic Syntax, Keywords, Variables, and Data Types, Type Conversion and Input/Output, Operators (Arithmetic, Relational, Logical, Assignment).	8
II	Control Structures and Data Structures: Conditional Statements: if, if-else, if-elif-else, Loops: for, while, break, continue, pass, Strings and String Methods, Lists, Tuples, Sets, and Dictionaries, List comprehensions.	8
III	Functions and Modules: Defining and Calling Functions, Function Arguments: Default, Keyword, Variable-length, Recursion in Python, Lambda, map(), filter(), reduce(), Modules: Importing, Built-in Modules, Creating Custom Modules.	8
IV	Object-Oriented Programming (OOP): Classes and Objects, Constructor (__init__()), Destructor, Data Hiding and Encapsulation, Inheritance: Single, Multiple, Multilevel, Method Overriding and super().	8
V	File Handling and Exception Handling: File Operations: Open, Read, Write, Append, Working with text and binary files, Exception Handling: try, except, finally, raise, Introduction to Python Packages: os, sys, math, random.	8

Suggested Readings:

1. Taming Python by Programming – Jeeva Jose, Khanna Publishers
2. Python Programming: Using Problem Solving Approach – Reema Thareja, Oxford University Press
3. Core Python Programming – Wesley J. Chun, Pearson
4. Learning Python – Mark Lutz, O'Reilly Media
5. Think Python – Allen B. Downey, Green Tea Press (Free online book)

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UCC1102: AI FOR EVERYONE
Course Outcome (CO)

CO1	Understand the fundamental principles and applications of AI in different industries.	
CO2	Explain key AI techniques, including supervised and unsupervised learning, deep learning, and neural networks.	
CO3	Analyze ethical challenges and biases in AI systems and their impact on society.	
CO4	Apply AI-driven solutions in fields like healthcare, finance, and automation.	
CO5	Critically evaluate the benefits and risks associated with AI technologies.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to AI (Concept + Hands-on): What is AI? Understanding AI vs. Machine Learning vs. Deep Learning, AI in daily life: Smart assistants, AI in social media, AI in e-commerce, Prompt Engineering, Real Life Applications of AI. Tools: Explore AI-based tools (Google AI, ChatGPT, MetaAI, Gemini).	8
II	Introduction to Machine Learning and Deep Learning: Introduction to learning theory, Methods and Models. Supervised vs. Unsupervised Learning (Examples from real life), Reinforcement Learning, Introduction to ANN and Deep Learning.	9
III	Computer Vision & Image Processing: Introduction to Image processing and Computer Vision ?, Hardware used, Face Recognition, Object Detection, and AI-powered Cameras, How AI understands text & speech, AI in Chatbots, Sentiment Analysis, and AI-based Translation Practical	9
IV	AI in Automation & Robotics: AI-powered automation in businesses, How AI is used in robotics and smart homes, Ethical AI & Responsible AI, Bias in AI and fairness in decision-making, How to use AI responsibly.	8
V	Mini AI Projects (Without Coding): Hands-on Project Options: AI for Image Classification: Train an AI model to recognize objects Create an AI Chatbot: Use Dialog flow or Chatbot.com AI in Business: Automate tasks using AI-based productivity tools.	8

Suggested Readings:

1. **Software Engineering**, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
2. **Software Engineering: A Primer**, Waman S Jawadekar, Tata McGraw-Hill, 2008
3. **Software Engineering, 3 Principles and Practices**, Deepak Jain, Oxford University Press.
4. **Software Engineering 1: 4 Abstraction and modelling**, Diner Bjarne, Springer International edition, 2006.
5. **Software Engineering 2: Specification of systems and languages**, Diner Bjorner, Springer International edition 2006.
6. **Software Engineering Principles and Practice**, Hans Van Vliet, 3rd edition, John Wiley & Sons Ltd.
7. **Software Engineering 3: Domains, Requirements, and Software Design**, D. Bjorner, Springer International Edition.
8. **Introduction to Software Engineering**, R. J. Leach, CRC Press.


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MCA5105: DISCRETE MATHEMATICS

Course Outcome (CO)

CO1	Use mathematical and logical notation to define and formally reason about basic Discrete structures such as Sets, Relations and Functions	
CO2	Apply mathematical arguments using logical connectives and quantifiers to check the validity of an argument through truth tables and propositional and predicate logic	
CO3	Identify and properties of Algebraic Structures like Groups, Rings and Fields	
CO4	Formulate and solve recurrences and recursive functions	
CO5	Apply the concept of combinatorics to solve basic problems in discrete mathematics	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Set Theory: Introduction, Size of sets and Cardinals, Venn diagrams, Combination of sets, Multi sets, Ordered pairs and Set Identities. Relation: Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation. Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.	8
II	Natural Numbers: Introduction, Piano's axioms, Mathematical Induction, Strong Induction and Induction with Nonzero Base cases. Recurrence Relation & Generating functions: Introduction and properties of Generating Functions. Simple Recurrence relation with constant coefficients and Linear recurrence relation without constant coefficients. Methods of solving recurrences.	8
III	Propositional: Propositions, Truth tables, Tautology, Contradiction, Algebra of Propositions, Theory of Inference and Natural Detection. Predicate Logic: Theory of Predicates, First order predicate, Predicate formulas, Quantifiers, Inference theory of predicate logic.	8
IV	Posets, Hasse Diagram and Lattices: Introduction, Partial ordered sets, Combination of Partial ordered sets, Hasse diagram, Introduction of lattices, Properties of lattices– Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Boolean functions. Simplification of Boolean functions, Karnaugh maps, Logic gates.	8
V	Algebraic Structures: Introduction to algebraic Structures and properties. Types of algebraic structures: Semi group, Monoid, Group, Abelian group and Properties of group. Subgroup, Cyclic group, Co sets, Permutation groups, Homomorphism and Isomorphism of groups. Rings and Fields: Definition and elementary properties of Rings and Fields.	8

Suggested Readings:

1. C.L. Liu, "Elements of Discrete Mathematics" Mc Graw Hill Book Co., 1985
2. N. Deop, "Graph Theory with applications to Engineering and Computer Science", PHI 1993.
3. B. Colman and Robert C. Busby, "Discrete Mathematical structure for Computer Science," PHI.
4. Olympia Nicodemi, "Discrete Mathematics" CBS Publication, Delhi.
5. M.N.S. Swamy and K. Thulasiraman, "Graphs, Networks and Algorithms," Wiley Inter Science, NY, 1989.

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MCA5109: Introduction to Cyber Security		
Course Outcome (CO)		
CO1	Students will be able to identify some of the factors driving the need for network security.	
CO2	Students can identify and classify particular examples of attacks.	
CO3	Students will be able to define the terms vulnerability, threat and attack.	
CO4	They may identify physical points of vulnerability in simple networks.	
CO5	Students can compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack, and explain the characteristics of hybrid systems.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction to Information Security: Definition and Importance: What is information security? Why is it crucial for organizations and individuals? Historical Overview: Evolution of cybersecurity threats and solutions, Key Concepts: Confidentiality, Integrity, Availability (CIA Triad).	8
II	Cybersecurity Principles: Risk Management: Identifying and managing risks, risk assessment, and risk mitigation strategies. Security Policies and Procedures: Developing and implementing security policies, standards, and procedures. Incident Response: How to prepare for, detect, respond to, and recover from security incidents.	9
III	Introduction to cyber-attacks: Application security (design, development and testing), operations security, monitoring, identifying threats and remediating them, Principles of data security - Confidentiality, Integrity and Availability, Data Privacy, Data breaches, preventing attacks and breaches with security controls, Compliance standards, Computer Ethics.	10
IV	Threats and Vulnerabilities: Malware: Viruses, worms, trojans, ransomware, and spyware. Phishing and Social Engineering: Techniques used to deceive individuals into divulging confidential information. Network Attacks: Denial of Service (DoS), Distributed Denial of Service (DDoS), Man-in-the-Middle (MitM), and others.	9
V	Security Controls and Measures: Access Control: Authentication, authorization, and accounting (AAA). Encryption: Principles of cryptography, types of encryption (symmetric, asymmetric), and practical applications. Firewalls and Intrusion Detection Systems (IDS): Functionality and configuration of firewalls and IDS.	9
Suggested Readings: 1. William Stallings, Computer Security: Principles and Practice, Pearson Education 2. Michael E. Whitman and Herbert J. Mattord, Principles of Information Security, Cengage Learning 3. B. B. Gupta, D. P. Agrawal & Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press 4. Chwan-Hwa (John) Wu & J. David Irwin, Introduction to Computer Networks and Cybersecurity, CRC Press 5. V.K. Jain, Cyber Security, Khanna Book Publishing		

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MCA5103: WEB DEVELOPMENT TECHNOLOGIES

Course Outcome (CO)

- | | |
|-----|---------------------------------------|
| CO1 | Define the principle of Web page |
| CO2 | Define the basics in web design |
| CO3 | Visualize the basic concept of HTML. |
| CO4 | Recognize the elements of HTML. |
| CO5 | Develop the concept of web publishing |

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Introduction to Internet, www, Internet browsers, what is web, Introduction to Client Server Concepts, History of the web, Growth of the web, protocols governing the web, web development strategies, Web applications, web project, web team.	8
II	Web Page Designing: HTML: list, table, images, frames, forms, Cascading Style Sheet (CSS); XML: Introduction to XML, DTD, XML schemes, presenting and using XML.	8
III	Scripting: Introduction to Java script, variables, control structures, looping structures, documents, forms, statements, functions, objects, event and event handling, Arrays; Introduction to VB Script, Fundamental of AJAX.	8
IV	Server Site Programming: Introduction to java server pages (JSP), JSP application design, tomcat server, JSP Life Cycle, JSP Implicit objects, JSP Scripting Elements, declaring variables, and methods, debugging, sharing data between JSP pages, Session, Database with JSP, Introduction to active server pages (ASP), ASP.NET.	8
V	PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form mail, file upload, session, error, exception, filter, PHP-ODBC.	8

Suggested Readings:

1. Burdman, Jessica, "Collaborative Web Development" Addison Wesley
2. Xavier, C, "Web Technology and Design", New Age International
3. Ivan Bayross, "HTML, DHTML, Java Script, Perl & CGI", BPB Publication
4. Hans Bergsten, "Java Server Pages", SPD O'Reilly
5. Margaret Levine Young, "The Complete Reference Internet", McGraw Hill.
6. Greg Lim, "Beginning Node.js, Express & MongoDB Development", 1 September 2020, Greg Lim
7. Shannon Bradshaw, Eoin Brazil, Kristina Chodorow, "MongoDB: The Definitive Guide, 3rd Edition", December 2019, O'Reilly Media, Inc.

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UCC1101: IKS-I (INDIAN KNOWLEDGE SYSTEM – I)

Course Outcome (CO)

CO1	Creating awareness amongst the youths about the true history and rich culture of the country.
CO2	Understanding the scientific value of the traditional knowledge of Bharata.
CO3	Promoting the youths to do research in the various fields of Bhartiya knowledge system.
CO4	Converting the Bhartiya wisdom into the applied aspect of the modern scientific paradigm.
CO5	Adding career, professional and business opportunities to the youths.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Indian Education • Vedic Education: Focuses on the traditional system of learning during the Vedic period. • Spiritual and Moral Development: The role of education in promoting ethics and spiritual growth. • Intellectual Growth: How Vedic education contributed to intellectual advancement. • Social and Cultural Refinement: The cultural impact of education on society.	
II	Methodology of Indian Knowledge System • Pramana: The means of obtaining knowledge and validation in Indian philosophy. • Nyaya: Logical reasoning and debate in the Indian knowledge tradition.	
III	Indian Metallurgy • Indian Text for Metallurgy: Ancient Indian scriptures related to metallurgy. • Important Specimens of Metals Preserved/Found: Notable examples of metalwork from Indian history. • Vedic References of Metals: Mentions of metals in Vedic texts and their significance.	
IV	Indian Health Sciences • Literature: ○ Vedic Foundations of Ayurveda: Ancient texts that form the basis of Ayurveda. ○ Ayurveda Concern for Good Health: Focus on holistic well-being. ○ Three Guna, Three Dosha, Panch Mahabhoot, Sapta Dhatu, Six Rasa: Concepts central to Ayurveda. ○ Dincharya & Ritucharya: Daily and seasonal regimens for health. • Practical: ○ Sushruta Samhita: Ancient text on surgery. ○ Charaka Samhita: Ayurvedic text on medicine. ○ Ashtanga Hridaya – Sutra Sthana: An Ayurvedic classic. ○ Qualities of a Surgeon: The required attributes of a good surgeon. Surgical Practices: Ancient Indian surgical methods.	

