



FUTURE UNIVERSITY

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FUTURE UNIVERSITY, BAREILLY

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

COURSE CURRICULUM

AND

EVALUATION SCHEME

MCA

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 BCA 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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Board of Studies

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

for

Master of Computer Application



(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 on the basis of the recommendations of the second BOS for the session 2024-25 and 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.

Dean
Faculty of Computer
Applications
Future University
Bareilly

Academic Council
Future University
Bareilly



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)
HOD
Department of Computer Application
Future University, Bareilly

Dean
Faculty of Computer
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Bareilly

Academic Council
Future University
Bareilly



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.

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

Best Regards,

(Dr. Jeelani)

HOD

Department of Computer Application
Future University, Bareilly

Dean
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Future University
Bareilly

Academic Council
Future University
Bareilly



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

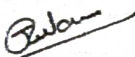
Respected Mr. Sachin Saxena,

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, 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: 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

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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

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Chairperson

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
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: 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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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 Master of Computer Application 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.

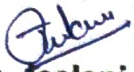

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The meeting ended with a Vote of thanks to the external members who spared their valuable time and for the suggestions.



Dr. Jeelani

HOD, Computer Application
Department of Computer Application
Faculty of Computer Applications
Future University, Bareilly



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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:

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

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EXAMINATION:

- 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.


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- 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 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

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

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- (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.
- (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 $\text{CGPA Earned} \times 10 = \text{Percentage of marks scored}$. Illustration: $\text{CGPA earned } 7.15 \times 10 = 71.5 \%$

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**.


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(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.

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


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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.
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) (Postgraduate Regular)											
Course Structure/ Degree Award Checklist 2025-2027											
Program Name:			Master of Computer Application (MCA)							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	Major Core Course	MCA5102	Object Oriented Programming Concepts Using C++	3	1	0	30	70	100	4	
3	Major Core Course	MCA5103	Web Development Technologies	4	0	0	30	70	100	4	
4	Minor Course	MCA5105	Discrete Mathematics	3	0	0	30	70	100	3	
5	Multidisciplinary	UCC1101	IKS-I (Indian Knowledge System - I)	1	0	0	50	0	50	1	
6	Skill Enhancement Course	UCC1102	AI for Everyone	3	0	0	30	70	100	3	
Practical											
1	Major Core Course	MCA5170	Office Automation Lab	0	0	2	50	50	100	1	
2	Major Core Course	MCA5171	OOPs Concepts Using C++ Lab	0	0	2	50	50	100	1	
3	Major Core Course	MCA5172	Web Development Technologies Lab	0	0	2	50	50	100	1	
			TOTAL	17	1	6	350	500	850	21	

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Semester -II										
SN.	Course Category	Course Code	Theory Course Title	Week			Evaluation Scheme		Total	Credit
				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 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	Skill Enhancement Course	LSM5202	LSM-I (Life Skills & Mentoring – I)	0	0	0	0	0	0	0
Practical										
1	Major Core Course	MCA5270	Data Structure Using C++ 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	MCA5272	A. I. using Python Lab	0	0	2	50	50	100	1
			TOTAL	18	0	6	330	570	900	21


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Semester -III										
SN.	Course Category	Course Code	Theory	Week			Evaluation Scheme		Total	Credit
			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		Elective - 1	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	3
		MCA6314	Principal of Management							
6	Major Core Course		Elective - 2	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	18	0	6	280	520	800	21

Note: In the second semester, Remedial Mathematics (Theory) will be a compulsory subject from the list of papers for those students who did not have Mathematics in Intermediate (12th) class.


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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	Major Core Course	MCA6409	Computer Graphics	3	0	0	30	70	100	3
2	Minor Course		Elective - 3	3	0	0	30	70	100	3
3	Minor Course		Elective - 4	3	0	0	30	70	100	3
4	Major Core Course	MCA6401	Introduction to Research Methodology	0	0	9	30	70	100	3
5	Skill Enhancement Course	MCA6411	Industrial Training-2	0	0	0	0	0	0	0
Practical										
1	Major Core Course	MCA6471	Research Methodology LAB	0	0	2	50	50	100	1
2	Major Core Course	MCA6472	Major Project LAB	0	0	16	150	250	400	8
3	Major Core Course	MCA6473	Computer Graphics LAB	0	0	2	50	50	100	1
			TOTAL	12	0	15	370	630	1000	24

Sr.N	Course Category
1	Major (Core)
2	Minor Stream
3	Multidisciplinary
4	Ability Enhancement Course
5	Skill Enhancement Course
6	Value Added Courses Common for All UG
7	Summer Internship
8	Research Project/ Dissertation


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		ELECTIVE SUBJECTS
		Elective-1
1	MCA6304	Cloud Computing (El)
1	MCA6307	Cryptography & Network Security (El)
1	MCA6316	Software Project Management (El 1)
1	MCA6317	Data Warehousing and Data Mining (El 1)
		Elective-2
2	MCA6318	Software Testing and Quality Assurance (El 2)
2	MCA6319	Big Data (El 2)
2	MCA6320	Web Technology (El 2)
2	MCA6321	Digital Image Processing (El 2)
		Elective-3
3	MCA6412	Privacy & Security in Online social media
3	MCA6413	Soft Computing
3	MCA6414	Pattern Recognition
3	MCA6416	Software Quality Engineering
3	MCA6417	Compiler Design
		Elective-4
4	MCA6418	Block chain Architecture
4	MCA6419	Neural Network
4	MCA6407	Internet of Things
4	MCA6421	Wireless and Mobile Computing
4	MCA6422	Computer Vision
		Elective-5
5	MCA6404	Mobile Computing
5	MCA6424	Computer Graphics and Animation
5	MCA6425	Natural Language Processing
5	MCA6426	Machine Learning
5	MCA6427	Quantum Computing


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Syllabus

MCA 1stYear 1st 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: Its 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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MCA5102: OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++

Course Outcome (CO)

CO1	Understand the difference between the top-down and bottom-up approach.	
CO2	Describe the object-oriented programming approach in connection with C++.	
CO3	Illustrate the process of data file manipulations using C++.	
CO4	Apply virtual and pure virtual function & complex programming situations.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to OOP: Advantages of OOP, Need of object-oriented programming, Procedure Oriented Vs Object Oriented Programming. Introduction to C++ : C++ Programming Basics, Basic Program Construction of C++, Key words in C++, Input/Output in C++, Variables, Constants, Data Types and Operators in C++, Precedence of Operators, Storage Classes Arrays in C++.	8
II	Decision Making and Loops in C++ : Conditional statement, Switch Statement, Break Statement, Continue Statement, Go to Statement Loops in C++, While, Do-While, For loop. Arrays: Array notation and representation, Declaring one-dimensional array, Initializing arrays, Accessing array elements, Manipulating array elements, Arrays of unknown or varying size, Two-dimensional arrays, Multidimensional arrays.	8
III	Strings: Introduction, Initializing strings, Accessing string elements, Array of strings, Passing strings to functions. Functions : User Defined Functions, library functions, General form of a function, scope rules of functions, function arguments(Call by value, Call by Reference), Recursion Calling Functions with arrays, Returning by reference, Friend Functions, Inline Functions, Structures and Unions in C++, Pointers in C++, Pointers with structure, Pointer with functions. Structure: Introduction, defining and declaring structure, Accessing members, Operations on structures, Structure within structure, Array of structure, Pointers to structure. Union: Introduction, Declaring union, Usage of unions, Operations on union. Enumerated data types Storage classes: Introduction, Types-automatic register static and external.	8
IV	Pointers: Introduction, Characteristics, * and & operators, Pointer type declaration and assignment, Pointer arithmetic, Call by reference, Passing pointers to functions, array of pointers, Pointers to functions, Pointer to pointer, Array of pointers. Dynamic Allocation Operators – Function Overloading – Default function arguments – Overloading Constructors – Ambiguity in function overloading.	8
V	Objects and classes : Structure and Classes, Union and Class, friend classes, Scope resolution operator, specifying and using class and object, Constructors, objects and function arguments. Inheritance: Base Class, Derived Class, access specifies Single Inheritance, Multiple Inheritance, Multilevel Inheritance. Polymorphism: Compile time, Run time, Operator Overloading, Function Overloading, Virtual functions, Dynamic Binding, Static Binding Dynamic Memory Allocation: Introduction, new and delete operators. File Handling: Basics, File types, File operations, File pointer, File opening modes, File handling functions, File handling through command line argument, Record I/O in files.	8

Suggested Readings:

1. R. S. Salaria, Mastering Object-Oriented Programming with C++, Khanna Publishing House
2. C++ Programming, Black Book, Steven Holzner, dreamtech
3. Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia
4. Object Oriented Programming with ANSI and Turbo C++, Ashok Kamthane, Pearson.

