

KIT – Kalaignarkarunanidhi Institute of Technology

(An Autonomous Institution)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai Accredited by NAAC with 'A' GRADE & NBA (AERO, CSE, ECE, EEE, MECH & MBA) An ISO 9001 : 2015 Certified Institution Coimbatore – 641 402.

REGULATIONS, CURRICULUM & SYLLABUS – 2023

(Applicable for students admitted from the Academic Year 2023-24 onwards)

I to IV Semester

Master of Computer Applications



Department of Computer Applications

Vision and Mission of the Department

Vision			
+	To provide a modern, industry-oriented education in the field of computer applications and explore the current emerging challenges in the technological arena for the development of individual and society.		

Mission			
+	To produce technically skillful, knowledgeable and innovative computer professionals to face the industrial and social challenges by imparting quality education with ethical values.		

Program Educational Objectives (PEO's)			
PEO 1	Graduates will pursue research, or be successfully employed in academia / industries associated with Computer Science and Engineering, or become entrepreneurs, adapting to new technologies and engaging in continuous education and training.		
PEO 2	Graduates will take leadership roles, making holistic decisions guided by professional, ethical, societal, economic, legal and environmental considerations, and communicating clearly with stakeholders.		
PEO 3	Graduates will engage in lifelong learning activities by adapting to the advanced software technologies for continuous professional development.		

Programme Outcomes (PO's)

After the successful completion of the P.G. programme in Master of Computer Applications, Graduates will be able to :		
PO 1	Engineering knowledge : Acquire in-depth knowledge of computer science and engineering to analyse, evaluate, and synthesize computing systems.	
PO 2	Problem analysis : Identify, formulate and critically analyse complex computing problems.	

PO 3	Design/development of solutions : Conceptualize solutions, evaluate the alternatives, and arrive at an optimal solution after considering societal, environmental and cultural factors.			
PO 4	Conduct investigations of complex problems : Apply appropriate research methodologies while solving unfamiliar problems, survey research literature, design & conduct experiments, and analyse & interpret results in a broader perspective.			
PO 5	Modern tool usage : Create, select, and apply state-of-the-art techniques and tools to analyse requirements, design, develop, evaluate, and maintain complex computing systems.			
PO 6	The engineer and society : Demonstrate understanding of societal, health, cultural, safety, environmental and legal issues, and consequent responsibilities relevant to computing practice.			
PO 7	Environment and sustainability : Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
PO 8	Ethics : Understand and commit to professional ethics and norms of computing practices.			
PO 9	Individual and team work : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
PO 10	Communication : Communicate effectively with diverse stakeholders through clear instructions, reports and presentations.			
PO 11	Project management and finance : Apply management principles to projects in computing as well as multidisciplinary environments considering economic factors			
PO 12	Life-long learning : Engage in independent, reflective and continuous learning in the context of social and technological changes			
Program Specific Outcome (PSO's)				

After the successful completion of the P.G. programme in Master of Computer Applications, Graduates will be able to:		
PSO 1	Acquire proficiency in developing and implementing efficient solutions using emerging technologies, platforms and Free and Open-Source Software (FOSS).	
PSO 2	Gain critical understanding of hardware and software tools catering to the contemporary needs of IT industry.	

PG Regulations

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1. SHORT TITLE AND COMMENCEMENT

- t These Regulations shall be called the "KIT Kalaignarkaraunanidhi Institute of Technology, Coimbatore, Regulations for the Award of M.E. / M.Tech. / M.B.A / M.C.A., Degree".
- They have been evolved, drafted and implemented after deliberations in and approvals from UGC, Anna University and Academic Council of the Institute, and are subject to change / modifications from time to time; (major modifications at a frequency of TWO years in synchronization with the curriculum structure revision and minor changes as and when applicable).
- t The latest / first version shall be applicable for the students enrolling for M.E. / M.Tech. / M.B.A / M.C.A., degree programs at this Institute from Academic year 2023 2024 onwards.