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V	Foundational Literature of Indian Civilization Vedang, Ayurveda, Natya Shastra, Dharma Shastra, Arthashastra: Key texts that shaped Indian civilization in various fields like linguistics, health, arts, law, and politics.	8
VI	Bharata varsha—A Land of Rare Natural Endowments Seasons, Land Variations, Heritage, Natural Resources, Geographical Isolation: The geography of India and how it shaped the country's culture, heritage, and resources.	
<u>Suggested Readings:</u> 1. Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep Kohle et al. Samskrit Bharati (2006). 2. Vedic Physics by Keshav Dev Verma, Motilal Banarsidass Publishers (2012). 3. India's Glorious Scientific Tradition by Suresh Soni, Ocean Books Pvt. Ltd. (2010).		

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MCA5170: OFFICE AUTOMATION LAB

Course Outcome (CO)

CO1	Demonstrate the knowledge of the basic structure, components, features and Generations of computers.	
CO2	Describe the concept of computer languages, language translators and construct Algorithms to solve problem using programming concepts.	
CO3	Compare and contrast features, functioning & types of operating system and computer networks.	
CO4	Demonstrate architecture, functioning & services of the Internet and basics of Multimedia.	
CO5	Illustrate the emerging trends and technologies in the field of Information Technology.	

DETAILED SYLLABUS

Demonstrate the various hardware components of computer system.

1. Open the command prompt and create a directory in C: system drive using MS DOS commands. Now change the directory and create a subdirectory in this folder.
2. Create the following directory structure using MS DOS commands

- ❖ UIM
- ❖ UIT
 - CSE
 - MECH
- ❖ LAW
- ❖ USCS
 - MCA
 - BCA
 - BSCIT

- i.Remove the directory named MECH and MGT.
- ii.Remove the directory named UIT in single step.
- iii.Rename the directory LAW to LLB
- iv.Display the directory structure of UU.
- v.Rename the directory named BSCIT to BSIT.

3. Create Microsoft Word document with the name as UIM-MY-BIOGRAPHY. Write about your basic information, likes, dislikes, strengths and weakness. Along with, write the fields in which you excel. Also write about the concepts that inspire you. The font size of the title must be 14 and that of remaining text as 12. The font must be Times New Roman. Write a short biography having not more than 150 words.
4. Create your C.V. using pre-installed templates in WORD.
 - 1- Use table for education qualification, apply paragraph formatting while stating the summary at the end of your C.V., use bullets and numbering wherever applicable
 - 2- Use TIMES NEW ROMAN with font of size 12 and for heading size 14.
5. Invite your friends and relatives to your birthday party by creating a .mdb and linking it with the word document using a utility called Mail Merge. The list of invitees should not be less than 15. Apply formatting to the invitation - apply page borders to the final merged document. Provide the word "birthday invitation " in the header part and "name and contact number" in the footer part.

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6. Create the following table in MS Word and name it as UIM-Student.

Roll no.	Name	Father's Name
1	Aman	Akhilesh Sharma
2	Raman	Narendra Gupta

Insert one more row in the existing table and input the data as: Roll no=3, Name= Daman, Father's Name= Anuj Kumar. Insert one more column named Mother's Name, next to the Column named Father's Name and complete the data of existing records. The student named "Raman" decided to leave the course, so his record needs to be removed from the table. Apply table design to improve its visibility.

7. Create a power point presentation of topic of your own choice and apply different transitions, animations to the slide in your presentation. You must have at least 15 slides in your presentation.

NOTE:- The presentation must have table of contents, consisting of

1. Introduction
2. History/ Background
3. Features
4. Working
5. Advantages
6. Limitation
7. Conclusion, if applicable
8. References- mandatory
9. Thank you .

8. Create the record of at least 10 students in MS Excel consisting of the following

Columns:-

Column 1. Serial number

Column 2. Roll number

Column 3. University ID

Column 4. Your name

Column 5. Father's name

Column 6. Mother's name

Column 7. Address

Column 8. Your contact number

Column 9. Father's contact number

Column 10. Mother's contact number

Column 11. Date of birth

Column 12. Total Marks obtained in previous semester

Column 13. Percentage obtained in previous semester

Consider the following sample table:

Student Data												
S. No.	R. No.	UID	Name	Father's Name	Mother's Name	Address	Contact No.	Father's Contact No.	Mother's Contact No.	Date of Birth	Marks Obtained in Previous Semester	Percentage Obtained in Previous Semester
1	3	U1301	Aman	Anuj	Sumita	#123, Prem Nagar, Dehradun, UK	7060000000	7060000000	7060000000	11 March 2000	600	60%
2	4	U1304	Cherry	Amer	Priya	#1395, Setagut, Dehradun, UK	7060000000	7060000000	7060000000	24 March 2000	400	40%
4	5	U1305	Daman	Bonar	Anita	#1230, Clement Town, Dehradun, UK	7060000000	7060000000	7060000000	15 April 2000	450	45%
5	6	U1306	Shash	Anuj	Devi	#1223, Southwale, Dehradun, UK	7060000000	7060000000	7060000000	16 April 2000	140	14%
6	7	U1307	Shagun	Gurpreet	Vishvendra	#1224, Southwale, Dehradun, UK	7060000000	7060000000	7060000000	17 March 2000	300	30%
7	8	U1308	Yash	Jaspreet	Mansi	#1234, Clement Town, Dehradun, UK	7060000000	7060000000	7060000000	28 October 2000	350	35%
8	10	U1310	Jagan	Anuj	Ashwini	#1235, Clement Town, Dehradun, UK	7060000000	7060000000	7060000000	19 January 2000	380	38%
9	11	U1311	Kamal	Akhilesh	Priyanka	#1236, Vasant Vihar, Dehradun, UK	7060000000	7060000000	7060000000	22 March 2000	440	44%
10	12	U1312	Madan	Purnima	Anamika	#1236, Prem Nagar, Dehradun, UK	7060000000	7060000000	7060000000	26 June 2000	460	46%

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Column 4. Subject 2

Column 5. Subject 3

Column 6. Subject 4

Column 7. Subject 5

Column 8. Calculate the sum of marks obtained in all the subject

Column 9. Calculate percentage marks obtained

Column 10. If percentage is ≥ 40 then display "Pass" in front of that cell otherwise display "Fail"?

Consider the following sample data:

Student Data												
S. No.	R. No.	UID	Name	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Marks Obtained	Percentage	Result	Remarks
1	1	UU101	Aman	61	76	88	66	67	358	71.6	Pass	
2	2	UU102	Baman	43	82	40	82	87	334	66.8	Pass	
3	4	UU104	Cherry	90	67	52	81	82	372	74.4	Pass	
4	5	UU105	Daman	40	78	54	58	67	297	59.4	Pass	
5	6	UU106	Elish	89	63	85	62	83	382	76.4	Pass	
6	7	UU107	Gagan	98	54	90	56	68	366	73.2	Pass	
7	9	UU109	Ishar	97	74	61	68	94	394	78.8	Pass	
8	10	UU110	Jagan	50	93	72	71	58	344	68.8	Pass	
9	11	UU111	Kamal	92	88	72	83	40	375	75	Pass	
10	12	UU112	Madan	91	51	57	83	48	330	66	Pass	

10. In the above task include the following column as well:

Column 11. Display remarks as "Excellent" if percentage of student is greater than or equal to 85 but less than 95 and display remarks as "Distinction" if percentage is greater than or equal to 95 but less than or equal to 100.

11. Consider the following sample data of students:

S. No.	Male Height	Female Height
1	159	152
2	162	148
3	163	156
4	164	155

1. Find the average height of male and female students respectively.
2. Find the maximum and minimum height of male and female students respectively.

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MCA5173: PYTHON PROGRAMMING LAB		
Course Outcome (CO)		
CO1	Demonstrate understanding of Python basics, syntax, keywords, and data types.	
CO2	Implement control structures and data structures (lists, tuples, sets, dictionaries) for data processing.	
CO3	Develop modular programs using functions, recursion, and Python built-in modules.	
CO4	Apply object-oriented principles such as classes, inheritance, and encapsulation.	
CO5	Perform file operations and handle exceptions efficiently in Python programs.	
DETAILED SYLLABUS		
I	- Write a Python program to swap two numbers using a temporary variable and without using a temporary variable. - Write a Python program to demonstrate different data types and use the type() function to display their types. - Write a Python program to accept two numbers from the user and perform all arithmetic operations. - Write a Python program to demonstrate the use of relational, logical, and assignment operators. - Write a Python program to perform type conversion (implicit and explicit) and display the results. - Write a Python program to check whether a given number is even or odd using an if-else statement. - Write a Python program to find the largest of three numbers using if-elif-else. - Write a Python program to print the multiplication table of a given number using a for loop. - Write a Python program to calculate the sum of all numbers from 1 to N using a while loop. - Write a Python program to demonstrate the use of break, continue, and pass statements. - Write a Python program to demonstrate various string operations and string methods (like upper(), lower(), find(), replace(), split() etc.). - Write a Python program to perform basic operations on lists, tuples, sets, and dictionaries. - Write a Python program using list comprehension to generate a list of squares of numbers from 1 to 10. - Write a Python function to find the factorial of a number (using both recursion and iteration). - Write a Python program to demonstrate default, keyword, and variable-length arguments. - Write a Python program to demonstrate lambda, map(), filter(), and reduce() functions. - Write a Python program to import and use built-in modules such as math, random, and os. - Create a custom module (e.g., mymodule.py) containing at least two functions, and import it in another program. - Write a Python program to define a class Student with attributes like name and marks, and methods to display details. - Write a Python program to demonstrate the use of constructor (__init__()) and destructor (__del__()). - Write a Python program to demonstrate single, multiple, and multilevel inheritance. - Write a Python program to show method overriding and use of the super() function. - Write a Python program to demonstrate data hiding and encapsulation using private variables. - Write a Python program to create a text file, write data into it, and then read the contents. - Write a Python program to append text to an existing file and display the updated contents. - Write a Python program to handle exceptions using try, except, finally, and raise.	8

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MCA5172: WEB DEVELOPMENT TECHNOLOGIES LAB

Course Outcome (CO)

- | | |
|------------|---------------------------------------|
| CO1 | Define the principle of Web page |
| CO2 | Define the basics in web design |
| CO3 | Visualize the basic concept of HTML. |
| CO4 | Recognize the elements of HTML. |
| CO5 | Develop the concept of web publishing |

DETAILED SYLLABUS

- | | | |
|--|---|--|
| | <p>Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com The website should consist the following pages.</p> <ul style="list-style-type: none"> • Home page, • Registration and user Login, • User profile page, • Books catalog, • Shopping cart, • Payment By credit card, • Order confirmation. <p>1</p> <p>2 Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.</p> <p>3 Design a web page using CSS (Cascading Style Sheets) which includes the following:</p> <ul style="list-style-type: none"> • Use different font, styles: In the style definition you define how each selector should work (font, color etc.). • Then, in the body of your pages, you refer to these selectors to activate the styles. <p>4 Design a web page using CSS (Cascading Style Sheets) which includes the following:</p> <ul style="list-style-type: none"> • Set a background image for both the page and single elements on the page • Control the repetition of the image with the background-repeat property <p>5 Design an HTML page with JavaScript that takes a number from one text field in the range 0-999 and display it in other text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.</p> <p>6 Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt</p> <p>7 Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems:</p> <p>a. Parameter: A string
Output: The position in the string of the left-most vowel</p> <p>b. Parameter: A number
Output: The number with its digits in the reverse order</p> <p>8 Develop a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.</p> <p>9 Develop a PHP program to gerent online electricity bill where user provides the input</p> | |
|--|---|--|

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of previous reading and present reading and prepare an electricity bill using the following conditions.