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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 Engineering1: 4 Abstraction and modelling**, Diner Bjarne, Springer International edition, 2006.
5. **Software Engineering2: Specification of systems and languages**, Diner Bjorner, Springer International edition 62006.
6. **Software Engineering Principles and Practice**, Hans Van Vliet, 3rd edition, John Wiley & Sons Ltd.
7. **Software Engineering3: Domains, Requirements, and Software Design**, D. Bjorner, Springer International Edition.
8. **Introduction to Software Engineering**, R. J. Leach, CRC Press.



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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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 Dhātu, 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.	

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	Surgical Practices: Ancient Indian surgical methods.	
	Foundational Literature of Indian Civilization	
V	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.	
Suggested Readings: 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.	Uni.	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	1	UJ001	Aman	Armit	Sumita	#123, Prem Nagar, Dehradun, UK	7000000002	7000100001	7000015700	13 March 2000	400	40%
2	2	UJ002	Cherry	Armit	Priya	#1306, Srinagar, Dehradun, UK	7000007272	7000012320	7000010000	24 March 2000	400	40%
3	3	UJ003	Shruti	Armit	Arpita	#1234, Ganesht, Varanasi, Dehradun, UK	7000007074	7000012700	7000017074	19 April 2000	400	40%
4	4	UJ004	Shruti	Armit	Arpita	#1234, Srinagar, Dehradun, UK	7000000004	7000013500	7000010000	26 April 2000	360	36%
5	5	UJ005	Shruti	Armit	Arpita	#1234, Srinagar, Dehradun, UK	7000000000	7000013500	7000010000	17 March 2000	360	36%
6	6	UJ006	Shruti	Armit	Arpita	#1234, Srinagar, Dehradun, UK	7000000000	7000013500	7000010000	17 March 2000	360	36%
7	7	UJ007	Shruti	Armit	Arpita	#1234, Srinagar, Dehradun, UK	7000000000	7000013500	7000010000	17 March 2000	360	36%
8	8	UJ008	Shruti	Armit	Arpita	#1234, Srinagar, Dehradun, UK	7000000000	7000013500	7000010000	17 March 2000	360	36%
9	9	UJ009	Shruti	Armit	Arpita	#1234, Srinagar, Dehradun, UK	7000000000	7000013500	7000010000	17 March 2000	360	36%
10	10	UJ010	Shruti	Armit	Arpita	#1234, Srinagar, Dehradun, UK	7000000000	7000013500	7000010000	17 March 2000	360	36%

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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	258	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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MCA5171: OOPS CONCEPTS USING C++ LAB

Course Outcome (CO)

CO1	Understand the difference between the top-down and bottom-up approach.	
CO2	Describe the object-oriented programming approach in connection with C++.	
CO3	Apply the concepts of object-oriented programming.	
CO4	Illustrate the process of data file manipulations using C++.	
CO5	Apply virtual and pure virtual function & complex programming situations.	

DETAILED SYLLABUS

- 1 Raising a number n to a power p is the same as multiplying n by itself p times. Create a function called `power ( )` that takes a double value for n and an int value for p , and returns the result as double value. Use a default argument of 2 for p , so that if this argument is omitted, the number will be squared. Write a `main ( )` function that gets values from the user to test this function.
- 2 Create a program that uses a structure called `point` to model a point. Define three points, and have the user input values to two of them. Then set the third point equal to the sum of the other two, and display the value of the new point. Interaction with the program might look like this:
Enter coordinates for P1: 3 4
Enter coordinates for P2: 5 7
Coordinates of P1 + P2
are : 8, 11
- 3 Create the equivalent of a four-function calculator. The program should request the user to enter a number, an operator, and another number. It should then carry out the Specified arithmetical operation: adding, subtracting, multiplying, or dividing the two numbers. (It should use a switch statement to select the operation). Finally it should display the result.

When it finishes the calculation, the program should ask if the user wants to do another calculation. The response can be Y or N . Some sample interaction with the program might look like this.
Enter first number, operator, second
number: 10/ 3 Answer = 3.333333
Do another (Y/ N)? Y
Enter first number, operator, second
number 12 + 100 Answer = 112
Do another (Y/ N)? N
- 4 A phone number, such as (212) 767-8900, can be thought of as having three parts: the area code (212), the exchange (767) and the number (8900). Develop a program that uses a structure to store these three parts of a phone number separately. Call the structure `phone`. Create two structure variables of type `phone`. Initialize one, and have the user input a number for the other one. Then display both numbers. The interchange might look like this:

Enter your area code, exchange, and number:
415 555 1212 My number is (212) 767-8900
Your number is (415) 555-1212


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5

Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the results are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

6

Create a class rational which represents a numerical value by two double values- NUMERATOR & DENOMINATOR. Include the following public member Functions: constructor with no arguments (default). constructor with two arguments. void reduce() that reduces the rational number by eliminating the highest common factor between the numerator and denominator. Overload + operator to add two rational number. Overload >> operator to enable input through cin. Overload << operator to enable output through cout. Write a main () to test all the functions in the class.

7

Consider the following class

```
definition class father {
```

```
protected : int age;
```

```
public;
```

```
father (int x) {age = x;}
```

```
virtual void iam()
```

```
{ cout << I AM THE FATHER, my age is : << age<< endl;}
```

```
};
```

Derive the two classes son and daughter from the above class and for each, define iam () to write our similar but appropriate messages. You should also define suitable constructors for these classes. Now, write a main () that creates objects of the three classes and then calls iam () for them. Declare pointer to father.

Successively, assign addresses of objects of the two derived classes to this pointer and in each case, call iam () through the pointer to demonstrate polymorphism in action.

8

A hospital wants to create a database regarding its indoor patients. The information to store include

a. Name of the patient

b. Date of admission

c. Disease

d. Date of discharge

Create a structure to store the date (year, month and date as its members). Create a base class to store the above information. The member function should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. List the information about all the to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).

9

Imagine a toll booth with a class called toll Booth. The two data items are a type unsigned int to hold the total number of cars, and a type double to hold the total amount of money collected. A constructor initializes both these to 0. A member function called payingCar () increments the car total and adds 0.50 to the cash

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total. Another function, called `nopayCar ( )`, increments the car total but adds nothing to the cash total. Finally, a member function called `displays` the two totals. Include a program to test this class. This program should allow the user to push one key to count a paying car, and another to count a nonpaying car. Pushing the ESC key should cause the program to print out the total cars and total cash and then exit.

- 10 Write a function called `reversit ( )` that reverses a string (an array of `char`). Use a for loop that swaps the first and last characters, then the second and next to last characters and so on. The string should be passed to `reversit ( )` as an argument. Write a program to exercise `reversit ( )`. The program should get a string from the user, call `reversit ( )`, and print out the result. Use an input method that allows embedded blanks. Test the program with Napoleon's famous phrase, `Able was I ere I saw Elba`).

- 11 Make a class `Employee` with a name and salary. Make a class `Manager` inherit from `Employee`. Add an instance variable, named `department`, of type `string`. Supply a method to `string` that prints the manager's name, department and salary. Make a class `Executive` inherit from `Manager`. Supply a method to `String` that prints the string `Executive` followed by the information stored in the `Manager` superclass object. Supply a test program that tests these classes and methods.

- 12 Create a base class called `shape`. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called `triangle` and `rectangle` from the base `shape`. Add to the base class, a member function `get_data ( )` to initialize base class data members and another member function `display_area ( )` to compute and display the area of figures. Make `display_area ( )` as a virtual function and redefine this function in the derived classes to suit their requirements. Using these three classes, design a program that will accept dimensions of a triangle or a rectangle interactively and display the area.

Remember the two values given as input will be treated as lengths of two sides in the case of rectangles and as base and height in the case of triangles and used as follows: Area of rectangle = $x * y$,

Area of triangle =

$\frac{1}{2} * x * y$

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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

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.