2. PREAMBLE

The regulations prescribed herein have been made by KIT, an autonomous institution, approved by AICTE,New Delhi and affiliated to the Anna University, Chennai, to facilitate the smooth and orderly conduct of its academic programmes and activities at the M.E. / M.Tech. / M.B.A / M.C.A.,level. It is expected that the regulations will enable the students to take advantage of the various academic opportunities at the Institute and prepare themselves to face the challenges in their professional careers ahead. It may be noted that :

- a. The provision made herein shall be applicable to all the M.E. / M.Tech. / M.B.A / M.C.A., programmes offered at the institute, at present;
- b. They shall also be applicable to all the new M.E. / M.Tech. / M.B.A / M.C.A., programmes which may be started at the Institute in the future;
- c. Academic and non-academic requirements prescribed by the Academic Council have to be fulfilled by a student for eligibility towards award of M.E. / M.B.A / M.C.A., Degree..

3. PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires :

SI. No.	Name	Definition
1.	Programme	Refers to Degree Programme that is M.E. / M.Tech. / M.B.A/ M.C.A., Degree Programme.
2.	Discipline	Refers to branch or specialization of M.E. / M.Tech. / M.B.A/ M.C.A., Degree Programme, like Computer Science and Engineering, Mechanical Engineering etc.,
3.	Course	Refers to a theory or practical subject that is normally studied in a semester, like Computer Applications and Design, Machine learning Techniques, Marketing management, etc.,

4.	Principal / Head of the Institution	Refers to the authority of the institution who is responsible for all academic activities, for the implementation of relevant rules and regulations.
5.	Controller of Examinations (CoE)	Refers to the authority of the college who is responsible for all activities of the Examinations.
6.	Head of the Department (HoD)	Refers to the Head of the Department concerned.
7.	University	Refers to Anna University, Chennai.
8.	КІТ	Refers to KIT-Kalaignarkarunanidhi Institute of Technology, Coimbatore.
9.	Curriculum	Refers to the various components / courses studied in each programme that provide appropriate outcomes (knowledge, skill and behavior / attitude) in the chosen branch of study.
10.	L-T-P-C	Refers to Lecture, Tutorial, Practical and Credits respectively.
11.	Programme Coordinator	Refers to the coordinator of the programme concerned. He/she acts as interface between programme and key stakeholders, students, faculty and employer. He/She is responsible for planning the academic activities of the programme along with the course coordinator(s) and the HoD. He/She also prepares, evaluates and analyses the attainment of the programme outcomes along with Programme Advisory Committee.
12.	Faculty Advisor	The Faculty Advisor is responsible for providing general advice on the Academic matters, monitor the attendance and academic performance of the students and counsel them periodically. If necessary, the Faculty Advisor may also inform the parents about the progress / performance of the students concerned through HoD.

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13.	Course Coordinator	Course Coordinator is responsible for teaching the course, evaluating and analysing the performance of the students. The students is also responsible for the assessment of the Course Outcomes / Program Outcomes / Program Specific Outcomes. They can also recommend to organize workshops / seminars / guest lectures / industrial visits to meet the Course Outcomes and Program Outcomes.
14.	Class committee	Class committee for each semester of a programme comprises of HoD, Programme Coordinator, Faculty Advisor, Course Coordinators (as applicable) and Student Representatives.
15.	Academic Evaluation Committee (AEC)	The committee includes Principal, CoE, HoD concerned (For details refer Appendix V)
16.	Department Evaluation Committee (DEC)	The committee included HoD (need basis), senior faculty member(s) of departmentfrom various levels, class advisor, Mentor of the students. (For details refer Appendix V)
17.	CIA	Refers to Continuous Internal Assessment.
17. 18.	CIA ESE	Refers to Continuous Internal Assessment. Refers to End Semester Examination.
17. 18. 19.	CIA ESE CBCS	Refers to Continuous Internal Assessment. Refers to End Semester Examination. Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve their target number of credits by using their choice both in terms of pace and sequence of courses. The students are given the privilege to choose any course as an elective which they have not studied before.
17. 18. 19. 20.	CIA ESE CBCS GPA	Refers to Continuous Internal Assessment.Refers to End Semester Examination.Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve their target number of credits by using their choice both in terms of pace and sequence of courses. The students are given the privilege to choose any course as an elective which they have not studied before.Refers to Grade Point Average
17. 18. 19. 20. 21.	CIA ESE CBCS GPA CGPA	Refers to Continuous Internal Assessment.Refers to End Semester Examination.Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve their target number of credits by using their choice both in terms of pace and sequence of courses. The students are given the privilege to choose any course as an elective which they have not studied before.Refers to Grade Point AverageRefers to Cumulative Grade Point Average
17. 18. 19. 20. 21. 22.	CIA ESE CBCS GPA CGPA CEC	Refers to Continuous Internal Assessment.Refers to End Semester Examination.Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve their target number of credits by using their choice both in terms of pace and sequence of courses. The students are given the privilege to choose any course as an elective which they have not studied before.Refers to Grade Point AverageRefers to Cumulative Grade Point AverageRefers to Career Enhancement Courses
17. 18. 19. 20. 21. 22. 23.	CIA ESE CBCS GPA CGPA CEC PCC	Refers to Continuous Internal Assessment.Refers to End Semester Examination.Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve their target number of credits by using their choice both in terms of pace and sequence of courses. The students are given the privilege to choose any course as an elective which they have not studied before.Refers to Grade Point AverageRefers to Cumulative Grade Point AverageRefers to Career Enhancement CoursesRefers to Professional Certificate Courses