Units Consumed	Rate
<100	Rs 3/Unit
Between 100 and 200	Rs 4/Unit
Between 201 and 300	Rs 5/Unit
>301	Rs 6 /Unit

- 10 Design an HTML form to input the salary details of an employee (Employee name, Basic pay, DA and HRA). Write a PHP script to accept user input data and store it in a text file. Write a PHP script to display the contents of the file.
- 11 Develop a PHP program to implement a session based counter which counts the number of how time dose the user view the web page for this create a session variable using PHP. Display the session variable using PHP.
- 12 Create a PHP program to develop a web application which display the result of the student I which users inputs the marks list of the student and connect to a database and retrieve data from a table and show the details in a neat format
 - a) Mark list of a student is entered and saved to MySQL table using PHP
 - b) Data stored in MySQL table is displayed

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Syllabus

MCA -AI

1st Year

IInd Semester



MCA5201: OPERATING SYSTEMS

Course Outcome (CO)

CO1	To understand the basic components of a computer operating system, and the interactions among the various components.	
CO2	The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.	
CO3	Responsible for allocating resources to users and processes	
CO4	Some operating systems implement significant OS functionality in user-mode, e.g. User-mode such as Linux.	
CO5	Program execution, Access to I/O devices – Display, disk, network, printer, keyboard, camera, etc.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Operating System Structure- Layered structure, System Components, Operating system functions, Classification of Operating systems-Batch, Interactive, Timesharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multi process Systems, Multithreaded Systems, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	8
II	Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation, Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem, Inter Process Communication models and Schemes, Process generation.	8
III	CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block(PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	8
IV	Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	8
V	I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File System implementation issues, File system protection and security	8

Suggested Readings:

1. Silberschatz A., Galvin P. B. and Gagne G., "Operating Systems Concepts", Wiley Pub.
2. Halder S. and Arvind A. A "Operating Systems", Pearson Education.
3. Dietel H. M., " An Introduction to Operating System", Pearson Education.
4. Stallings W., "Operating Systems: Internals and Design Principles", Pearson Education.
5. Harris J.A., "Operating Systems (Schaum's Outlines)", McGraw Hill Education.

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MCA5202: DATA STRUCTURE & ANALYSIS OF ALGORITHM

Course Outcome (CO)

CO1	Understanding the linear and non-linear data structures, sorting and searching operations, File structures.	
CO2	Analyse the performance of - Stack, Queue, and Lists.	
CO3	Analyse the performance of Trees, Graphs, Searching and Sorting techniques.	
CO4	Implement all the applications of Data structures in a high-level language.	
CO5	Design and apply appropriate data structures for solving computing problems	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to data structure: Data, Entity, Information, Difference between Data and Information, Data type, Build in data type, Abstract data type, Definition of data structures, Types of Data Structures :Linear and Non- Linear Data Structure, Introduction to Algorithms: Definition of Algorithms, Difference between algorithm and programs, properties of algorithm, Algorithm Design Techniques, Performance Analysis of Algorithms, Complexity of various code structures, Order of Growth, Asymptotic Notations. Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulaefor1-D, 2-D Array Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable.	8
II	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C++, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Queues: Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C++, Dequeue and Priority Queue. Searching: Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution. Techniques used in Hashing.	8
III	Sorting: Insertion Sort, Selection Sort, Bubble Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time: Counting Sort and Bucket Sort. Graphs: Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component.	8
IV	Trees: Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer (Linked List) Representation, Binary Search Tree, Complete Binary Tree, A Extended Binary Trees, Tree Traversal algorithms: In-order, Pre-order and Post-order, Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search Tree.	8

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	Threaded Binary trees, Huffman coding using Binary Tree, AVL Tree and B Tree.	
V	Divide and Conquer with Examples Such as Merge Sort, Quick Sort, Matrix Multiplication: Strassen's Algorithm Dynamic Programming: Dijkstra, Algorithm, Bellman Ford Algorithm, All- pair Shortest Path: Warshal Algorithm, Long Common Sub-sequence Greedy Programming Prims and Kruskal algorithm	8

Suggested Readings:

1. Cormen T. H., Leiserson C. E., Rivest R. L. and Stein C., "Introduction to Algorithms", PHI.
2. Horowitz E., Sahni S. and Rajasekharan S., "Fundamentals of Computer Algorithms", Universities Press.
3. Dave P. H. and Dave H. B, "Design and Analysis of Algorithms", Pearson Education.
4. Lipschuts S., "Theory and Problems of Data Structures Schaum's Series)", Tata McGraw-Hill.
5. Goyal K. K., Sharma S. and Gupta A., "Data Structures and Analysis of Algorithms", HP Hamilton.
6. Samanta D., "Classic Data Structures", Prentice Hall India.
7. Goodrich M. T. and Tomassia R., "Algorithm Design: Foundations, Analysis and Internet Examples", John Wiley and sons.
8. Sridhar S., "Design and Analysis of Algorithms", Oxford Univ. Press.
9. Aho A., Ullman J. and Hopcroft J., "Design and Analysis of algorithms", Pearson Education.
10. Neapolitan R. and K. Naimipour, "Foundations of Algorithms", Jones and Bartlett Student Edition.

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MCA5203: RELATIONAL DATABASE MANAGEMENT SYSTEMS		
Course Outcome (CO)		
CO1	Identify the basic concepts and various data model used in database design ER modelling concepts and architecture use and design queries using SQL.	
CO2	Apply relational database theory and be able to describe relational algebra expression, tuple and domain relation expression from queries.	
CO3	Recognize and identify the use of normalization and functional dependency, indexing and hashing technique used in database design.	
CO4	Recognize/ identify the purpose of query processing and optimization and also demonstrate the basic of query evaluation.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction: Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modelling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	8
II	Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction to SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PLSQL	8
III	Data Base Design& Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	8
IV	Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict& View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Check points, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System	8
V	Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	8
Suggested Readings: 1. Silbertschatz A., Korth H. and Sudarshan S., "Database Concepts", McGraw Hill. 2. Date C. J., "An Introduction to Database Systems", Addison Wesley. 3. Elmasri R. and Navathe S., "Fundamentals of Database Systems", Pearson Education. 4. O'Neil P., "Databases", Elsevier Publications.		

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MCA5204: INTRODUCTION TO ARTIFICIAL INTELLIGENCE		
Course Outcome (CO)		
CO1	Under the basic concepts of Python Programming	
CO2	Develop algorithmic solutions to simple computational problems	
CO3	Structure simple Python programs for solving problems	
CO4	Represent compound data using Python lists, tuples, dictionaries	
CO5	Develop applications using file and exception handling concepts	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Artificial Intelligence: Introduction to artificial intelligence, Historical development and foundation areas of artificial intelligence, Tasks and application areas of artificial intelligence. Introduction, types and structure of intelligent agents, Computer Vision, Natural language processing.	8
II	Searching Techniques: Introduction, Problem solving by searching, Searching for solutions, Uniformed searching techniques, Informed searching techniques, Local search algorithms, Adversarial search methods, Search techniques used in games, Alpha-Beta pruning	8
III	Introduction to Python: Importance of Python, Installing and working with Python in Windows, Linux and Mac, Using Python as calculator, Comments, How to define main function in Python The concept of data types - Variables, Arithmetic Operators and Expressions.	8
IV	String manipulations - Subscript Operator, Indexing, Slicing a string, Converting strings to numbers and vice versa, split function, Control flow - if statements, for and while loops, nested loops, Shortcircuit (lazy evaluation), range() function, break and continue statements, pass statements	8
V	Data Structures: Lists - Basic list operations, Replacing, inserting, removing an element; Searching and sorting a list, Methods of list objects, Using lists as Stacks and Queues, How efficient lists are when used as stack or queue, List and nested list Comprehensions Tuple, Sets, Difference between list and tuple, Dictionary - adding and removing keys, accessing and replacing values, traversing dictionaries.	8
Suggested Readings: 1. Russell S. and Norvig P., "Artificial Intelligence – A Modern Approach", Pearson Education. 2. Rich E. and Knight K., "Artificial Intelligence", McGraw Hill Publications. 3. Charnik E. and McDermott D., "Introduction to Artificial Intelligence", Pearson Education. 4. Patterson D. W., "Artificial Intelligence and Expert Systems", Prentice Hall of India Publications. 5. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greentepress.com/wp/thinkpython/)		

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MCA5205: COMPUTER BASED NUMERICAL TECHNIQUES
Course Outcome (CO)

CO1	Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems	
CO2	Ability to go in research by applying optimization techniques in problems of Engineering and Technology	
CO3	Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	PRELIMINARIES: - Inventory Models and Replacement problems: Inventory models – various costs-deterministic inventory models, Single period inventory model with shortest cost, stochastic models, Application of inventory models, Economic lot sizes- price breaks, and Replacement problems-capital equipment-discounting costs- replacement in anticipation of failure- group replacement-stochastic nature underlying the failure phenomenon	8
II	LINEAR PROGRAMMING PROBLEMS (LPP): - Definition of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method, and Artificial Variable Method, Two Phase Method, Charnes' Big-M Method, Sensitivity Analysis, Revised Simplex Method, Duality, Dual Simplex Method	8
III	INTEGER LINEAR PROGRAMMING PROBLEMS: - Integer Linear Programming Problems, Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method, 0-1 integer linear programming problem. Transportation Problems: Introduction to Transportation Model, Matrix Form of TP, Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining. Assignment Problems: Definition, Hungarian Method for AP.	8
IV	INTRODUCTION TO NLP: - Definition of NLP, Convex Programming Problems, Quadratic Programming Problems, Wolfe's Method for Quadratic Programming, Kuhn-Tucker Conditions, Geometrical Interpretation of KT- Conditions, KT-Points etc. Dynamic Programming: Bellman's Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem	8
V	QUEUEING THEORY: -Introduction to Queues, Basic Elements of Queueing Models, Queue Disciplines, Memoryless Distribution, Role of Exponential and Poisson Distributions, Markovian Process, Erlang Distribution, Symbols and Notations, Distribution of Arrivals, Distribution of Service Times, Definition of Steady and Transient State, Poisson Queues.	8

Suggested Readings:

1. Hadley, G., "Linear Programming, and Massachusetts", Addison-Wesley
2. Taha, H.A., "Operations Research – An Introduction", Macmillan.
3. Hiller, F.S., G.J. Lieberman, "Introduction to Operations Research", Holden-Day
4. Swarup K et al, "Operation Research", S. Chand.

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MCA5208: Introduction to Machine Learning
Course Outcome (CO)

CO1	Develop and apply classification algorithms to classify multivariate data.	
CO2	Apply learning algorithms for finding relationships between data variables.	
CO3	Develop and apply reinforcement learning algorithms for learning to control complex systems.	
CO4	Discuss the Scientific reports on computational machine learning methods, results and conclusions.	
CO5	Implement the clustering algorithms to real time problems.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	BASICS: Learning Problems, Perspectives and Issues, Concept Learning, Find-S, Version Spaces and Candidate Eliminations, Inductive bias.	8
II	DECISION TREE & NEURAL NETWORKS: Decision Tree Learning - Introduction, Decision tree representation, appropriate problems, ID3 algorithm. Neural Network Representation Problems, Perceptions Multilayer Networks and Back Propagation Algorithms,	9
III	BAYESIAN AND COMPUTATIONAL LEARNING: Bayes Theorem, Concept Learning Maximum, Likelihood Minimum Description Length, Principle Bayes Optimal Classifier, Gibbs Algorithm, Naïve, Bayes Classifier, Bayesian Belief Network, EM Algorithm, Probability Learning.	10
IV	INSTANT BASED LEARNING: K- Nearest Neighbour Learning, Locally weighted Regression Radial, Bases Functions, Case Based Learning..	9
V	CLUSTERING: Overview- Types of clustering, Types of clusters, K-Means, Agglomerative Hierarchical, Clustering, Density-Based Clustering, Graph-Based Clustering, Cluster evaluation.	9

Suggested Readings:

1. S. Shalev-Shwartz, S.Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2nd Edition, 2018.
3. Duda, Richard, Peter Hart, and David Stork, "Pattern Classification," 2nd Edition, John Wiley & Sons, Hoboken, 2000.
4. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.