- 1
 - Home page,
 - Registration and user Login,
 - User profile page,
 - Books catalog,
 - Shopping cart,
 - Payment By credit card,
 - Order confirmation.
- 2 Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
- 3 Design a web page using CSS (Cascading Style Sheets) which includes the following:
 - 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.
- 4 Design a web page using CSS (Cascading Style Sheets) which includes the following:
 - 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
- 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.
- 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
- 7 Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems:
 - a. Parameter: A string
Output: The position in the string of the left-most vowel
 - b. Parameter: A number
Output: The number with its digits in the reverse order
- 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.
- 9 Develop a PHP program to gerent online electricity bill where user provides the input

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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 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 Formulae for 1-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,	8

	Deletion, Searching & Modification of data in Binary Search Tree. 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: 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	Knowledge & Reasoning, Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation, using predicate logic, representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.	8
IV	Representing knowledge using rules, Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge. Probabilistic reasoning, Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dumpster Shafer theory, Fuzzy sets, and fuzzy logics.	8
V	Natural Language Processing, Introduction, Syntactic processing, semantic analysis, discourse, and pragmatic processing. Expert Systems, Representing and using domain knowledge, expert system shells, and knowledge acquisition. Basic knowledge of programming language like Prolog.	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. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI.
4. Prolog Programming for A.I. by Bratko, TMH
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://greenteapress.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	ITERATIVE METHODS: Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.	8
II	SIMULTANEOUS LINEAR EQUATIONS: Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, Ill Conditioned system of equations, Refinement of solution. Gauss Seidal iterative method, Rate of Convergence Interpolation and approximation: Finite Differences, Difference tables Polynomial Interpolation: Newton's forward and backward formula.	8
III	INTERPOLATION WITH UNEQUAL INTERVALS: Langrange's Interpolation, Newton Divided difference formula, Numerical Differentiation and Integration: Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules, Picard's Method, Runge-Kutta methods.	8
IV	Curve fitting, Cubic Spline and Approximation: Method of least squares, fitting of straight lines, polynomials, exponential curves etc.	8
V	Time series and forecasting: Moving averages, smoothening of curves, forecasting models and methods. Testing of Hypothesis: Test of significance, Chi-square test, t-test, F-Test Application to medicine, agriculture etc	8

Suggested Readings:

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

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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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MCA5270: DATA STRUCTURE USING C++ 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:

- Insert at least 10 tuples in the table.
- 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*.
- 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.
- Display *employee_id*, *employee_name* and *employee_date_of_joining* who work in work in department number 222.
- Delete the employee's details having *employee_id* as UU1003.
- 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

- Add a new column named *employee_address* having data type as varchar2, size 30 in the *uim_employee* table.
- Update the addresses of existing *uim_employees* in the table.
- Drop the column named *employee_date_of_joining* from the table.
- Modify the size of the column named *employee_contact_no* to 14.
- Rename the table to *uim_employee_details* from the table name *uim_employee*.
- Truncate as the records from the *uim_employee_details* table.
- 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

- Describe the structure of *uim_student* table.
- Insert few tuples in the table.
- Examine the error message by inserting same *student_roll_no* values for two rows. Write the error message and reason.
- 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.

- Add a new column named book_price having data type as Number and size as 7,2 in the existing table named uim_book.
- Display the contents of uim_book table.
- Update the book prices of available books in the uim_book table.
- Display the contents after updation in uim_book table.
- Find the sum of all the book price based on the book theme.
- 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

- Insert few tuples in the uu_employee table.
- Display the contents of uu_employee table
- Calculate the sum of salaries of all the employees.
- 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_ADDRESS_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	1-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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MCA5272: A. I. USING PYTHON 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

- | | | |
|--|--|--|
| | <ol style="list-style-type: none">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 2ND Year
3RD Semester**



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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MCA6317: DATA WAREHOUSING AND DATA MINING (EL 1)

Course Outcome (CO)

CO1	Classify the functionality of the various data mining and data warehousing component
CO2	Demonstrate the limitations of various data mining and data warehousing models
CO3	Explain the analyzing techniques of various data
CO4	Describe different methodologies used in data mining and data warehousing
CO5	Compare different approaches of data warehousing and data mining with various technologies

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	UNIT – I Data Warehouse: , Data Modeling, Schema Design, star and snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; FactLess-Facts, Dimension Table characteristics; Fact-Less-Facts, Dimension Table characteristics; OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP	9
II	UNIT -II Introduction to Data Mining: Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing- Data Cleaning, Missing Data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation , Data Transformation.	8
III	UNIT – III Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation, APRIORI Algorithm, The Partition Algorithms.	9
IV	UNIT -IV Classification: Problem definition, General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision trees- Decision Tree Construction, Methods for expressing attribute test conditions, Measures for Selecting the Best split,	8
V	UNIT – V Clustering: Problem Definition, Clustering overview, Evaluation of clustering algorithms, Partitioning clustering K-Means Algorithm, K-Means Additional Issues, PAM Algorithm,	8

Suggested Readings:

1. Data Mining Introductory and advanced topics -Margaret H Dunham. Pearson education.
2. Data Mining Techniques - Arun K Pujari. University Press.
3. Data Warehousing in the Real World- Sam Aanhory& Dennis Murray Pearson in Edn Asia. .
4. .Data Warehousing Fundamentals-PaulrajPonnaiah Wiley student Edition The Data Warehouse Life cycle Tool kit-Ralph Kimball Wiley student edition

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MCA6316: SOFTWARE PROJECT MANAGEMENT (EL 1)

Course Outcome (CO)

CO1	Understand the fundamentals of software project management, project planning, and management principles.
CO2	Apply software process models and estimation techniques for project development.
CO3	Develop project schedules using activity planning and network techniques such as CPM and PERT.
CO4	Analyze project risks and apply appropriate risk management and resource allocation strategies.
CO5	Manage software projects using monitoring, control techniques, and effective team management practices.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Software Project Management: Importance of Software Project Management, Project Activities, Methodologies, Categorization of Software Projects, Setting Objectives, Management Principles, Management Control, Project Portfolio Management, Cost-Benefit Evaluation Techniques, Risk Evaluation, Strategic Program Management, Stepwise Project Planning.	8
II	Project Life Cycle & Effort Estimation: Software Process and Process Models, Choice of Process Models, Rapid Application Development (RAD), Agile Methods, Dynamic System Development Method (DSDM), Extreme Programming (XP), Managing Interactive Processes, Basics of Software Estimation, Effort and Cost Estimation Techniques, COSMIC Full Function Points, COCOMO II Model.	8
III	Activity Planning & Scheduling: Objectives of Activity Planning, Project Scheduling, Activities, Sequencing and Scheduling Techniques, Network Planning Models, Formulating Network Models, Forward Pass and Backward Pass Techniques, Critical Path Method (CPM).	8
IV	Risk Management & Resource Allocation: Risk Identification, Risk Assessment, Risk Planning, Risk Management Process, PERT Technique, Monte Carlo Simulation (Basic Concept), Resource Allocation, Creation of Critical Paths, Cost Scheduling.	8
V	Project Control & Team Management: Framework for Project Management and Control, Data Collection, Progress Visualization, Cost Monitoring, Earned Value Analysis, Project Tracking, Change Control, Software Configuration Management, Contract Management. Staffing in Software Projects: Managing People, Staff Selection, Motivation, Team Work, Decision Making, Organizational Structures, Communication Plans, Leadership, Ethical and Professional Issues.	8

Text and Reference Books:

1. Software Project Management Bob Hughes Mike Cotterell – Tata McGraw Hill
2. Software Project Management in Practice Pankaj Jalote – Pearson Education
3. Software Engineering A Practitioners Approach Roger Pressman – McGraw Hill
4. Agile Project Management Jim Highsmith – Pearson
5. The Mythical Man Month Fred Brooks – Addison-Wesley

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MCA6307: CRYPTOGRAPHY & NETWORK SECURITY (EL 1)

Course Outcome (CO)

CO1	Define cryptography, its use, areas where cryptography is needed.	
CO2	Discuss the different available algorithms in terms of complexity, response time, key size, data size, security assurance, etc.	
CO3	Develop code to implement a cryptographic algorithm using any programming language.	
CO4	Classify the security concepts, Ethics in Network Security, security threats, and the security services.	
CO5	Analyze all key less and keyed algorithms to identify their strength and weaknesses and try to solve and remove the limitations or optimize the complexity of algorithm(s).	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Cryptography: Introduction To Security Attacks, Services & Mechanisms, And Conventional Encryption: Classical Techniques, cryptanalytic attacks.	6
II	Private Key Encryption: Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, Double DES, Triples DES.	8
III	Public Key Encryption: Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm, public key distribution, symmetric key distribution using asymmetric cryptosystem.	8
IV	Hash Functions:- Message Authentication & Hash Functions, Authentication Functions, Message Authentication Codes (MAC), Secure Hash Algorithm (SHA), Digital Signatures.	8
V	Application Layer Security: Electronic Mail Security, Pretty Good Privacy (PGP). Transport Layer Security: Secure Socket Layer & Transport Layer Security. Network Layer Security: Authentication Header, Encapsulating Security Payloads. Network and System Security: Authentication Applications-KerberosX.509, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles.	10

Suggested Readings:

1. Cryptography and Network Security: Principles and Practice, William Stallings, Prentice Hall, New Jersey, 4th Edition.
2. Introduction to cryptography , JohannesA.Buchmann, Springer, Verlag, 2001.
3. Cryptography and Network Security, Atul Kahate, TMH, 2nd Edition.
4. Cryptography, Forouzan, TMH, 2007.