4. ADMISSION

4.1 Candidates seeking admission to M.E. / M.Tech. / M.B.A / M.C.A., Degree Programme :

Candidates for admission to the first semester of the Post-Graduate Degree Programme shall be required to have passed an appropriate Under-Graduate Degree Examination of Anna University or equivalent as specified under qualification for admission as per the Tamil Nadu Common Admission (TANCA) criteria. This is applicable for students admitted both under Single Window Counselling process and through the Management Quota.

Note : TANCA releases the updated criteria during the admissions every academic year. Admission shall be offered only to the candidates who possess the qualification prescribed against each programme.

Any other relevant qualification which is not prescribed against each programme shall be considered for equivalence by the committee constituted for the purpose. Admission to such degrees shall be offered only after obtaining equivalence to such degrees.

However, the University may decide to restrict admission in any particular year to candidates having a subset of qualifications prescribed at the time of admission.

Not with standing the qualifying examination the candidate might have passed, he/she shall have a minimum level of proficiency in the appropriate programme / courses as prescribed by the University from time to time.

4.2 Re - admission

Students, who have discontinued for reasons other than disciplinary action, may be readmitted as per guidelines given by DoTE, Government of TamilNadu and Anna University. Department Evaluation Committee (DEC) shall study and recommend on the exception and addition of courses to be registered for, by the student concerned during re-admission. The details shall be forward to Academic Evaluation Committee (AEC) for approval and the committee's decision shall be final.

5. PROGRAMMES OFFERED

KIT offers 2 year (4 Semesters) M.E. / M.Tech. / M.B.A / M.C.A., Degree programme affiliated to Anna University, under Choice Based Credit System (CBCS) for students admitted from 2023 onwards in the following branches of Engineering and Technology as in Table 1.

M.E., Applied Electronics		
M.E., VLSI Design		
M.E., Engineering Design		
M.E., Computer Science and Engineering		
M.E., Power Systems Engineering		
M.B.A., Master of Business Administration		
M.C.A., Master of Computer Applications		

Table : 1 List of M.E. / M.B.A / M.C.A., programmes offered

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6. ACADEMIC STRUCTURE OF PROGRAMMES

6.1 Medium of Instruction

The medium of instruction is English for all courses, examinations, seminar presentations and project / thesis / dissertation.

6.2 Categorization of Courses

Every Post Graduate Degree Programme will have a curriculum with syllabi consisting of theory and practical courses that shall be categorized as follows :

- i. Foundation Courses (FC) may include Mathematics or other basic courses
- ii. Professional Core (PC) courses include the core courses relevant to the chosen specialization / branch.
- iii. Professional Elective (PE) courses include the elective courses relevant to the chosen specialization / branch.
- iv. Project Work (PW) includes Project Work to be done in final semester
- Career Enhancement Courses (CEC) includes Mini Project Work and/or Internship, Seminar, Professional Practices, Summer Project, Case Study and Industrial / Practical Training.
- vi. Open Elective Courses (OEC) include the courses credited from other post graduate Programmes of M.E. / M.Tech. / M.B.A / M.C.A and online courses.