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MCA5206: AI FOR DEVELOPERS

Course Outcome (CO)

CO1	Understand fundamental AI concepts and their applications.	
CO2	Develop and implement machine learning models using Python.	
CO3	Apply AI techniques in natural language processing and computer vision.	
CO4	Integrate AI tools in software development processes.	
CO5	Explore advanced AI applications in real-world scenarios.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Artificial Intelligence: Definition and Scope of AI, History and Evolution of AI, AI vs. Machine Learning vs. Deep Learning, Applications of AI in Software Development, AI Ethics and Responsible AI.	8
II	Machine Learning for Developers: Supervised, Unsupervised, and Reinforcement Learning, Data Preprocessing and Feature Engineering, Model Selection and Evaluation Metrics, Popular ML Libraries: Scikit-Learn, TensorFlow, PyTorch, Implementing ML Models in Python.	8
III	Natural Language Processing (NLP) and Computer Vision: NLP Basics: Tokenization, Stemming, Lemmatization,	8
IV	Sentiment Analysis and Chatbot Development, Image Processing and Feature Extraction, CNNs for Image Recognition (Introduction to OpenCV, TensorFlow), AI-based Object Detection and Face Recognition.	8
V	AI in Software Development: AI-powered Code Generation (GitHub Copilot, ChatGPT API), Automated Testing and Debugging using AI, AI in DevOps: CI/CD Automation, Performance Monitoring, AI-based Security: Intrusion Detection and Threat Analysis, AI and Cloud Computing (AWS AI, Azure AI, Google AI).	8

Reference Books:

1. "Artificial Intelligence: A Guide for Thinking Humans" – Melanie Mitchell
2. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" – Aurélien Géron
3. "Deep Learning for Coders with fastai & PyTorch" – Jeremy Howard, Sylvain Gugger
4. "Pattern Recognition and Machine Learning" – Christopher M. Bishop
5. "Artificial Intelligence: A Modern Approach" – Stuart Russell, Peter Norvig

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MCA5274: DATA STRUCTURE USING PYTHON LAB

Course Outcome (CO)

CO1	Understanding the linear and non-linear data structures, sorting and searching operations, File structures.	
CO2	Analyse the performance of - Stack, Queue, and Lists.	
CO3	Analyse the performance of Trees, Graphs, Searching and Sorting techniques.	
CO4	Implement all the applications of Data structures in a high-level language.	
CO5	Design and apply appropriate data structures for solving computing problems	

DETAILED SYLLABUS

Program in C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

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MCA5271: RDBMS LAB

Course Outcome (CO)

CO1	Identify the basic concepts and various data model used in database design ER modelling concepts and architecture use and design queries using SQL.
CO2	Apply relational database theory and be able to describe relational algebra expression, tuple and domain relation expression from queries.
CO3	Recognize and identify the use of normalization and functional dependency, indexing and hashing technique used in database design.
CO4	Recognize/ identify the purpose of query processing and optimization and also demonstrate the basic of query evaluation.
CO5	Apply and relate the concept of transaction, concurrency control and recovery in database.

DETAILED SYLLABUS

1. Create a table named uim_employee having attributes such as: Employee id, Employee name, Employee's department number, Employee's date of joining, Employee's salary, Employee's email_id and Employee's contact number.
Consider the following table:

Attribute	Datatype	Size
employee id	Varchar2	10
employee name	Char	25
employee department no	Number	03
employee date of joining	Date	-
employee salary	Number	8,2
employee email id	Varchar2	30
employee contact no	Number	12

Note: Insert department number values as 111, 222, 333, 444,etc.

Note: Insert employee id values as UU1001, UU1002, UU1003, UU1004,etc.

Write SQL queries to:

- i. Insert at least 10 tuples in the table.
- ii. Display employee's complete details including *employee_id*, *employee_name*, *employee_department_no*, *employee_date_of_joining*, *employee_salary*, *employee_email_id* and *employee_contact_no*.
- iii. Display employee's complete details including *employee_id*, *employee_name*, *employee_department_no*, *employee_date_of_joining*, *employee_salary*, *employee_email_id* and *employee_contact_no* who work in department number 444.
- iv. Display *employee_id*, *employee_name* and *employee_date_of_joining* who work in work in department number 222.
- v. Delete the employee's details having *employee_id* as UU1003.
- vi. Update *employee_contact_no* to 9592929295 having *employee_id* as UU1007.

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2. Implement DDL and DML on the uim_employee table.

Consider the following table:

Attribute	Datatype	Size
employee id	Varchar2	10
employee name	Char	25
employee department no	Number	03
employee date of joining	Date	-
employee salary	Number	8,2
employee email id	Varchar2	30
employee contact no	Number	12

i. Add a new column named *employee_address* having data type as varchar2, size 30 in the *uim_employee* table.

ii. Update the addresses of existing *uim_employees* in the table.

iii. Drop the column named *employee_date_of_joining* from the table.

iv. Modify the size of the column named *employee_contact_no* to 14.

v. Rename the table to *uim_employee_details* from the table name *uim_employee*.

vi. Truncate as the records from the *uim_employee_details* table.

vii. Drop the table named *uim_employee_details*.

3. Implementation of keys and constraints concept. Create a table named *uim_student* having attributes such as: student's roll number, student's name, student's date of birth, student's course, student's house address, student's contact number, student's aadhaar number. The attribute named: *student_roll_no* has a PRIMARY KEY constraint, *student_name* has NOT NULL constraint, *student_aadhaar_no* as UNIQUE constraint.

Consider the following table:

Attribute	Datatype	Size	Constraint
student roll no	Number	3	PRIMARY KEY
student name	Char	25	NOT NULL
student date of birth	Date	-	-
student course	Varchar	15	-
student address	Varchar2	30	-
student contact no	Number	10	-
student aadhaar no	Number	12	UNIQUE

i. Describe the structure of *uim_student* table.

ii. Insert few tuples in the table.

iii. Examine the error message by inserting same *student_roll_no* values for two rows. Write the error message and reason.

iv. Examine the error message by NOT inserting *student name* value in a row in the table.

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Write the error message and reason.

- v. Examine the error message by inserting same *student_aadhaar_no* values for two rows.
Write the error message and reason.

4. Implementation of Foreign key concept using two tables named: *uim_employee* and *uim_department*. The employee table has employee's id, employee's name and employee's department number. The department table has department number, department name and department location.

Consider the following two tables:

Table name: uim_employee				Table name: uim_department			
Attribute	Data type	Size	Constraint	Attribute	Data type	Size	Constraint
employee_id	Char	8	-	department_no	Number	3	PRIMARY KEY
employee_name	Varchar2	20	-	department_name	Char	15	-
employee_department_no	Number	3	FOREIGN KEY	department_location	Varchar2	20	-

- Display the structure of *uim_employee* table
- Display the structure of *uim_department* table
- Insert at least three department details in the *uim_department* table.
- Display the data of *uim_department* table.
- Insert employee's details working in the corresponding departments as in the *uim_department* table.
- Display the data of *uim_department* table.
- Examine the error message by inserting a value in *employee_department_no* which is NOT there in *uim_department* table's *department_no*. Write the error message and reason.
- Delete any department number from the *uim_department* table and examine its effects in *uim_employee* table.

5. Create a table named *employee_contact_details* from *employee* table by taking the attribute named: *employee_id*.

Consider the table below:

Table name: employee_contact_details		
Attribute	Datatype	Size
employee_id	employee_id from employee table	

- Display the contents of *employee_contact_detailstable*
- Add a new column *employee_contact_no* having data type as Number and size as 12 in *employee_contact_details* table
- Display the contents of *employee_contact_details* table.
- Update the contact details of existing employees

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v. Display the updated contents of employee_contact_details table

6. Create a table named uim_book having the attributes related to book id, book name and book theme. The book_theme attribute can have only two values: IT or MGT where IT is Information Technology and MGT is Management. Apply CHECK constraint on the attribute named book_theme.

Consider the table below:

Table name: book			
Attribute	Datatype	Size	Constraint
Book id	Number	10	PRIMARY KEY
book name	Varchar2	25	NOT NULL
book theme	Char	4	CHECK

i. Describe the structure of uim_book table.

ii. Insert few tuples in the uim_book table.

iii. Display the contents of uim_book table.

iv. Examine the error message by inserting a value other than IT/MGT in column named book_theme. Write the error message and reason.

7. Extract the data from both the tables by performing join. Given two tables named: uim_employee and uim_department. The employee table has attributes related to employee's id, employee's name and employee's department number. The department table has attributes related to department number, department name and department location.

Consider the following two tables:

Table name: uim_employee				Table name: uim_department			
Attribute	Data type	Size	Constraint	Attribute	Data type	Size	Constraint
employee_id	Char	8	-	department_no	Number	3	PRIMARY KEY
employee_name	Varchar2	20	-	department_name	Char	15	-
employee_department_no	Number	3	FOREIGN KEY	department_location	Varchar2	20	-

i. Display the structure of uim_employee table

ii. Display the structure of uim_department table

iii. Insert at least three department details in the department table.

iv. Display the data of uim_department table.

v. Insert employee's details in uim_employee table who work in the corresponding departments as in the uim_department table.

vi. Display the data of uim_employee table.

vii. Display employee_id, employee_name, department_no and department_name of employees from both the tables uim_employee and uim_department by performing join.

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viii. Display employee id, department no, department_name and department_location of employees from both the tables uim_employee and uim_department by performing join.

8. The data in the table can be grouped based on certain attributes. Consider the book table having attributes as book_id, book_name, book_theme and book_price. Consider the table below:

Table name: uim_book			
Attribute	Datatype	Size	Constraint
Book id	Number	10	PRIMARY KEY
book_name	Varchar2	25	NOT NULL
book theme	Char	4	CHECK

Note: the book_theme can either be 'it' or 'mgt' only.

i. Add a new column named book_price having data type as Number and size as 7,2 in the existing table named uim_book.

ii. Display the contents of uim_book table.

iii. Update the book prices of available books in the uim_book table.

iv. Display the contents after updation in uim_book table.

v. Find the sum of all the book price based on the book theme.

vi. Display the maximum book_price in each group of book_theme.

9. There are numerous aggregate functions that can be performed on table(s). Consider the attributes in the employee table as: employee's id, employee's name, employee's department number, employee's designation, employee's date of joining, employee's salary, employee's email id, employee's contact no and employee's aadhaar number.

Consider the following uu_employee table:

Attribute	Datatype	Size	Constraint
employee id	Varchar2	10	PRIMARY KEY
employee name	Char	25	NOT NULL
employee department no	Number	03	NOT NULL
employee designation	Varchar2	15	NOT NULL
employee date of joining	Date	-	NOT NULL
employee salary	Number	8,2	NOT NULL
employee email id	Varchar2	30	NOT NULL
employee contact no	Number	12	NOT NULL
employee aadhaar no	Number	12	UNIQUE

i. Insert few tuples in the uu_employee table.

ii. Display the contents of uu_employee table

iii. Calculate the sum of salaries of all the employees.

iv. Calculate the sum of salaries of employees working in department number 222.