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MCA6304: CLOUD COMPUTING (EL 1)

Course Outcome (CO)

CO1	Describe architecture and underlying principles of cloud computing.	
CO2	Explain need, types and tools of Virtualization for cloud.	
CO3	Describe Services Oriented Architecture and various types of cloud services.	
CO4	Explain Inter cloud resources management cloud storage services and their providers Assess security services and standards for cloud computing.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction To Cloud Computing: Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On- demand Provisioning.	8
II	Cloud Enabling Technologies Service Oriented Architecture: REST and Systems of Systems – Web Services – Publish, Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.	8
III	Cloud Architecture, Services And Storage: Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.	8
IV	Resource Management And Security In Cloud: Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.	8
V	Cloud Technologies And Advancements Hadoop: MapReduce – Virtual Box – Google App Engine – Programming Environment for Google App Engine – Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.	8

Suggested Readings:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

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MCA6314: 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 Itenz 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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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), $\lim_{x \rightarrow a} x^n - a^n = na^{n-1}$, $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$. $x \rightarrow a$ $x - a$ $\theta \rightarrow 0$ θ	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
Suggested Readings: 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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BCA6318: SOFTWARE TESTING AND QUALITY ASSURANCE (EL 2)

Course Outcome (CO)

CO1	Become confident of speaking in English impeccably and with utmost enthusiasm.	
CO2	Be familiar with different styles of communication	
CO3	Practice different types of communication and successfully confront the different barriers of communication.	
CO4	Involve in conversations without fear, shy and apprehension and become more self-confident and develop strong determination.	
CO5	Understand and practice interview etiquettes and socialize with ease and comfort.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Software Testing: What is software testing? Objectives and importance of testing, Difference between Testing vs Debugging , Principles of testing (7 principles), Software Development Life Cycle (SDLC), Software Testing Life Cycle (STLC),	8
II	Fundamentals of Software Testing: Testing Strategies and Techniques, Structural and Functional testing, Static Black Box and Dynamic Black Box Testing Techniques. Manual Testing, Automation Testing, Black Box Testing, White Box Testing, Grey Box Testing, Unit Testing, Integration Testing, System Testing, Acceptance Testing (Alpha & Beta).	8
III	White Box Testing: Static White Box Testing, Dynamic White Box Testing, Types of Testing: Configuration Testing, Compatibility Testing, Graphical User Interface Testing. Documentation Testing, Security Testing.	8
IV	Testing Tools: Benefits of Automation Testing, Random Testing, Bug Bashes and Beta Testing, Test Planning: Test Planning, Test Cases, Bug life cycle.	8
V	Software Quality Assurance: Definition of Quality, Testing and Quality Assurance at Workplace, Test Management and Organizational Structure, Software Quality Assurance Metrics, Quality Management in IT, Organizational Structure: CMM (Capability Maturity Model), ISO 9000, Software Engineering Standards.	8

Suggested Readings:

- Richards W. Adrion, Martha A. Branstad, and John C. Cherniavsky. Validation, verification, and testing of computer software. ACM Computing Surveys, 14(2):159–192, June 1982.
- Alfred V. Aho, Ravi Sethi, and Jeffrey D. Ullman. Compilers: Principles, Techniques, and Tools. Addison-Wesley Longman, Boston, 1986
- Kenneth M. Anderson, Richard N. Taylor, and E. James Whitehead Jr. Chimera: Hypermedia for heterogeneous software development environments. ACM Transactions on Information Systems, 18(3):211–245, July 2000.
- Carol M. Barnum. Usability Testing and Research. Allyn & Bacon, Needham Heights, MA, 2001.
- Boris Beizer. Black-Box Testing: Techniques for Functional Testing of Software and Systems. John Wiley and Sons, New York, 1995.

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MCA6319: BIG DATA (EL 2)

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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MCA6320: WEB TECHNOLOGY (EL 2)

Course Outcome (CO)

CO1 Understand basics of web technologies and internet concepts

CO2 Design web pages using HTML and CSS.

CO3 Use of Packages and Interface in java.

CO4 Understand server-side scripting and database connectivity

CO5 Develop dynamic and interactive web applications

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Basics of Internet and World Wide Web, Web Browsers and Web Servers, HTTP & HTTPS Protocol, URL, DNS, Client-Server Architecture. HTML: Structure of HTML document, Basic tags, Lists, Tables, Forms and Input Controls, Semantic HTML.	8
II	CSS: Introduction to CSS, Types of CSS (Inline, Internal, External), Selectors and Properties, Box Model, Positioning, Flexbox and Grid. Responsive Design: Media Queries, Mobile Friendly Design, Display property (block, inline, inline-block).	8
III	JavaScript: Introduction, Variables, Data Types, Operators, Conditional Statements, Arrow Functions, Loops, Functions, Event Handling, DOM (Document Object Model).	8
IV	Server-Side Scripting: Introduction, Basics of PHP, Variables, Operators, Control Statements, Form Handling, Sessions and Cookies. Database Connectivity: Introduction to MySQL, PHP with MySQL, GET vs POST Method, File Handling in PHP, Include & Require, CRUD Operations.	8
V	XML: Introduction to XML, Features of XML, Difference between HTML and XML, Structure of XML Document, XML Elements and Attributes, XML Parser Types (DOM & SAX), XML Namespaces, DTD (Document Type Definition), XML Schema (Basics), XML Parsing, Applications of XML.	8

Text and Reference Books:

1. Web Technologies – Uttam K. Roy
2. Internet & World Wide Web – Deitel & Deitel
3. HTML & CSS – Jon Duckett
4. PHP & MySQL Web Development – Luke Welling

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MCA6321: Digital Image Processing (EL 2)		
Course Outcome (CO)		
CO1	To become familiar with digital image fundamentals.	
CO2	To get exposed to simple image enhancement techniques in Spatial and Frequency domain	
CO3	To learn concepts of degradation function and restoration techniques	
CO4	To study the image segmentation and representation techniques.	
CO5	To become familiar with image compression and recognition method	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	DIGITAL IMAGE FUNDAMENTALS: Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.	8
II	IMAGE ENHANCEMENT : Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.	8
III	IMAGE RESTORATION : Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering	8
IV	IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.	8
V	IMAGE COMPRESSION AND RECOGNITION: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.	8
Suggested Readings: 8. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing Pearson, Third Edition, 2010 9. Anil K. Jain, Fundamentals of Digital Image Processing Pearson, 2002. 10. Kenneth R. Castleman, Digital Image Processing Pearson, 2006. 11. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB Pearson Education, Inc., 2011. 12. D.E. Dudgeon and R.M. Mersereau, Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.		