6.3 Number of courses per semester

Curriculum of a semester shall normally have a blend of lecture courses and practical courses including Career Enhancement Courses. Each course may have credits assigned as per clause 6.4.

6.4 Credit Assignment

Each course offered is given a L-T-P-C structure, depending on the number of Lecture (L), number of periods for Tutorial periods (T), number of periods for practical (P),C-credits required for an efficient teaching – learning process. A student is expected to put-in his/her own efforts in proportion with periods spent in classroom, as defined in L-T-P-C structure. On successful completion of the course a student is said to have earned a specified number of credits defined for each course. Each course is assigned certain number of credits based on the following table :

Contact period per week	Credits
1 Lecture (L)	1
1 Tutorial (T)	1
1 Practical Period (P) (Laboratory / Seminar /Project work etc.)	1/2

Table 2	3	Credit Assigned
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6.5 Project Work

- 6.5.1 The project work for M.E. / M.B.A / M.C.A. Programmes consist of Project Work I and Project Work - II. The Project Work - I is to be undertaken during Semester III and Project Work - II, which is a continuation of Project Work - I, (except when project work II is carried out in the industry) is to be undertaken during Semester IV.
- 6.5.2 In case of students of M.E. Programmes not completing Project Work I of project work successfully, the students can undertake Project Work I again in the subsequent semester. In such cases the students can enroll for Project Work II, only after successful completion of Project Work I.
- 6.5.3 Projectworkshallbecarriedoutunderthesupervisionofa"qualifiedteacher"intheDepartment concerned. In this context "qualified teacher" means the faculty member possessing (i) PG degree with a minimum of 3 years experience in teaching or (ii) Ph.D. degree.
- 6.5.4 A student may, however, undergo Project Work II (M.E. / M.Tech. Programme) in industry / academic institution of repute offering PG programmes in Engineering/ Technology (other than affiliated colleges of Anna University) / research institutions for a minimum of 16 weeks during the final semester. In such cases, the students shall undergo the Project Work - II with the approval obtained from the Head of the institution and Centre for Academic Courses preferably one month before the start of the industrial project.
- 6.5.5 The Project Work II carried out in industry / academic institution of repute / research institutions need not be a continuation of Project Work I. In such cases, the Project Work shall be jointly supervised by a supervisor of the department and an expert as a joint supervisor from the organization and the student shall be instructed to meet the supervisor periodically and to attend the review committee meetings for evaluating the progress. The review meetings, if necessary, may also be arranged in online mode with prior approval from the Head of the Institution and suitable record of the meetings shall be maintained.
- **6.5.6** The Project Work (Project Work II in the case of M.E. / M.Tech.) shall be pursued for a minimum of 16 weeks during the final semester.
- 6.5.7 The deadline for submission of final Project Report (Project Work II for M.E. / M.Tech. programmes) is 60 calendar days from the last working day of the semester in which project work / thesis / dissertation is done. However, the Project Work I in the case of M.E. / M.Tech. / M.B.A / M.C.A Programmes shall be submitted within the last working day of the semester as per the academic calendar.

6.5.8 Industry Supported Project Work

The students satisfying the following conditions shall be permitted to carry out their final semester Project work for six months in industry/research organization.

The student should not have current arrears and shall have CGPA of 8.0 and above until 2nd semester (for M.B.A. / M.E. / M.Tech / M.C.A. Students). The student shall undergo the final semester courses in the Pre semester. The Head of Department, in consultation with the faculty handling the said courses shall forward the proposal recommended by the Principal to CoE after approval fromAEC atleast four weeks before the commencement of the pre-semester of the programme.

6.6 Career Enhancement Courses

6.6.1 Industrial Training / Internship

Students shall undergo industrial training/Internship if mandated in the curriculum for periods as specified in the curriculum during the summer/winter vacation, the training being taken on a continuous basis for the periods mentioned. The industry/organization is to be selected with the approval of the Department Evaluation Committee (DEC). Industrial training may also be referred to as "In-plant training".

The Industrial Training / Internship shall carry 100 marks and shall be evaluated through CIA only. The credit will be awarded to the student after the submission of Internship / Training report to the HoD. The report will be evaluated by a team of (DEC) faculty members nominated by the HoD for awarding the Credit. Based on the recommendation by the team, the student will be awarded credits and the results will be sent to the Controller of Examinations. The awarded credit will take for CGPA calculation. The final year project period at industry / research organization will not be considered as industrial Training / internship.