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10. Demonstrate the following based on the uu_employee table.
Consider the following table data:

uu_employee									
EMPLOYEE_ID	EMPLOYEE_NAME	EMPLOYEE_DEPARTMENT_NO	EMPLOYEE_DESIGNATION	EMPLOYEE_DATE_OF_JOINING	EMPLOYEE_SALARY	EMPLOYEE_EMAIL_ID	EMPLOYEE_CONTACT_NO	EMPLOYEE_AADHAR_NO	EMPLOYEE_DATE_OF_RESIGNING
uu1001	aman	111	assistant prof.	17-Sep-18	30000	uu.aman@gmail.com	7060106060	617289452563	
uu1002	baman	222	assistant prof.	1-Aug-18	30000	uu.baman@gmail.com	7060106070	617289055563	
uu1003	chaman	111	professor	1-Jul-18	70000	uu.chaman@gmail.com	7160106060	697289452563	
uu1004	daman	111	assistant prof.	7-Aug-19	35000	uu.daman@gmail.com	7060101060	607289452563	10-Jul-20
uu1005	raman	111	professor	2-Feb-20	52000	uu.raman@gmail.com	7080106060	637289452563	

- i. Count the number of employees in the uu_employee table.

Display the maximum salary of employees having employee_designation as "assistant prof."

- ii. Display the minimum salary of employees having employee_designation as "Professor".

- iii. Calculate the average of salaries of all the employees.

11. Implement the single-row character function on the customer table. The customer table as attributes related to customer's id, customer's first name, customer's last name, customer's contact number, customer's house number, customer's street of address, customer's city of address, customer's state of address and customer's email id.

Consider the following customer table:

Table name: uim_customer			
Attribute	Datatype	Size	Constraint
customer_id	Varchar2	10	PRIMARY KEY
customer_first_name	Char	25	NOT NULL
customer_last_name	Char	25	-
customer_contact_no	Number	03	NOT NULL
customer_house_no	Number	03	-
customer_home_street	Varchar2	15	-
customer_home_city	Varchar2	15	-
customer_home_state	Varchar2	15	-
customer_email_id	Date	-	-

- i. Insert few tuples in the uim_customer table

- ii. Concatenate customer_first_name as My first name is in display.

- iii. Display the customer_first_name in upper case.

- iv. Display the customer_home_city in with first letter as capital and remaining in lower case (e.g. Dehradun).

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12. Implement the date functions on uu_employee table. Consider the attributes in the employee table as: employee's id, employee's name, employee's department number, employee's designation, employee's date of joining, employee's salary, employee's email id, employee's contact no, employee's aadhaar number and employee's date of resigning. Consider the following employee table:

Attribute	Datatype	Size	Constraint
employee id	Varchar2	10	PRIMARY KEY
employee name	Char	25	NOT NULL
employee department no	Number	03	NOT NULL
employee designation	Varchar2	15	NOT NULL
employee date of joining	Date	-	NOT NULL
employee salary	Number	8,2	NOT NULL
employee email id	Varchar2	30	NOT NULL
employee contact no	Number	12	NOT NULL
employee aadhaar no	Number	12	UNIQUE
employee date of resigning	Date	-	

- Describe the structure of uu_employee table.
- Add a new column named employee_date_of_resigning having date data type in uu_employee table
- Update the data in uu_employee table those who have resigned (wherever applicable)
- Display the number of months between employee's joining and resignation. (Note: There might be few employees who have resigned).
- Display the last day of the month in which employees have resigned.
- Calculate the working employee's experience in the current organization. (Note: Use sysdate)

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MCA5273: MACHINE LEARNING LAB

Course Outcome (CO)

CO1	Under the basic concepts of Python Programming	
CO2	Develop algorithmic solutions to simple computational problems	
CO3	Structure simple Python programs for solving problems	
CO4	Represent compound data using Python lists, tuples, dictionaries	
CO5	Develop applications using file and exception handling concepts	

DETAILED SYLLABUS

1. Write a python program to implement Breadth First Search Traversal?
 2. Write a python program to implement Water Jug Problem?
 3. Write a python program to remove punctuations from the given string?
 4. Write a python program to sort the sentence in alphabetical order?
 5. Write a program to implement Hangman game using python.
 6. Write a program to implement Tic-Tac-Toe game using python.
 7. Write a python program to remove stop words for a given passage from a text file using NLTK?
 8. Write a python program to implement stemming for a given sentence using NLTK?
 9. Write a python program to POS (Parts of Speech) tagging for the give sentence using NLTK?
 10. Write a python program to implement Lemmatization using NLTK?
- Write a python program to for Text Classification for the give sentence using NLTK

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LSM5202: LSM-I (LIFE SKILLS & MENTORING -I)

Course Outcome (CO)

CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession.
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO3	Understand the value of harmonious relationship based on trust and respect in their life and profession.
CO4	Understand the role of a human being in ensuring harmony in society and nature.
CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

DETAILED SYLLABUS

I	Overview of Life Skills: Meaning and significance of life skills, Life skills identified by WHO: Self- awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem solving, Effective communication, interpersonal relationship, coping with stress, coping with emotion. Life skills for professionals: positive thinking, right attitude, attention to detail, having the big picture, learning skills, research skills, perseverance, setting goals and achieving them, helping others, leadership, motivation, self-motivation, and motivating others, personality development, IQ, EQ, and SQ
II	Self-awareness: definition, need for self-awareness; Coping With Stress and Emotions, Human Values, tools and techniques of SA: questionnaires, journaling, reflective questions, meditation, mindfulness, psychometric tests, feedback. Stress Management: Stress, reasons and effects, identifying stress, stress diaries, the four A's of stress management, techniques, Approaches: action- oriented, emotion oriented, acceptance- oriented, resilience, Gratitude Training, Coping with emotions: Identifying and managing emotions, harmful ways of dealing with emotions, PATH method and relaxation techniques. Morals, Values and Ethics: Integrity, Civic Virtue, Respect for Others, Living Peacefully, Caring, Sharing, Honesty, Courage, Valuing Time, Time management, Cooperation, Commitment, Empathy, Self-Confidence, Character, Spirituality, Avoiding Procrastination, Sense of Engineering Ethics.
III	21st century skills: Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity, Critical thinking Vs Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence. Steps in problem solving: Problem Solving Techniques, Six Thinking Hats, Mind Mapping, Forced Connections. Analytical Thinking, Numeric, symbolic, and graphic reasoning. Scientific temperament and Logical thinking
IV	Group and Team Dynamics: Introduction to Groups: Composition, formation, Cycle, thinking, Clarifying expectations, Problem Solving, Consensus, Dynamics techniques, Group vs Team, Team Dynamics, Virtual Teams. Managing team performance and managing conflicts, Intrapreneurship.

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V	Leadership: Leadership framework, entrepreneurial and moral leadership, vision, cultural dimensions. Growing as a leader, turnaround leadership, managing diverse stakeholders, crisis management. Types of Leadership, Traits, Styles, VUCA Leadership, Levels of Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders.	
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Suggested Readings:

1. Girish Batra, Experiments in Leadership, Chennai: Notion Press, 2018
2. Mitesh Khatri, Awaken the Leader in You, Mumbai: Jaico Publishing House, 2013
3. Carnegie Dale, Become an Effective Leader, New Delhi: Amaryllis, 2012
4. Hall, C.S., Lindzey. G. & Campbell, J.B Theories of Personality. John Wiley & Sons, 1998
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.

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Syllabus

**MCA (AI &
ML) 1st Year
IIIrd Semester**



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MCA6311: COMPUTER NETWORKS

Course Outcome (CO)

CO1	Understand fundamentals of computer networks and layered architecture
CO2	Analyze data communication techniques and network models
CO3	Understand routing, switching and transport layer mechanisms
CO4	Apply concepts of network security and congestion control
CO5	Understand modern networking technologies and protocols

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Computer Network, Types (LAN, MAN, WAN), Network Topology, Transmission Modes, OSI Model, TCP/IP Model (basic idea). Physical Layer: Transmission Media (wired & wireless), Switching (Circuit & Packet), Multiplexing (basic idea).	8
II	Physical Layer: Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Introduction to Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared), Switching methods, integrated services digital networks	8
III	Medium Access sub layer: Channel Allocations, LAN protocols -ALOHA protocols, Collision free Protocols-Token Passing, IEEE standards, Ethernet and Token Ring. Data Link Layer: Framing, Error detection and correction codes: checksum, CRC, hamming code, Sliding Window Protocols: Stop & Wait ARQ, Selective repeat ARQ	8
IV	Network Layer: Point-to Point networks, Routing algorithms, Congestion control algorithms, Internetworking Devices, IP protocol, IP addresses: IPv4 classful and classless addressing, Introduction to IPv6	8
V	Transport Layer: Connection management: Three-way Handshaking. Introduction of User Datagram Protocol (UDP), Basics of Transmission Control Protocol. (TCP). Application Layer: File Transfer Protocol, Domain Name System, Hyper Text Transfer Protocol, WWW.	8

Text and Reference Books:

1. Database System Concepts, Henry Korth, A. Silberschatz, 5th Edition, 2005.
2. An Introduction to Database System, Bipin Desai, Galgotia Publications, 1991.
3. SQL, PL/SQL the Programming Language of Oracle, Ivan Bayross, BPB Publications, 4th Edition.

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MCA6312: SOFTWARE ENGINEERING
Course Outcome (CO)

CO1	To apply fundamental software engineering principles.	
CO2	To apply fundamental software engineering practices to real-world scenarios	
CO3	To compare and contrast different SDLC models	
CO4	To analyze user needs and translate into clear, concise, and measurable requirements.	
CO5	To apply fundamental project management principles.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction of Software Engineering ,Software Development Life Cycle, Software Process Introduction, S/W Engineering Paradigm life cycle models: waterfall, incremental, spiral, win-win spiral, Agile, evolutionary, prototyping , Object-Oriented life cycle models-system engineering , computer-based system, life cycle process, development process.	8
II	Requirements Software Requirements: Functional & non-functional ,user- system requirement engineering process , feasibility studies , elicitation, validation & management , software prototyping ,S/W documentation, Analysis and modeling, Case Tools.	8
III	Design: Design Concepts and Principles Modular design, design heuristic, Software architecture, data design, architectural design, transform & transaction mapping, Introduction to SCM process, Software Configuration Items, the DSSD Approach Jackson system development.	8
IV	Testing, Software Testing Taxonomy of Software testing, levels , black box testing, testing boundary conditions ,structural testing ,regression testing, Software testing strategies, unit testing, integration testing ,validation testing, system testing and debugging , Traceability matrix.	8
V	Software Project Management: Software cost estimation, Function point models, COCOMO model, Project Scheduling-Delphi method, Software challenges, and Software Maintenance, Reliability, Reliability and availability models, SQA, CMM & ISO 9001 Standard.	8

Reference Books:

1. Roger S.Pressman, Software Engineering- -Hill
- 2.2. Ian Sommerville, Software engineering, Pearson education Asia
- 3.3. Pankaj Jalote, Software Engineering A Precise Approach Wiley
4. Merlin Dorfman (Editor), Richard H. Thayer (Editor) ,Software Engineering
- 8.5. Robert C. "Uncle Bob" Martin, Clean Architecture: A Craftsman's Guide to Software Structure and Design

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MCA6303: ADVANCE JAVA PROGRAMMING

Course Outcome (CO)

CO1	To understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.	
CO2	To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.	
CO3	Establish database connections using JDBC, Execute SQL queries and manage database transactions.	
CO4	Create JSP pages to generate dynamic web content, Use JSP expressions, scriptlets, and directives effectively.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Java: Features of Java, JDK Environment, Object Oriented Programming Concept: Overview of Programming, Paradigm, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C++ and JAVA. Structure of JAVA program, Data types, Variables.	8
II	Java Programming Fundamental: , Operators, Keywords, Naming Convention, Decision Making (if, switch), Looping (for, while), Type Casting Creating Classes and objects, Memory allocation for objects, Constructor, Implementation of Inheritance, Implementation of Polymorphism, Method Overloading, Method Overriding, Nested and Inner classes.	8
III	Introduction to JDBC: Overview of JDBC and its architecture, Setting up a database and JDBC driver, Establishing a database connection; Executing SQL Queries with JDBC: CRUD operations (Create, Read, Update, and Delete), Prepared statements and batch processing, Handling transactions and rollback.	8
IV	Exception Handling and Resource Management in JDBC: Exception handling in JDBC, Closing connections and managing resources, Connection pools concepts; Introduction to Servlets: Overview of Servlets and their role in web applications, Creating and configuring a simple Servlet, Understanding the servlet lifecycle.	8
V	Introduction to JSP: Overview of JSP and its advantages, Creating a simple JSP page, Understanding JSP lifecycle; JSP Expressions, Scriptlets, and Directives: Using expressions and scriptlets in JSP, JSP directives and their usage, Integrating JSP with JavaBeans.	8

Suggested Readings:

1. E Balagurusamy , Programming with JAVA, TMH, 2007
2. Herbert Schildt , “Java-The Complete Reference”, 8th Edition, 2009.
3. The Complete Reference: Java, Herbert Schieldt, TMH, 7th Edition 2006
4. Programming in JAVA, E. Balagurusamy, TMH, 2nd Edition 2007
5. Object Oriented Modeling and Design, James Rumbaugh et al, PHI, 4th Edition 2003
6. Object Oriented Analysis & Design with Application, Booch Grady, Pearson Education, New Delhi, 3rd Edition, 2006.