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MCA6372: ADVANCED JAVA PROGRAMMING LAB

Course Outcome (CO)

CO1	Designing of window based applications.	
CO2	To create a client and server communication using net package.	
CO3	Design reusable software components using java beans.	
CO4	Develop server side programming.	
CO5	Develop the dynamic web pages using JSP	

DETAILED SYLLABUS

Sr No.	Topic	Hours
1	- Write a Java Program to create an applet that show a simple message along with background and foreground colors? - Write a Java Program to create an applet that scrolls a message from left to right? - Write a Java Program to create an applet that receives a string and returns either its Uppercase or Lowercase, Reverse of given string, and length of a given String. - Write a java program to draw Lines, ovals, filled ovals and arcs, filled arcs? - Write a java program to draw rectangle, filled rectangle and rounded rectangle and filled rounded rectangle with any two colors? - Write a java program to draw a smiley face? - Write a Java program to demonstrate the mouse event handlers. - Write a Java program to demonstrate the key event handlers. - Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box. - Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. - Write a Java Program to create 4 push Buttons bearing the names of 4 colors. When a button is clicked, that particular color is set as background color in a frame? - Write a Java Program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts. - Write a Java Program to create multiple frames, which create a Frame2 with a 'back' button, such that when a user click 'back' button, Frame 2 is closed and we see the Frame1 only? - Write a Java Program to create an applet using Swings which contains two push buttons. If a user presses a particular button then display a message 'selected' button is pressed. - Write a Java Program to create a frame using swing in which create a push button	1

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	with a label and image. When the button is clicked an image is displayed in the Frame? 16. Write a Java Program to create a student table, which includes name, roll no, branch and age or DOB? 17. Write a Java Program to create a tabbed pane with two tabs. In the first tab sheet, display some push buttons with names of Branches. In second tab sheet, display checkboxes with names of subjects. 18. Write a java program to create a menu with several menu items by implementing JMenu. 19. Write a java program to create a combo box with some name of some places. The user can select any one name from the list and the selected country name is displayed in the frame? (Use JComboBox) 20. Write a java program to select multiple places and displayed in Frame using JList? 21. Write a java program to create a simple visual bean with a area filled with a color. The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouse click. The color should also be changed if we change the color in the "property window". 22. Write a java program to create a bean that performs conversion of American dollar to Indian rupee. 23. Write a java program to create a bean that counts the number of button clicks? 24. Write a Java program to retrieve the information from the given URL? (Note: Read the URL from Command Line Arguments). 25. Write a java program to create a sample TCP chat application where client and server can chat with each other? 26. Installation of Apache Tomcat webserver. 27. Write a java Program to create a simple servlet and run it using tomcat server. 28. Write a java Program to create a servlet to read information from client Registration page? 29. Write a java Program to create a JSP page to display a simple message along with current Date? 30. Write a java Program to create a JSP page to display the random number?	
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Suggested Readings:

1. Java; the complete reference, 7th editon, Herbert schildt, TMH.
2. Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education.
3. An introduction to Java programming and object oriented application development, R.A. Johnson Thomson.
4. Core Servlets and Java Server pages volumel: Core Technologies By Marty Hall and Larry Brown Pearson.

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MCA637B Mini Project LAB

Course Outcome (CO)

CO1	Identify project/research problems; understand information and grasp meaning; translate knowledge into new context; use information, methods, concepts, and theories of fundamental topics in computer science in new situations (Knowledge, Comprehension);	
CO2	Apply computer science principles and practices to a real-world problem; demonstrate in-depth knowledge in the area of the project they have undertaken; solve problems using required knowledge and skills; implement and test solutions/algorithms (Application and Evaluation);	
CO3	Identify potential solutions/algorithms for the project problem; see patterns and modularize the problem, recognize hidden meanings and identify components, show proficiency in software engineering principles (Analysis);	
CO4	Apply a software development methodology currently practiced in industry to produce software system in a rigorous and systematic way using different software life cycle phases (specification, architecture, design, implementation, validation, documentation) (Synthesis);	
CO5	Show evidence (group collaboration, regular meetings, email communications, significant knowledge and skills contributions, etc.) of working productively as an individual and in a team on a project that produces a significant software product (Team Work);	
CO6	Show evidence of competency in oral and written communications skills through oral presentations (project presentation, department seminar or conferences, client interactions), technical reports and/or published research papers in conferences and/or journals (Communications);	
CO7	Use modern techniques, skills and tools necessary for computer science practices relevant to the project they undertake; use techniques in recent research papers to solve problems (Lifelong Learning).	

DETAILED SYLLABUS

Sr. N	Topic	Hours
	LAB: Besides completing the subject/Lab assignments, the students will be required to complete one mini project as follows: MINI-PROJECT in VB, VC++ or Java under Linux(UNIX)/Windows In addition to completing Mini-Project, the students will be doing the exercises provided by the respective teachers in their class rooms. The individual	

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	teachers who are teaching the courses will be responsible for completing their respective lab assignments.	
	Some of the representative areas/problems may include the following:	
1	Developing Window Based Applications using recent technologies using .NET Platform or Java Technologies like Java Servlet, Java Beans, COM, CORBA etc.	
2	Students should learn languages such as PROLOG or LISP to solve the Laboratory exercises.	
3	An expert system shell such as IITM rule be used to create a small expert system for, say, troubleshooting moped, VCR etc. Some suggested experiments are : Tour of India, Stable marriage problem, Game playing (such as bridge), coin change problem etc.	

Suggested Readings:

1. Robert Lafore, "Object Oriented Programming in C++", Pearson
2. R. Brown, "Visual Basic .NET – Your Visual Blueprint for Building Versatile Programs on the .NET Framework", Wiley Publishing, Inc.
3. Ivan Bayross, "Oracle", BPB
4. E.N. Mackay, "Developing user Interfaces for Windows", WP Publishers & Distributors Pvt. Ltd.

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Syllabus
MCA 2nd Year
4th Semester



MCA6401: INTRODUCTION TO 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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MCA6409: COMPUTER GRAPHICS

Course Outcome (CO)

CO1	Understand the basic concepts of computer graphics and its applications	
CO2	Apply line and circle drawing algorithms and analyze their efficiency.	
CO3	Apply 2D transformations using matrix operations and composite transformations.	
CO4	Analyze clipping algorithms and advanced window to viewport mapping techniques.	
CO5	Understand 3D transformations, projections, viewing pipeline and basic rendering concepts.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Computer Graphics: Definition, applications, types (Raster & Vector), graphics system components, input/output devices, display devices (CRT, LCD, LED), resolution, aspect ratio, frame buffer, graphics pipeline overview.	8
II	Line and Circle Drawing Algorithms: DDA algorithm, Bresenham's line algorithm, midpoint circle algorithm, performance comparison, numerical problems, anti-aliasing techniques, scans conversion, polygon filling algorithms.	8
III	2D Transformations: Translation, rotation, scaling, reflection, shearing, homogeneous coordinates, composite transformations, matrix representation, inverse transformations, windowing transformations.	8
IV	Clipping and Windowing: Clipping concepts, Cohen-Sutherland line clipping, Liang-Barsky algorithm, Sutherland-Hodgman polygon clipping, window to viewport transformation, viewport clipping, normalization transformation.	8
V	3D Graphics and Transformations: 3D coordinate system, 3D translation, rotation, scaling, homogeneous coordinates (4×4 matrix), projections (parallel and perspective), vanishing points, 3D viewing pipeline, hidden surface removal (Z- buffer), basic illumination models.	8

Suggested Readings:

1. Donald Hearn & M. Pauline Baker – Computer Graphics (C Version)
2. Foley, Van Dam – Computer Graphics Principles and Practice
3. Steven Harrington – Computer Graphics: A Programming Approach
4. Rogers & Adams – Mathematical Elements for Computer Graphics
5. Newmann & Sproull – Principles of Interactive Computer Graphics

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MCA6414: PATTERN RECOGNITION (EL 3)

Course Outcome (CO)

CO1	A good knowledge of Bayesian decision theory and Bayesian learning.	
CO2	Fundamental understanding of classifiers such as linear discriminant function, quadratic discriminant function, nearest neighbour rule, neural network and SVM	
CO3	A good understanding of feature selection algorithms	
CO4	Ability to evaluate the performance of various classifiers on real-world datasets	
CO5		

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Basics of Probability, Random Processes and Linear Algebra (recap): Probability: independence of events, conditional and joint probability, Bayes theorem Random Processes: Stationary and non-stationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra. Bayes Decision Theory: Minimum-error-rate classification. Classifiers, Discriminant functions, Decision surfaces. Normal density and discriminant functions. Discrete features	8
II	Parameter Estimation Methods: Maximum-Likelihood estimation: Gaussian case. Maximum Posteriori estimation. Bayesian estimation: Gaussian case. Unsupervised learning and clustering - Criterion functions for clustering. Algorithms for clustering: K-Means, Hierarchical and other methods. Cluster validation. Gaussian mixture models, Expectation-Maximization method for parameter estimation. Maximum entropy estimation. Sequential Pattern Recognition. Hidden Markov Models (HMMs). Discrete HMMs. Continuous HMMs. Nonparametric techniques for density estimation. Parzen-window method. K-Nearest Neighbour method	8
III	Dimensionality reduction: Principal component analysis - it relationship to Eigen analysis. Fisher discriminant analysis - Generalized Eigen analysis. Eigen vectors/Singular vectors as dictionaries. Factor Analysis, Total variability space - a dictionary learning methods. Non negative matrix factorization - a dictionary learning method	8
IV	Linear discriminant functions: Gradient descent procedures, Perceptron, Support vector machines - a brief introduction. Artificial neural networks: Multilayer perceptron – feed forward neural network. A brief introduction to deep neural networks, convolutional neural networks, recurrent neural networks	8
V	Non-metric methods for pattern classification: Non-numeric data or nominal data. Decision trees: Classification and Regression Trees (CART). Application(s): Face recognition - preprocessing, face detection algorithms, selection of representative patterns, classification algorithms, results and discussion.	8

Suggested Readings:

1. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006
2. P.A Devijver and J. Kittler, Pattern Recognition: A Statistical Approach, Prentice-Hall International, Englewood Cliffs, NJ, 1980.
3. K. Fukunaga, Introduction to Statistical Pattern Recognition, 2nd Ed. Academic Press, New York, 1990.