6.6.2 If Industrial Training/ Internship is not prescribed in the curriculum, the student may undergo Industrial Training/ Internship during Summer/Winter vacation optionally and the credits earned will be indicated in the Grade Sheet. If the student earns three credits in Industrial Training/ Internship, the student may drop one Professional Elective (only one professional elective can be dropped). In such cases, Industrial Training / Internship need to be undergone continuously from one organization or with a combination one two week and one four week programme, from one/two organizations. However, if the number of credits earned is 1, these credits shall not be considered for classification of the degree. Students shall get permission from the Head of the Institution for taking industrial training/internship and the Certificate of completion of Industrial Training / Internship shall be forwarded to COE.

DURATION OF TRAINING / INTERNSHIP	CREDITS
3 Weeks*	1

6.6.3 Professional Certificate Courses

Students have to undergo one credit courses offered by experts from industry / research organizations and approved by academic council. Students can register such courses from his/her second year of study as and when these courses are conducted by the departments. A student is also permitted to register for these courses of other departments.

If a student does not successfully complete the registered industry supported one credit courses in a semester, the registration of that course will be considered as cancelled. Further, it will not be treated as arrear and if he/she wishes, he/she can reregister for the same course in the ensuing semesters and successfully complete it as and when it is offered subsequently.

6.6.4 Online Courses offered through SWAYAM / NPTEL

Students may be permitted to register maximum of two online courses, subject to a maximum of three credits, registered through SWAYAM / NPTEL instead of Professional / Open Elective Courses are permitted for credit transfer) of regular M.E. / M.Tech. / M.B.A / M.C.A Programme with the approval of BOS through DEC. The online course of minimum 3 credits can be considered instead of one Professional / Open elective course.

DEC finalizes the courses to be permitted for credit transfer through SWAYAM / NPTEL prior to the commencement of the semester. The courses selected through the SWAYAM / NPTEL may not be necessarily the courses which are offered in the list of Professional / Open Elective courses, as part of the curriculum.

The Committee also intimates the students about the selected courses prior to the commencement of the semester, identify and designate a Course Coordinator for the online course(s) offered. The Course Coordinator guides the students throughout the course, submits the certificates and marks earned by the students to the office of the CoE during credit transfer request by the student.

The student has to register for the credit transfer of the online course during the course registration. The online course(s) which is/are successfully completed by the student in a particular semester during the course of study is eligible for credit transfer in the immediate next semester by registering it (i.e. an online course is eligible for credit transfer in the immediate next semester only)

6.6.5 Soft Skills (only for M.B.A. & M.C.A.)

Every Student is required to go for two soft skill courses during first year of study. The soft skill course includes the communication skill, interpersonal skill and career development courses. Two credit will be awarded for each soft skill courses and it will be included for GPA / CGPA calculations.

6.7 Course Numbering Scheme

Each course is denoted by a unique code consisting of 9 alphanumeric characters. The details of the numbering scheme are in APPENDIX A.

6.8 Credit Requirement for Programmes

The total number of credits that a student earns during the period of study is called the Total credits. The minimum prescribed credits required for the award of the degree shall be within the limits specified below :

Programme	KIT Credit Range
M.E.	69-79
M.B.A.	102
M.C.A.	84

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7. DURATION OF THE PROGRAMMES

7.1 The minimum and maximum period for completion of the P.G. Programmes are given below :

Programme	Min. No. of Semesters	Max. No. of Semesters
M.E. (Full-Time)	4	8
M.B.A. (Full Time)	4	8
M.C.A. (Full Time)	4	8

- **7.2** The Curriculum and Syllabi of all the P.G. Programmes shall be approved by the Academic Council of KIT. The number of Credits to be earned for the successful completion of the programme shall be as specified in the Curriculum of the respective specialization of the P.G. Programme
- 7.3 Each semester normally consists of 90 working days, including test and examination days. In any contingent situation, the number of working days per semester shall not be less than 65 days. The Principal is given the discretionary powers to decide the number of working days. In such contingencies, the Principal shall ensure that every faculty member teaches the full content of the specified syllabus for the course being taught.
 - 7.3.1 Due to Pandemic / Abnormal situations the Scheme of Examinations and Evaluation will be followed as per the guidelines issued by the Government of Tamil Nadu and Anna University, Chennai.
- **7.4** The total period for completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 7.1 irrespective of the period of break of study in order that he/she may be eligible for the award of the degree
- **7.5** For the purpose of regulations, the academic year will be divided into two semesters, the odd semester normally spanning from June to November and the even semester from December to May.