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MCA6313: REMEDIAL MATHEMATICS (Theory)

Course Outcome (CO)

CO1	Describe the Introduction, Polynomial, Rational fractions, Proper and Improper fractions.	
CO2	Explain Matrices and Determinant.	
CO3	Discuss the Derivative of a function, Derivative of a constant.	
CO4	Evaluate the Analytical Geometry.	
CO5	Analyze the Introduction, Definition, Properties of Laplace transform.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Partial fraction: Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics. Logarithms: Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems. Function: Real Valued function, Classification of real valued functions. Limits and continuity: Introduction, Limit of a function, Definition of limit of a function ($\epsilon - \delta$ definition), $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}, \quad \lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1.$	8
II	Matrices and Determinant: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations.	8
III	Differentiation: Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) Without Proof: Derivative of x^n w.r.t x , where n is any rational number, Derivative of e^x , Derivative of $\log_e x$, Derivative of a^x , Derivative of trigonometric functions from first principles (without Proof), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application	8
IV	Analytical Geometry Introduction: Signs of the Coordinates, Distance formula. Straight Line: Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope–intercept form of a straight line.	8

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	Integration: Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application.	
V	Differential Equations : Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations Laplace Transform : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations	8
<u>Suggested Readings:</u> 1. Differential Calculus by Shanthinarayan 2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H. 3. Integral Calculus by Shanthinarayan 4. Higher Engineering Mathematics by Dr.B.S.Grewal		

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MCA63014: PRINCIPAL OF MANAGEMENT

Course Outcome (CO)

CO1	Demonstrate the nature & purpose, importance & Functions.	
CO2	Describe the Evolution of Management Thought.	
CO3	Understand the Process of Planning, Barriers to Effective Planning.	
CO4	Explain Process of Communication, Non- verbal Communication.	
CO5	Describe Writing of Proposal; Significance. Nuances of Delivery.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Nature of Management: Meaning, Definition, nature & purpose, importance & Functions, Management as Art, Science & Profession, Management as social System Concepts of management- Administration-Organization, Management Skills, Levels of Management.	8
II	Evolution of Management Thought: Contribution of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard & Peter Drucker to the management thought. Business Ethics & Social Responsibility: Concept, Shift to Ethics, Tools of Ethics.	8
III	Functions of Management: Part-I Planning – Meaning- Need & Importance, types, Process of Planning, Barriers to Effective Planning, levels –advantages & limitations. Forecasting- Need & Techniques, Decision making-Types – Process of rational decision making & techniques of decision making, Organizing – Elements of organizing & processes: Types of organizations, Delegation of authority – Need, difficulties , Delegation – Decentralization, Staffing – Meaning & Importance, Direction – Nature – Principles, Communication – Types & Importance.	8
IV	Functions of Management: Part-II Motivation–Importance–theories Leadership–Meaning –styles, qualities & function of leader Controlling – Need, Nature, importance, Process & Techniques, Total Quality Management, Coordination – Need – Importance	8
V	Management of Change: Models for Change, Force for Change, Need for Change, Alternative Change Techniques, New Trends in Organization Change, Stress Management. Strategic Management: Definition, Classes of Decisions, Levels of Decision, Strategy, Role of different Strategist, Relevance of Strategic Management and its Benefits, Strategic Management in India	8

Suggested Readings:

1. Essential of Management – Horold Koontz and Iteinz Weibrich- McGraw-Hill's International
2. Management Theory & Practice – J.N.Chandan
3. Essential of Business Administration – K.Aswathapa, Himalaya Publishing House
4. Principles & practice of management – Dr. L.M.Prasad,, Sultan Chand & Sons – New Delhi
5. Business Organization & Management – Dr. Y.K.Bhushan
6. Management: Concept and Strategies by J.S. Chandan, Vikas Publishing
7. Principles of Management, By Tripathi, Reddy Tata McGraw Hill

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MCA6372: Advance JAVA PROGRAMMING LAB

Course Outcome (CO)

CO1	Demonstrate Java environment and executing Java Programs	
CO2	Understand and formulate the problems in basic programming constructs	
CO3	Applying OOP concepts to solve real world problems	
CO4	Implement inheritance and polymorphism features of Java	
CO5	Implementing multithreading to enhance efficiency and handle run time errors	

Experiments:

1. WAP in Java to print Hello and explore the difference between print() and println()
2. WAP in Java with two classes create an object of first class and call into another class (having main method)
3. WAP in Java to find product of two numbers.
4. WAP in Java product of two numbers (Input by the user)
5. WAP in Java to illustrate the concept of local, instance and static variable
6. WAP in Java to count the total number of vowels and consonants in a string.
7. WAP in Java input a string and check whether it is palindrome or not.
8. WAP in Java to implement implicit and explicit type casting
9. WAP in Java to implement various operators in java
10. WAP in Java to check whether the given number is prime or not.
11. WAP in Java for constructor overloading.
12. WAP in Java for method overloading
13. WAP in Java for method overriding
14. WAP in Java to find the factorial of a given number.
15. WAP in Java to show run time polymorphism (up casting)
16. WAP in Java for access specifiers (all four)
17. WAP in Java to implement the single dimension array
18. WAP in Java to copy the elements from one array to another array
19. WAP in Java to perform the addition and multiplication in 2-D array
20. WAP in Java to print the duplicate elements of an array.
21. WAP in Java to find the sum of each row and each column of a matrix
22. WAP in Java to sort the elements of an array in ascending/ descending order using Bubble Sort and Insertion sort.
23. WAP in Java for simple inheritance
24. WAP in Java for Final keyword
25. WAP in Java for super keyword
26. WAP in Java to create package (user defined)
27. WAP in Java for abstract method, class
28. WAP in Java for interface
29. WAP in Java multiple inheritance
30. WAP in Java for exception handling by using try, catch and finally
31. WAP in Java for throw and throws exception
32. WAP in Java to throw your own exceptions
33. WAP in Java to reading and writing through console class.
34. WAP in Java how to create thread using Thread Class.
35. WAP in Java how to create thread using runnable interface.
36. WAP in Java to implement the multithreading.

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MAC6374: MINI PROJECT

Course Outcome (CO)

CO1	Discover potential research areas in the field of IT.	
CO2	Conduct a survey of several available literatures in the preferred field of study	
CO3	Compare and contrast the several existing solutions for research challenges.	
CO4	Demonstrate an ability to work in teams and manage the conduct.	
CO5	Formulate and propose a plan for creating a solution for the research plan identified.	
DETAILED SYLLABUS:		

Projects Steps & Scheduling

- The Master of Computer Applications (MCA) program prepares the learners to take up positions as Programmers, Systems Analysts, Systems Designers in the field related to computer application and information technology or learners may go for higher studies in this area.
- The theoretical background of various courses provides you the necessary foundation, principles, and practices to develop effective ways to solve computing problems. The hands-on experience gained from the practical courses provide you the knowledge to work with various operating systems, programming languages and software tools. This project work is kept in the MCA program to give you an opportunity to develop quality software solutions.
- During the development of the project, you should be involved in all the stages of the software development life cycle (SDLC) like requirements analysis, systems design, software development/coding, testing and documentation, with an overall emphasis on the development of reliable software systems.
- The primary emphasis of the project work is to understand and gain the knowledge of the principles of software engineering practices, and develop a good understanding of SDLC.
- The MCA learners are encouraged to involve themselves completely on the project work in their Fifth semester. It is advised to learners to develop their project for solving problems of the software industry or any research organization.
- Doing this will give more exposure to handling real life problems of project development. Learners should take this project work very seriously.
- The project should be genuine and original in nature and should not be copied from anywhere else.
- Learners, who wish to do their Project Report from any organization, are required to take NOC from the concerned organization, to carry out the Code of the Project done.
- The project covers Study of existing system & System Requirements, Analysis, Design and Coding. Learners should submit their Project Reports as per the guidelines.
- Project Reports which are not as per the guidelines will not qualify for evaluation. Objective of the Project
 - a) To train the learner to independently formulate and solve a social, philosophical, Commercial, or technological problem and present the results in written and oral form.
 - b) To expose learners to the real-life problems in the World of Work.
 - c) To provide opportunities to learners to interact with people and understand human relations.

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Syllabus

**MCA (AI &
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IVth Semester**



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MCA6409: COMPUTER GRAPHICS

Course Outcome (CO)

CO1	Analyze advanced graphics pipeline and rendering techniques.	
CO2	Apply advanced lighting, shading and texture mapping techniques.	
CO3	Understand animation principles and implement advanced animation techniques.	
CO4	Apply 2D and 3D transformations in complex graphical systems	
CO5	Develop interactive graphics and animation systems using modern tools.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Advanced Graphics Fundamentals: Graphics pipeline, rasterization, scan conversion, frame Buffer, anti-aliasing, color models, introduction to OpenGL/WebGL.	8
II	Advanced Animation Techniques: Principles of animation, key frame animation, interpolation methods (linear, spline), morphing, motion capture systems, procedural animation, physics-based animation (rigid body dynamics), character animation, inverse kinematics, skeletal animation, animation blending.	8
III	Rendering Techniques: Visible surface detection, shading models (Phong, Gouraud), illumination models, texture mapping basics.	8
IV	2D and 3D Transformations: Composite Transformations, homogeneous coordinates, viewing transformations, camera models, hierarchical modeling.	8
V	Advanced Modeling and Rendering: Geometric modeling, curves and surfaces (Bezier, B- Spline, CURBS), fractals, particle systems, global illumination, shadow algorithms, environment mapping, virtual reality (VR) and augmented reality (AR) basics.	8

Suggested Readings:

1. Donald Hearn & M. Pauline Baker – *Computer Graphics (C Version)*
2. Foley, Van Dam – *Computer Graphics Principles and Practice*
3. Alan Watt – *3D Computer Graphics*
4. Rick Parent – *Computer Animation: Algorithms and Techniques*
5. Rogers & Adams – *Mathematical Elements for Computer Graphics.*

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MAC6401: RESEARCH METHODOLOGY

Course Outcome (CO)

CO1	Define the basic framework of research process.	
CO2	Formulate hypotheses or suggested solutions.	
CO3	Use various sources of research design, information for literature review and data collection.	
CO4	Discuss the different sampling techniques	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Research: Meaning of Re-search, Retracing the path, Importance of re-search. Philosophies, and the language of research theory building Theoretical background of a research philosophy. The meaning of methodology (structured definition and examples). Understanding research terminologies i.e., Concepts, Constructs, Variables, and Definitions etc.	8
II	Problems and Hypotheses: Identifying research problem, State-of-the-Art, The problem definition lifecycle. Meaning/Definition of a hypothesis. Real world examples. Testing and Verification of Hypothesis.	8
III	Research design: Experimental and Non-experimental research design. Field research, Survey Research, Survey outcomes. Methods of data collection – Secondary data collection methods, qualitative methods of data collection, and Survey methods of data collection.	8
IV	Sampling Techniques: Research Population and Sample. Target Population, Accessible Population. Sampling techniques – The nature of sampling, Probability sampling design. Nonprobability sampling design, Determination of sample size.	8
V	Data Analysis & Report Generation: Types of Data Sources, Web Data, Survey Data. Data attributes, Discrete vs. Continuous Data attributes. Mean, Median, Mode; Range, Quartile, Variance, SD, Interquartile Range	8

Suggested Readings:

Text book(s):

1. Bryman, Alan & Bell, Emma (2011). Business Research Methods (Third Edition), Oxford University Press.
2. Kerlinger, F.N., & Lee, H.B. (2000). Foundations of Behavioural Research (Fourth Edition), Harcourt Inc.
3. Rubin, Allen & Babbie, Earl (2009). Essential Research Methods for Social Work, Cengage Learning Inc., USA.