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MCA6417: COMPILER DESIGN (EL 3)

Course Outcome (CO)

CO1	Employ formal attributed grammars for specifying the syntax and semantics of programming languages.	
CO2	Apply regular patterns and grammars for lexical analysis.	
CO3	Comprehend the working knowledge of the major phases of compilation.	
CO4	Implement parsing and translation techniques for automation of computing tasks.	
CO5	Design and write a complex programming project	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Compiling: Compiler, Translator and its Need, The phases of a compiler, phases of _C'compiler, Cousins of the Compiler, grouping of Phases, Bootstrapping.	8
II	Lexical Analysis: Role of lexical analyzer, Input buffering, specification & Recognition of tokens, Finite automata, Regular sets and expression, Conversion of Regular expression to FNA, Obtaining Regular expression from Finite Automata, Optimization of DFA states.	8
III	Basic Parsing Techniques: Context Free Grammar, Derivation and Parse Tree, Parsers: Top-down Parsing (Predictive Parser, Back tracking Parser or Recursive-descent parsing, LL parsing), Bottom Up Parsing (Shift-reduce parser, LR, Parser, SLR Parser, LALR Parser)	8
IV	Syntax Directed Translation: Syntax directed definition, L- attribute and S-attribute definition, 3-address code, Intermediate Code, Postfix notation, Quadruples, Triples, implementation of syntax directed translator, parse tree and syntax tree.	8
V	Error detection and recovery: Errors, Error recovery, Errors and Recovery in Lexical phase, Syntactic-phase, Semantic phase, LR Parsing, Predictive Parsing Code optimization: Principles sources of optimization, loop optimization, DAG representation of basic blocks, values numbers and algebraic laws, Global data-flow analysis.	8

Reference Books:

- Aho, Sethi & Ullman, —Compilers Principles & Techniques & Tools, Addison Wesley.
- Aho & Ullman, —Compiler Design, —Narosa Publishers, New Delhi

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MCA6413: SOFT COMPUTING (EL 3)
Course Outcome (CO)

CO1	To introduce the fundamental principles of soft computing techniques such as fuzzy logic, neural networks, and evolutionary algorithms.
CO2	Design suitable Neural Network for real time problems.
CO3	Discuss the appropriately use fuzzy rules and reasoning to develop decision making and expert systems.
CO4	Formulate the importance of optimization techniques and genetic programming.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Soft Computing, Differences between Soft Computing and Hard Computing, Requirements of Soft Computing, Applications of Soft Computing; Introduction to Artificial Intelligence, Models of Artificial Neural Network, Feed forward artificial neural networks, Perceptron and Multilayer Perceptron neural networks, Radial basis function artificial neural networks, Recurrent neural networks, Modular neural networks.	8
II	Learning Rules and Various Activation Functions: Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule, Widrow, Hoff Learning Rule, Correlation Learning Rule, Winner take All Learning Rule, Associative Memories.	8
III	Introduction to Fuzzy System: Fuzzy and Soft Computing Fuzzy Logic, Fuzzy Sets and Crisp Sets, Evolution of Fuzzy System, Fuzzy Set Operations, Fuzzy to Crisp Conversion, Inference in Fuzzy Logic, Fuzzy Rule Base, Fuzzy Knowledge Base, Fuzzification and Defuzzification.	8
IV	Genetic Algorithm-I: Genetic Algorithm, Basic Concept, Working Principle of Genetic Algorithm, Flow Chart of Genetic Algorithm, Genetic Representation (Encoding), Initialization and Selection.	8
V	Genetic Algorithm-II: Genetic Representations, (Encoding), Genetic Operators, Mutation, Generational Cycle.	8

Suggested Readings:
Reference Books

1. S. Rajsekaran & G.A. VijayalakshmiPai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India, 2003
2. Anderson, James, "Introduction to Neural Networks", PHI Publication, Delhi, India
3. N.P. Padhy, "Artificial Intelligence and Intelligent Systems" Oxford University Press, USA, 2005.
4. Simon Haykin, "Neural Networks and Learning Machines" Prentice Hall of India, 2005, Third Edition.

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MCA6416: SOFTWARE QUALITY ENGINEERING(EL 3)
Course Outcome (CO)

CO1	Students aware about the importance of the software testing during software development	
CO2	Development tools and languages taught	
CO3	Course will prepare the student for software testing and debugging	
CO4	Foundation for advanced courses in Software quality assurances	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction: Software program and its objective, Software development techniques, top-down versus bottom-up approach, modular and structures programming. A brief introduction about object oriented approach. Significance of Software Testing: Software testing and its importance, software development life cycle versus software testing life cycle, Deliverables, version and error control	8
II	Testing Techniques and Strategy: Unit testing, Integration testing, System testing, Acceptance testing White-Box testing: Flow Graph notation, Cyclomatic Complexity, Graph matrices, control structure and loop testing. Black-Box testing: Equivalence partitioning, Boundary Value Analysis, Orthogonal Array testing.	8
III	Verification and Validation: Requirement verification, Coding standards, Walk through, Formal Inspection, Design validation and verification, Function test, Design metrics, correctness proof and its requirement. Building Test Cases and Plans: Format of test cases, Du, dc and other data paths, Test data selection, branch coverage, statement coverage, pre-condition and post-condition, Test schedule and check pointing, suitable exercises for creating test cases for each type of techniques	8
IV	Quality Assurance and Standards: Parameters and its metrics, Software Configuration Change and types of errors, Quality management models: ISO, SPICE, IEEE, CMM	8
V	Debugging Technique and Tools: Environment, debugging, tracing, data inspection, exception errors, code and data redundancy, unreachable code. External Source of Errors: Main memory, conflicting dll and unknown interface as source of error and their rectification	8

Suggested Readings:
Reference Books

5. Tamres L, "Introducing Software Testing", Pearson Education, 2007.
6. Dustin E, "Effective Software Testing", Pearson Education, 2007.
7. Desikan S, Ramesh G, "Software Testing", Pearson Education, 2008.
8. Mathur A.P, "Fundamentals of Software Testing", Pearson Education, 2008.

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MCA6412: PRIVACY AND SECURITY IN ONLINE SOCIAL MEDIA (EL 3)

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

Unit	Topic	Proposed Lecture
I	Introduction to Social Media: Definition and evolution of social media, Popular platforms (e.g., Facebook, Instagram, X, Snapchat), Benefits and risks of social media usage, Digital footprint and online identity	8
II	Privacy Fundamentals: Meaning and importance of privacy, Types of personal data (PII, sensitive data), Privacy settings on social media platforms, Data collection and tracking mechanisms, Cookies, location tracking, and metadata	8
III	Security Basics: Concepts of cybersecurity, Common threats: Phishing, Malware, Identity theft, Social engineering, Password security and authentication methods. Two-factor authentication	8
IV	Risks in Social Media: Oversharing and its consequences, Cyberbullying and online harassment, Fake profiles and impersonation, Misinformation and fake news, Online scams and fraud.	8
V	Data Protection Laws and Policies: Overview of global privacy laws, GDPR (General Data Protection Regulation), IT Act (India), Platform privacy policies and user agreements, User rights and responsibilities	8

Reference Books:

1. A. Avizienis, J.-C. Laprie, B. Randell, and C. Landwehr. Basic concepts and taxonomy of dependable and secure computing. IEEE Trans. Dependable Secur. Comput., 1(1):11–33, 2004
2. M. Balduzzi, C. Platzer, T. Holz, E. Kirda, D. Balzarotti, and C. Kruegel. Abusing Social Networks for Automated User Profiling. Research Report RR-10-233, EURECOM, 2010
3. L. Bilge, T. Strufe, D. Balzarotti, and E. Kirda. All Your Contacts Are Belong to Us: Automated Identity Theft Attacks on Social Networks. In 18th Intl. World Wide Web Conference, 2009.
4. D. Florencio and C. Herley. A Large-Scale Study of Web Password Habits. In 16th International Conference on World Wide Web (WWW 2007), pages 657–666. ACM, 2007.