Other References:

1. Chawla, Deepak & Sondhi, Neena (2011). Research methodology: Concepts and cases, Vikas Publishing House Pvt. Ltd. Delhi.
2. Pawar, B.S. (2009). Theory building for hypothesis specification in organizational studies, Response Books, New Delhi.
3. Neuman, W.L. (2008). Social research methods: Qualitative and quantitative approaches, Pearson Education.

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MAC6415: DIGITAL MARKETING

Course Outcome (CO)

CO1	To understand the basic Concepts of Digital marketing and the road map for successful Digital marketing strategies.	
CO2	To know the importance of Social media Platforms importance in Digital Marketing	
CO3	To understand the technological importance of SEO	
CO4	How to creates effective Ad Words campaign & Advertising Positioning with respect to the Digital marketing.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Fundamentals of Digital marketing & Its Significance, Traditional marketing Vs Digital Marketing, Evolution of Digital Marketing, Digital Marketing Landscape, Key Drivers, Digital Consumer & Communities, Gen Y & Netizen's expectation & influence wrt Digital Marketing.	8
II	The Digital users in India, Digital marketing Strategy- Consumer Decision journey, POEM Framework, Segmenting & Customizing messages, Digital advertising Market in India, Skills in Digital Marketing, Digital marketing Plan.	8
III	Terminology used in Digital Marketing, PPC and online marketing through social media, Social Media Marketing, SEO techniques, Keyword advertising, Google web-master and analytics overview, Affiliate Marketing, Email Marketing, Mobile Marketing	8
IV	Display adverting, Buying Models, different type of ad tools, Display advertising terminology, types of display ads, different ad formats, Ad placement techniques, Important ad terminology, Programmatic Digital Advertising.	8

Suggested Readings:

1. Digital Marketing -Kamat and Kamat-Himalaya
2. Marketing Strategies for Engaging the Digital Generation, D. Ryan,
3. Digital Marketing, V. Ahuja, Oxford University Press
4. Digital Marketing, S.Gupta, McGraw-Hill
5. Quick win Digital Marketing, H. Annmarie , A. Joanna, Paperback edition

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MAC6473: COMPUTER GRAPHICS LAB

Course Outcome (CO)

Topic	
IMPLEMENT THE EXERCISES USING C / JAVA	
1. Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes Circle (Midpoint)	
2. 2D Geometric transformations – Translation, Rotation Scaling, Reflection Shear, Window- Viewport	
3. Composite 2D Transformations	
4. Line Clipping	
5. 3D Transformations - Translation, Rotation, Scaling.	
6. 3D Projections – Parallel, Perspective.	
7. Creating 3D Scenes.	
8. Image Editing and Manipulation - Basic Operations on image using any image editing software, creating gif animated images, Image optimization.	
9. 2D Animation – To create Interactive animation using any authoring tool.	

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MCA6322: NEURAL NETWORK (Domain 1) AI&ML

Course Outcome (CO)

CO1	Classify the role of neural networks in engineering, artificial intelligence, and cognitive modelling.
CO2	Describe the concepts and techniques of neural networks through the study of important neural network models.
CO3	Evaluate whether neural networks are appropriate to a particular application.
CO4	Implement neural networks to particular application.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Biological Neuron: Artificial Neural Model - Types of activation functions Architecture: Feedforward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem. XOR Problem, Multilayer Networks. Learning: Learning Algorithms, Error correction and Gradient Descent Rules, Learning objective of TLNs, Perceptron Learning Algorithm, Perceptron Convergence Theorem.	9
II	Supervised Learning: Perceptron learning and non-separable sets, a-Least Mean Square Learning, MSE Error surface, Steepest Descent Search, g-LMS approximate to gradient descent, Application of LMS to Noise Cancelling, Multi-layered Network Architecture, Back propagation Learning Algorithm, Practical consideration of BP algorithm.	9
III	Support Vector Machines and Radial Basis Function: Learning from Examples, Statistical Learning Theory, Support Vector Machines, SVM application to Image Classification, Radial Basis Function Regularization theory, Generalized RBF Networks, Learning in RBFNs, RBF application to face recognition.	9
IV	Attractor Neural Networks: Associative Learning Attractor Associative Memory, Linear Associative memory, Hopfield Network, application of Hopfield Network, Brain State in a Box neural Network, Simulated Annealing, Boltzmann Machine, Bidirectional Associative Memory.	8
V	Self-organization Feature Map: Maximal Eigenvector Filtering, Extracting Principal Components, Generalized Learning Laws, Vector Quantization, Self-organization Feature Maps, Application of SOM, Growing Neural Gas.	8

Suggested Readings:

Text Books:

1. Neural Networks A Classroom Approach— Satish Kumar, McGraw Hill Education (India) Pvt. Ltd, Second Edition.

Reference Books:

1. Introduction to Artificial Neural Systems-J.M. Zurada, Jaico Publications 1994.
2. Artificial Neural Networks-B. Yegnanarayana, PHI, New Delhi 1998.

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MCA6472: PROJECT		
Course Outcome (CO)		
CO1	Discover potential research areas in the field of IT.	
CO2	Conduct a survey of several available literature's in the preferred field of study.	
CO3	Compare and contrast the several existing solutions for research challenges.	
CO4	Demonstrate an ability to work in teams and manage the conduct.	
CO5	Report and present the findings of the study conducted in the preferred domain.	
DETAILED SYLLABUS:		
A project is an inquiry, conducted personally by a trainee(s) who is responsible for using a variety of methods (e.g. analysis, interpretation, planning etc.) to undertake a task or study a subject (knowledge or skill or attitude) and to write a report, or solve a problem etc., in line with the objectives of the project. A project can also be termed as an open-ended assignment, the outcome of which is not known at inception and whose progress depends mostly on the intelligence, skills, creativity and energy of the students. The project work exposes the students to real life problems and introduces them to the procedures and practices used in industry. The project work also helps the students to gain confidence in tackling problems of their own. The project work is needed to strengthen and supplement the learning experience of students. Project-based instruction is an authentic instructional model or strategy in which students plan, implement, and evaluate projects that have real-world applications beyond the classroom. Learning activities that are interdisciplinary, long term, and student centered are emphasized, rather than short, isolated lessons. Most importantly, students find projects fun, motivating, and challenging because they play an active role in choosing the project and in the entire planning process. Teachers are increasingly working with students who have a wide range of abilities, coming from various backgrounds. Institutes are seeking ways to respond to the needs of these students. Project-based instruction provides one way to introduce a wider range of learning opportunities into the classroom. It can engage students from diverse backgrounds because students can choose topics that are related to their own experiences, as well as allow them to use individual learning styles. There are a wide range of project types such as service-learning projects, work-based projects, task-oriented projects, problem-solving projects and so forth, but authentic projects all have in common these defining features: 1) Student centered, student directed 2) A definite beginning, middle, and end 3) Content meaningful to students; directly observable in their environment 4) Real-world problems 5) First hand investigation 6) Sensitivity to local culture and culturally appropriate 7) Specific goals related to curriculum and institute, district, or state standards 8) A tangible product that can be shared with the intended audience 9) Connections among academic, life, and work skills 10) Opportunity for feedback and assessments from expert sources 2 11) Opportunity for reflective thinking and student self-assessment 12) Authentic assessments (portfolios, journals, etc.)		

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MCA6323: DECISION SUPPORT SYSTEM (Domain 1) AI&ML

Course Outcome (CO)

CO1	Understand concept of managerial decision systems and outline its various phases.	
CO2	Demonstrate DSS components and identify sources of data for business intelligence.	
CO3	Categorize the methodologies involved in DSS development.	
CO4	Analyze evolution of enterprise DSS and knowledge management initiatives.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Decision Making: Managerial decision making and information systems - framework and concept for decision support, Decision making - introduction – definition - systems and models, phases of decision making process - Personality Types – Gender - Human Cognition - and Decision Styles.	9
II	Modeling and Analysis: Definition – Characteristics and capabilities of DSS – DSS components - Modeling and issues – Static and dynamic models – Certainty, Uncertainty and Risk – Influence Diagrams – Structure of Mathematical models.	9
III	DSS Development: Introduction – Traditional and alternative development methodologies - Change Management – DSS Technology Levels and Tools – Development Platforms – Tool Selection.	9
IV	Enterprise DSS and Knowledge Management: Communication support – Collaboration support - Group support systems and technologies – GSS meeting process – Creativity and idea generation – Enterprise information systems – Evolution – Characteristics and capabilities of executive support systems – Organizational DSS - Organizational learning and transformation – Knowledge management initiatives – approaches – implementation.	8
V	Business Intelligence: Nature and Sources of data – Data collection, problems and quality – Database organizations and structures -Data warehousing, Data mining and Data visualization.	8

Suggested Readings:

1. Efraim Turban, Jay E Aronson, Ting Peng Liang, Decision Support and Intelligent Systems, Prentice Hall of India, 7th Edition 2005.
2. Elaine Rich and Kevin Knight, Artificial intelligence, TMH, 2006.
3. Efraim Turban, Ramesh Sharda, Dursun Delen, Decision support and Business Intelligence systems, Pearson Education, 9th Edition, 2011.