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MCA6419: NEURAL NETWORK (EL 4)

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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MCA6418: BLOCKCHAIN ARCHITECTURE (EL 4)

Course Outcome (CO)

CO1	Define the Growth of blockchain technology, History of blockchain and Bitcoin	
CO2	Construct the Methods and Routes of decentralization, Decentralized organizations and platforms for decentralization.	
CO3	Sketch the Architecture, Life use cases of blockchain, Bitcoin digital keys and addresses, Limitations of Bitcoin.	
CO4	Describe the Double Spending, Bitcoin Network and payments, Bitcoin Clients and APIs.	
CO5	Demonstrate the Ethereum, Hyperledger, IOTA, EOS, Multichain, Bigchain, Design a distributed application, Blockchain applications.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Blockchain: Definition and Key Characteristics of Blockchain; History and Evolution of Blockchain Technology; Distributed Ledger Technology (DLT); Types of Blockchain: Public, Private, Consortium, Hybrid; Advantages, Challenges, and Limitations of Blockchain	8
II	Cryptographic Foundations: Fundamentals of Cryptography; Hash Functions (SHA-256, Keccak); Digital Signatures and Public Key Cryptography; Merkle Trees and their Role in Blockchain;	8
III	Blockchain Consensus Mechanisms: Proof of Work (PoW); Proof of Stake (PoS); Delegated Proof of Stake (DPoS); Practical Byzantine Fault Tolerance (PBFT)	8
IV	Blockchain Architecture and Components: Structure of a Blockchain Block; Blockchain Network Components: Nodes (Full Nodes, Light Nodes, Mining Nodes); Smart Contracts and Decentralized Applications (DApps); Peer-to-Peer (P2P) Network and its Importance; Forks in Blockchain (Soft Forks vs. Hard Forks); Smart Contract Development with Solidity (Basics)	9
V	Blockchain Platforms & Use Cases: Bitcoin and Ethereum: Architecture and Features; Hyperledger and Permissioned Blockchain Networks; Decentralized Finance (DeFi) & Non-Fungible Tokens (NFTs); Blockchain in Supply Chain Management, Healthcare, and IoT; Legal and Regulatory Challenges in Blockchain	9

Suggested Readings:

1. "Mastering Blockchain" Imran Bashir
2. "Blockchain Technology and Applications" - Narayan Prusty
3. "Blockchain Technology: Concepts and Applications" - Debajani Mohanty
4. "Blockchain for Enterprise Architecture" - Vivek Acharya
5. "Blockchain and Smart Contracts: Design, Architecture, and Applications" Ashish M. Gujarathi

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MCA6421: WIRELESS AND MOBILE COMPUTING (EL 4)

Course Outcome (CO)

CO1	Explain wireless communication principles and system architectures.	
CO2	Compare wireless technologies and protocols.	
CO3	Design and evaluate mobile computing systems.	
CO4	Identify and mitigate security threats in wireless environments.	
CO5	Develop and deploy basic mobile applications.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to Wireless Networks: Fundamentals: History and evolution of wireless communication, advantages, and limitations of mobile computing. Wireless Transmission: Frequencies for radio transmission, signals, antennas, signal propagation (path loss, fading, multipath propagation), multiplexing (SDMA, FDMA, TDMA, CDMA). Modulation & Spread Spectrum: Basic modulation techniques (ASK, FSK, PSK), Spread spectrum (DSSS, FHSS). Cellular Concepts: Frequency reuse, channel assignment strategies, handoff strategies, interference, and system capacity, improving coverage and capacity in cellular systems.	8
II	Wireless LANs and PANs: Wireless LAN (IEEE 802.11): Infrastructure and ad-hoc networks, physical layer, Medium Access Control (MAC) layer (CSMA/CA), MAC management, 802.11a/b/g/n/ac/ax standards. Bluetooth (IEEE 802.15): Architecture (piconets, scatternets), radio layer, baseband layer, Link Manager Protocol (LMP), L2CAP, Security. Other Technologies: RFID, ZigBee, and basic Introduction to WiMAX (IEEE 802.16).	8
III	Mobile Network and Transport Layer: Mobile Communication Architecture, Protocol Stack in Mobile Networks, Mobile IP and IPv6 Mobility Support, Routing in Mobile Ad Hoc Networks (MANETs), Transport Layer Issues in Wireless Networks, TCP over Wireless (Problems and Solutions)	8
IV	Mobile Data Management and Applications : Mobile Databases and Data Synchronization, Transaction Management in Mobile Systems, Location-Based Services (LBS), Mobile Middleware, Introduction to Mobile App Development, Overview of Android and iOS platforms	8
V	Wireless Security and Privacy: Security Issues in Wireless Networks: Authentication and Encryption Techniques, Wireless Security Protocols (WEP, WPA, WPA2), Secure Routing in MANETs, Privacy Issues in Mobile Computing, Mobile Malware and Threats	8

Suggested Readings:

1. Wireless Communications & Networks, Second Edition, William Stallings by Pearson.
2. Mobile Computing Technology, Applications, and service creation by Asoke K Telukder, Roopa R. Yavagal, TMH.
3. Wireless Communications, Principles and Practices by T. S. Rappaport, Pearson Education India.
4. Android Application Development Black Book by Pradeep Kothari, Dreamtech Press.
5. Wireless and Mobile Networks by Dr. Sunilkumar S. Manvi, Dr. Mahabaleshwar S. Kakkasageri, WILEY.

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MCA6407: INTERNET OF THINGS (IOT) (EL 4)

Course Outcome (CO)

CO1	Classify the fundamentals of IoT, its architecture, and applications.	
CO2	Identify and use IoT hardware, networking components, and communication protocols.	
CO3	Organize the IoT data handling techniques and security challenges.	
CO4	Develop IoT applications using programming and cloud platforms.	
CO5	Evaluate case studies and emerging technologies in IoT.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	Introduction to IoT : Definition, Characteristics, and Evolution of IoT, IoT Architecture & Layers, IoT vs. Traditional Embedded Systems, IoT Communication Models & Protocols, IoT Ecosystem and Applications (Smart Homes, Healthcare, Agriculture, Smart Cities, etc.)	8
II	IoT Hardware & Networking : Sensors, Actuators, and Microcontrollers (Raspberry Pi, Arduino), IoT Communication Technologies: Wi-Fi, Bluetooth, Zigbee, LoRa, NB-IoT, IoT Connectivity: IPv6, MQTT, CoAP, HTTP, Edge Computing and Fog Computing in IoT, Power Management in IoT Devices	8
III	IoT Protocols & Data Handling : IoT Protocols : MQTT, CoAP, AMQP, HTTP; Cloud Computing for IoT, IoT Data Processing & Storage (Big Data & NoSQL Databases), Security & Privacy Issues in IoT, IoT Middleware and IoT Platforms (AWS IoT, Google IoT Core, Azure IoT)	8
IV	IoT Application Development & Security : IoT Programming (Python for IoT, Node.js), IoT Operating Systems (Contiki, RIOT, FreeRTOS), Security Challenges in IoT (Threats, Authentication, Cryptography), Blockchain for IoT Security, IoT Testing & Debugging Tools	8
V	Case Studies & Future Trends in IoT : IoT Applications in Smart Cities, Agriculture, Healthcare, Industry 4.0; AI and Machine Learning for IoT, Digital Twin Technology in IoT, Future Trends in IoT (5G & Beyond, Quantum IoT), Ethical & Social Implications of IoT	8

Suggested Readings:

1. "Internet of Things: A Hands-On Approach" – By Arshdeep Bahga & Vijay Madisetti
2. "Internet of Things (IoT): Principles, Paradigms and Applications" – By Rajkumar Buyya & Amir Vahid Dastjerdi
3. "The Internet of Things: Connecting Objects to the Web" – By Hakima Chaouchi
4. "Internet of Things (IoT) with Raspberry Pi and Arduino" – By Rajesh Singh & Anita Gehlot
5. "IoT and Smart Cities: Advances in Green Computing" – By Pradeep Tomar & Gurjit Kaur