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MCA6428: FUZZY LOGIC (Domain 1) AI&ML

Course Outcome (CO)

CO1	Students will be able to differentiate a Fuzzy set, its properties and the operations on Fuzzy sets from their classical set theory counterparts
CO2	Students will be able to introduce fuzziness in classical relations and perform various operations on fuzzy relations
CO3	Students will be able to fuzzify a crisp set and defuzzify a fuzzy set
CO4	Students will be able to develop a Fuzzy rule based inference system

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Classical Sets and Fuzzy Sets: Classical Sets, Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions, Fuzzy Sets, Operations on Fuzzy Sets, Properties of Fuzzy Sets, Alternative Fuzzy Set Operations.	7
II	Membership Functions, Fuzzification and Defuzzification: Features of the Membership Function, Various Forms of Membership Functions, Membership Value Assignments, Assignment by Intuition, Inference and Rank Ordering Methods, Fuzzification, Defuzzification to Crisp Sets, Defuzzification to Scalars	7
III	Classical Relations and Fuzzy Relations: Cartesian Product, Crisp Relations, Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition of Crisp Relations, Crisp Equivalence Relations Fuzzy Relations, Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition of Fuzzy Relations, Fuzzy Equivalence Relations	7
IV	Logic and Fuzzy Systems: Classical Logic, Tautologies, Contradictions, Equivalence, Exclusive Or and Exclusive Nor, Logical Proofs, Deductive Inferences, Fuzzy Logic, Approximate Reasoning, Fuzzy Systems, Natural Language, Linguistic Hedges, Fuzzy Rule-Based Systems	7
V	Fuzzy Classification: Classification, Classification by Crisp and Fuzzy Equivalence Relations, Cluster Analysis, Cluster Validity, c -Means Clustering, Hard c -Means (HCM), Fuzzy c -Means (FCM), Classification Metric, Hardening the Fuzzy c -Partition	7
IV	Fuzzy Control Systems: Control System Design Problem, Control (Decision) Surface, Assumptions in a Fuzzy Control System Design, Simple Fuzzy Logic Controllers, Examples of Fuzzy Control System Design, Aircraft Landing Control Problem	7

Suggested Readings:

1. Fuzzy Logic with Engineering Applications by Timothy J. Ross, Second Edition, Wiley India
2. Fuzzy Sets, Uncertainty and Information by G. Klir, PHI Publication
3. Fuzzy Set Theory and Its Applications by H. Zimmermann, Fourth Edition, Springer
4. Publication
5. Neural Networks, Fuzzy Logic and Genetic Algorithms, Synthesis and Applications by S. Rajasekaran, PHI
6. Neuro-Fuzzy and Soft Computing By J. Jang, Pearson Education

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MCA6429: NATURAL LANGUAGE PROCESSING (Domain 1) AI&ML
Course Outcome (CO)

CO1	Explain the Gain knowledge in automated Natural Language Generation and Machine Translation.	
CO3	Demonstrate the applications of NLP	
CO4	Analyze the semantic analysis of natural language.	
CO5	Examine the language generation and discourse analysis	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	OVERVIEW AND MORPHOLOGY: Introduction – Models -and Algorithms - -Regular Expressions Basic Regular Expression Patterns – Finite State Automata Understand the wireless sensor network principles. Morphology -Inflectional Morphology - Derivational Morphology. Finite-State Morphological Parsing -- Porter Stemmer	9
II	WORD LEVEL AND SYNTACTIC ANALYSIS: N-grams Models of Syntax-Counting Words- Unsmoothed N-grams. Smoothing- Back-off Deleted Interpolation – Entropy - English Word Classes - Tag sets for English Part of Speech Tagging-Rule Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging.	9
III	CONTEXT FREE GRAMMARS: Context Free Grammars for English Syntax- Context-Free Rules and Trees -Understand the network simulation tools. Sentence- Level Constructions–Agreement – Sub Categorization. Parsing – Top-down – Early Parsing - feature Structures – Probabilistic Context-Free Grammars	9
IV	SEMANTIC ANALYSIS: Representing Meaning-Meaning Structure of Language-First Order Predicate Calculus Representing Linguistically Relevant Concepts -Syntax-Driven Semantic Analysis - Semantic Attachments -Syntax-Driven Analyzer. Robust Analysis - Lexemes and Their Senses - Internal Structure - Word Sense Disambiguation - Information Retrieval	9
V	LANGUAGE GENERATION AND DISCOURSE ANALYSIS: Discourse -Reference Resolution - Text Coherence -Discourse Structure – Coherence. Dialog and Conversational Agents - Dialog Acts – Interpretation -Conversational Agents. Language Generation– Architecture-Surface Realizations - Discourse Planning. Machine Translation -Transfer Metaphor– Interlingua – Statistical Approaches	9

Suggested Readings:

1. Daniel Jurafsky and James H Martin,” Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Prentice Hall, 2nd Edition, 2008
2. C. Manning and H. Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press. Cambridge, MA:,1999

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MCA6324: BIG DATA (Domain 2) AI&DS

Course Outcome (CO)

CO1	Discuss the Big Data Platform and its Use cases.
CO2	Provide an overview of Apache Hadoop.
CO3	Provide HDFS Concepts and Interfacing with HDFS.
CO4	Understand Map Reduce Jobs.
CO5	Apply analytics on Structured, Unstructured Data.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	INTRODUCTION TO BIG DATA AND HADOOP, Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.	8
II	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.	8
III	Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.	8
IV	Hadoop Eco System 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 Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction.	8
V	Data Analytics with R Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.	8

Suggested Readings:

1. Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
3. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.

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MCA6425: PYTHON PROGRAMMING FOR DATA ANALYTICS (Domain 2) AI&DS

Course Outcome (CO)

CO1	Apply descriptive statistics to obtain a deterministic view of data
CO2	Perform data handling using Numpy arrays
CO3	Load, clean, transform, merge, and reshape data using Pandas
CO4	Visualize data using Pandas and matplotlib libraries
CO5	Solve real world data analysis problems

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to basic statistics and analysis: Fundamentals of Data Analysis, Statistical foundations for Data Analysis, Types of data, Descriptive Statistics, Correlation and covariance, Linear Regression, Statistical Hypothesis Generation and Testing, Python Libraries: NumPy, Pandas, Matplotlib, Seaborn	8
II	Array manipulation using Numpy: Numpy array: Creating Numpy arrays; various data types of Numpy arrays, indexing and slicing, swapping axes, transposing arrays, data processing using Numpy arrays.	8
III	Data Manipulation using Pandas: Data Structures in Pandas: Series, DataFrame, Index objects, Loading data into Pandas data frame, Working with DataFrames: Arithmetics, Statistics, Binning, Indexing, Filtering, Handling missing data, Hierarchical indexing, Data wrangling: Data cleaning, transforming, merging and reshaping	8
IV	Plotting and Visualization: Using Matplotlib to plot data: figures, subplots, markings, color and line styles, labels and legends, Plotting functions in Pandas: Line, bar, Scatter plots, histograms, stacked bars, Heatmap, 3D Plotting, interactive plotting using Bokeh and Plotly.	8
V	Data Aggregation and Group operations: Group by mechanics, Data aggregation, General split-apply-combine, Pivot tables and cross tabulation	8

Suggested Readings:

1. Chen D. Y. Pandas for Everyone: Python Data Analysis, First edition, Pearson Education, 2018.
2. Miller J.D. Statistics for Data Science, Packt Publishing Limited, 2017.
3. McKinney W. Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython, 2nd edition, O'Reilly Media, 2018.
4. Molin S. Hands-On Data Analysis with Pandas, Packt Publishing, 2019.
5. Gupta S.C., Kapoor V.K. Fundamentals of Mathematical Statistics, 12 th edition, Sultan Chand & Sons, 2020.

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MCA6430: STATISTICS FOR BUSINESS ANALYTICS (Domain 2) AI&DS		
Course Outcome (CO)		
CO1	To identify the association between various types of data.	
CO2	To apply statistical inference techniques.	
CO3	To apply methods of inference to applied business situations.	
CO4	To identify, build and validate appropriate statistical regression models.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction: Data -Data Tables - Categorical and Numerical Data - Recoding and Aggregation - Time Series - Describing Categorical Data - Charts of Categorical Data -The Area Principle - Mode and Median - Describing numerical data – Summaries of Numerical Variables- Histograms and the Distribution of -Numerical Data-Boxplot-Shape of a Distribution.	8
II	Association in Categorical and Numerical Data: Contingency Tables -Lurking Variables and Simpson's Paradox - Strength of Association – Scatter plots - Association in Scatter plots - Measuring Association - Summarizing Association with a Line - Spurious Correlation.	8
III	Probability: Probability - Conditional Probability - Random Variables - Association between Random Variables - Probability models for Counts - Normality – Managing Financial Risk - Modelling Sampling Variation.	8
IV	Inference: Samples and Surveys - Sampling Variation and Quality - Confidence Intervals- Hypothesis Tests - Alternative Approaches to Inference-Data for Comparisons- Two-sample T-test-Confidence Interval for the Difference- Rare Events -Testing Association.	8
V	Regression Models-I: Linear Patterns - Curved Patterns - Simple Regression – Regression Diagnostics - Multiple Regressions.	8
Suggested Readings: 1. Robert Stine, Dean Foster, Statistics for Business: Decision Making and Analysis, Pearson Education, Second Edition, 2013. 2. Paul Newbold, William L. Carlson, Betty Thorne, Statistics for Business and Economics, Pearson Education, Sixth Edition, 2007. 3. Keller Gerald, Statistics for Management and Economics, South Western, Tenth Edition, 2015.		

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MCA6430: STATISTICS FOR BUSINESS ANALYTICS (Domain 2) AI&DS

Course Outcome (CO)

CO1	To identify the association between various types of data.	
CO2	To apply statistical inference techniques.	
CO3	To apply methods of inference to applied business situations.	
CO4	To identify, build and validate appropriate statistical regression models.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Data -Data Tables - Categorical and Numerical Data - Recoding and Aggregation - Time Series - Describing Categorical Data - Charts of Categorical Data -The Area Principle - Mode and Median - Describing numerical data – Summaries of Numerical Variables- Histograms and the Distribution of -Numerical Data–Boxplot-Shape of a Distribution.	8
II	Association in Categorical and Numerical Data: Contingency Tables -Lurking Variables and Simpson's Paradox - Strength of Association – Scatter plots - Association in Scatter plots - Measuring Association - Summarizing Association with a Line - Spurious Correlation.	8
III	Probability: Probability - Conditional Probability - Random Variables - Association between Random Variables - Probability models for Counts - Normality – Managing Financial Risk - Modelling Sampling Variation.	8
IV	Inference: Samples and Surveys - Sampling Variation and Quality - Confidence Intervals- Hypothesis Tests - Alternative Approaches to Inference-Data for Comparisons- Two-sample T-test-Confidence Interval for the Difference- Rare Events -Testing Association.	8
V	Regression Models–I: Linear Patterns - Curved Patterns - Simple Regression – Regression Diagnostics - Multiple Regressions.	8

Suggested Readings:

1. Robert Stine, Dean Foster, Statistics for Business: Decision Making and Analysis, Pearson Education, Second Edition, 2013.
2. Paul Newbold, William L. Carlson, Betty Thorne, Statistics for Business and Economics, Pearson Education, Sixth Edition, 2007.
3. Keller Gerald, Statistics for Management and Economics, South Western, Tenth Edition, 2015.

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MCA6431: DATA MINING AND NOSQL DATABASES (Domain 2) AI&DS
Course Outcome (CO)

CO1	Design a data warehouse system and perform business analysis with OLAP tools.	
CO2	Apply suitable pre-processing and visualization techniques for data analysis	
CO3	Extract knowledge using data mining techniques and Adapt to new data mining tools.	
CO4	To provide an understanding of the various types of NoSQL databases (Key-Value, Document, Column, Graph).	
CO5	To develop practical skills for handling unstructured and semi-structured data using NoSQL tools.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	DATA MINING – INTRODUCTION: Introduction to Data Mining Systems, Knowledge Discovery Process – Data Mining Techniques – Issues – applications, Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.	8
II	DATA MINING – FREQUENT PATTERN ANALYSIS: Introduction of Unit, Mining Frequent Patterns, Associations and Correlations, Mining Methods- Pattern Evaluation Method, Pattern Mining in Multilevel, Multi Dimensional Space, Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns	8
III	WEKA TOOL: Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.	8
IV	Basics of NoSQL: Introduction to NoSQL, Difference between SQL and NoSQL, Types of NoSQL, databases: Key-Value, Document, Column-Family, Graph, Advantages and limitations of NoSQL, Real-life examples and use cases	8
V	MongoDB Introduction: Features - Data types - Mongo DB Query language - CRUD operations – Arrays - Functions: Count – Sort – Limit – Skip – Aggregate - Map Reduce. Cursors – Indexes - Mongo Import –Mongo Export.	8

Suggested Readings:

1. "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence" Author: Pramod J. Sadalage and Martin Fowler Publisher: Addison-Wesley.
2. "Professional NoSQL" Author: Shashank Tiwari Publisher: Wiley
3. "Learning NoSQL" Author: Gaurav Vaish, Publisher: Packt Publishing

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