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MCA6422: COMPUTER VISION (EL 4)		
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	Introduction to Images and Computer Vision: Fundamentals: What is Computer Vision? Human vision vs. Computer vision, real-world applications (healthcare, autonomous vehicles, security), and current challenges. Digital Image Basics: How cameras capture light, the concept of pixels, image resolution, and spatial coordinates. Color Spaces: Understanding how color is represented using RGB, Grayscale, and HSV models. Basic Operations: Reading, displaying, resizing, cropping, and saving images.	8
II	Introduction to Images and Computer Vision: Fundamentals: What is Computer Vision? Human vision vs. Computer vision, real-world applications (healthcare, autonomous vehicles, security), and current challenges. Digital Image Basics: How cameras capture light, the concept of pixels, image resolution, and spatial coordinates. Color Spaces: Understanding how color is represented using RGB, Grayscale, and HSV models. Basic Operations: Reading, displaying, resizing, cropping, and saving images.	8
III	Image Segmentation and Edge Detection: Image Segmentation: The need for segmentation (separating foreground objects from the background). Advanced Thresholding: Global thresholding vs. Adaptive thresholding. Edge Detection: Finding the boundaries of objects using gradients, the Sobel operator, and the Canny Edge Detector. Morphological Operations: Refining shapes in binary images using Dilation, Erosion, Opening, and Closing.	8
IV	Feature Extraction and Object Recognition - Understanding Features: What makes a "good" feature in an image? (Edges, corners, and flat regions), Corner Detection: Identifying distinct points using algorithms like the Harris Corner Detector, Template Matching: A simple technique for finding a specific smaller image patch within a larger image. Traditional Machine Learning in Vision: Brief introduction to using basic classifiers (like KNN or SVM) for image classification.	8

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V	AI and Deep Learning in Computer Vision: The Shift to AI: Why Deep Learning replaced traditional feature extraction, Neural Network Basics: Brief overview of artificial neurons and learning, Convolutional Neural Networks (CNNs): The architecture behind modern vision (Convolution layers, Pooling layers, Fully Connected layers), Modern Applications: How AI is used for Face Recognition, Object Detection (like YOLO), and exploring the role of AI in analyzing educational or behavioral data.	8
Suggested Readings: 1. Digital Image Processing by Rafael C. Gonzalez and Richard E. Woods. 2. Textbook: Computer Vision: Algorithms and Applications by Richard Szeliski. 3. Reference: Deep Learning for Vision Systems by Mohamed Elgendy.		

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MCA6471: RESEARCH METHODOLOGY LAB

Course Outcome (CO)

CO1	Identify and formulate research problems with an understanding of research design.	
CO2	Conduct systematic literature reviews using reliable sources and databases.	
CO3	Apply appropriate methodologies, tools, and techniques for data collection and analysis.	
CO4	Demonstrate academic integrity, ethical considerations, and proper citation practices.	
CO5	Draft high-quality research proposals, papers, and technical reports.	
CO6	Present research findings effectively through oral presentations and visual aids.	

DETAILED SYLLABUS

Sr. N	Topic	Hours
1	Introduction to Research: Definition, types, and significance of research. Research process: Problem identification, objectives, hypothesis. Research ethics and plagiarism.	
2	Literature Review: Importance and sources of literature. Using digital libraries: IEEE Xplore, Springer, Scopus, Google Scholar. Reference management tools: Mendeley, Zotero, EndNote.	
3	Research Design and Methodology: Qualitative vs Quantitative research. Sampling methods, data collection tools, surveys, experiments. Case studies and simulation methods.	
4	Data Analysis and Tools: Statistical analysis basics: Mean, median, mode, standard deviation. Tools: Excel, SPSS, R, Python (pandas, matplotlib). Interpretation and visualization of data.	
5	Research Documentation and Writing: Research paper structure: Abstract, Introduction, Methodology, Results, Discussion, Conclusion. Technical report writing. Referencing styles: APA, IEEE, MLA.	
6	Research Communication: Preparing presentations and posters. Publishing in journals, conferences. Handling peer review and revision.	

Suggested Readings:

1. C.R. Kothari, Research Methodology: Methods and Techniques, New Age International, 2004.
2. Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, SAGE Publications, 2019.
3. Jonathan Schwabish, Better Data Visualizations, Columbia University Press, 2021.
4. Eliot Freidson, Professional Powers: A Study of the Institutionalization of Formal Knowledge, University of Chicago Press.
5. IEEE/ACM Style Manuals – Available online for reference.

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MCA6472: DISSERTATION/MAJOR PROJECT LAB

Course Outcome (CO)

CO1	To help students develop openness to new ideas in computer science, develop the ability to draw reasonable inferences from observations and learn to formulate and solve new computer science problems using analytical and problem-solving skills;	
CO2	To help students develop the ability to synthesize and integrate information and ideas, develop the ability to think creatively, develop the ability to think holistically and develop the ability to distinguish between facts and opinion;	
CO3	To help students acquire the necessary competences to build a real-life software system by completing different software life cycle phases (like, specification, architecture, design, implementation, validation, documentation, etc);	
CO4	To help students develop the ability to work individually and as part of a team, develop a commitment to accurate work, develop management skills, improve speaking and writing skills, improve the ability to follow directions, instructions and plans, and improve the ability to organize and use time effectively;	
CO5	To help students develop a commitment to personal achievement, the ability to work skillfully, informed understanding of the role of science and technology, a lifelong love of learning, and cultivates a sense of responsibility for one's own behavior and improves self-esteem/self-confidence.	

DETAILED SYLLABUS

Sr. N	Topic	Hours
	Course Content This course consists of the development of a realistic application, representative of a typical real-life software system or to carry a research based project in an area related to CS & IT. 1. The students are expected to propose, analyze, design, develop, test and implement a real life software system using recent technologies. 2. In case of a research based project, the students are required to follow a proper research methodology to propose a solution (in terms of a model/ framework/ algorithm, etc) of a research problem related to computer science and IT. 3. The student will deliver oral presentations, progress reports, and a final report. A. Depending on the topic of the project and the chosen software development methodology, the following themes may be addressed to some extent: Software development methodologies, static (products) and dynamic aspects (processes);	

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	Requirement analysis (goals, use cases), software architectures, architectural styles and patterns, model-driven engineering(MDE); • Programming techniques, software development environments, refactoring; • Software validation through unit tests, integration tests, functional and structural tests, and code reviews. • Project management, planning, resource estimation, reporting. • Version management by using a version management tool. • Examples of kinds of systems to be developed are distributed systems, client/server systems, web based systems, secure systems, mobile systems, adaptable systems, optimizations of existing systems or data-intensive systems, etc. B. Typical process of research based problems may include, selection of a research topic followed by an extensive literature survey with an aim to find the research gap. Proposing a solution based on the findings (i.e., research gap) and publishing the research work.	
<u>Suggested Readings:</u> 1. Robert Lafore, "Object Oriented Programming in C++", Pearson 2. R. Brown, "Visual Basic .NET – Your Visual Blueprint for Building Versatile Programs on the .NET Framework", Wiley Publishing, Inc. 3. Ivan Bayross, "Oracle", BPB 4. E.N. Mackay, "Developing user Interfaces for Windows", WP Publishers & Distributors Pvt. Ltd.		


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MCA6473: Computer Graphics LAB		
Course Outcome (CO)		
CO1	Understand the core concepts of computer graphics.	
CO2	Implement various shapes drawing algorithms	
CO3	Apply geometric transformations on graphic objects and also implement clipping, shading and colour models.	
CO4	Understand multimedia systems architecture, multimedia components and use various multimedia tools.	
CO5	Perform activities involved in design, development and testing of modeling, rendering, shading and animation.	
DETAILED SYLLABUS		
	IMPLEMENT THE EXERCISES USING C++ / JAVA 1. Implementation of Line, Circle and ellipse attributes 2. To draw a straight line using DDA Algorithm 3. Implementation of mid-point circle generating Algorithm 4. Implementation of ellipse generating Algorithm 5. Implementation of Algorithms for drawing 2D Primitives – Line (Bresenham) – all slopes Circle (Midpoint) 6. 2D Geometric transformations – Translation, Rotation Scaling, Reflection Shear, Window- Viewport 7. Composite 2D Transformations 8. Line Clipping 9. 3D Transformations - Translation, Rotation, Scaling. 10. 3D Projections – Parallel, Perspective. 11. Creating 3D Scenes. 12. Image Editing and Manipulation - Basic Operations on image using any image editing software, creating gif animated images, Image optimization. 13. 2D Animation – To create Interactive animation using any authoring tool.	

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