8. COURSE REGISTRATION

Each student, on admission shall be assigned to a mentor who shall advice and counsel the student about the details of the academic programme and choice of courses, considering the student's academic background and career objectives. Some courses require students to register through a course registration process via online.

8.1. Course Registration

Each student on admission shall register for all the courses prescribed in the curriculum in the students first semester of the study.

The registration process for the courses offered in the online registration mode in the forthcoming semester, will commence preferably 10 working days prior to the last working day of the current semester.

A department shall offer a course only if a minimum number of students register for that course. This minimum number may vary from course to course and shall be specified by the department from time to time.

After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment Marks and appear for the End Semester Examination (ESE).

8.2 Credits details for Course Registration

Each student has to register for all courses to be undergone in the curriculum of a particular semester (with the facility to drop courses to a maximum of 6 credits). The student can also register for courses for which the student has failed in the earlier semesters.

The registration details of the candidates may be approved by the Head of the Institution and forwarded to the Controller of Examinations. This registration is for undergoing the course as well as for writing the End Semester Examinations.

The courses that a student registers in a particular semester may include

- t Courses of the current semester.
- The core (Theory / Lab / CEC) courses that the student has not cleared in the previous semesters.
- t Elective courses which the student failed (either the same elective or a different elective)

8.3 Flexibility to Drop courses

A student has to earn the total number of credits specified in the curriculum of the respective programme of study in order to be eligible to obtain the degree. However, if the student wishes, the student is permitted to earn more than the total number of credits prescribed in the curriculum of the student's programme.

From the Second to final semesters, the student has the option of registering for additional courses or dropping existing courses. Total number of credits of such course cannot exceed 6.

However, the maximum number of credits the student can register in a particular semester cannot exceed 30 credits (excluding courses for which the student has done reappearance registration (vide clause 8.4).

The student shall register for the project work phase I in the third semester and project work phase II in the fourth semester. However, if a student has not earned the minimum number of credits as specified in table 1, the student may be permitted to register for the project work Phase I and Phase II as and when the student earns the minimum number of credits.

8.4 Reappearance Registration

- **8.4.1** If a student fails in a theory or practical course, the student shall do reappearance registration for that course in the subsequent semester by retaining the Continuous Assessment Marks already earned.
- **8.4.2** If the theory course, in which the student has failed, is a Professional Elective or an Open Elective, the student may register for the same or any other Professional Elective

or Open Elective course respectively in the subsequent semesters. Such changes can be done only with due approval by DEC.

- **8.4.3** The student who fails in Project work/ Seminar other than Practical courses shall register for the same in the subsequent semester and reappear for the End Semester Examination.
- **8.4.4** If a student is not eligible to appear for end semester examination of a course due to lack of attendance, the student has to register for that course again, when offered next, attend the classes and fulfill the attendance requirements. If the course, in which the student has lack of attendance, is an elective, the student may register for the same or any other elective in the subsequent semesters.
- **8.4.5** If a student has completed the 6 semesters and has obtained RA grade in one or more courses, he can register and appear for arrear examination directly whenever conducted next.
- **8.4.6** A student who has already appeared for a course in a semester and passed the examination is not entitled to reappear the same course for improvement of Grade/ Marks.

9. REQUIREMENTS FOR APPEARING ESE

- **9.1** A student who has fulfilled the following conditions (vide clause 9.1 and 9.2) shall be deemed to have satisfied the attendance requirements for appearing for end semester examination of a particular course.
- **9.2** Ideally every student is expected to attend all periods and earn 100% attendance. However, the student shall secure not less than 80% attendance course wise taking into account the number of periods required for that course as specified in the curriculum.
 - i. If a student secures not more than 80% attendance in any Course in the Current Semester due to medical reasons (hospitalization / accident / specific illness) or due to participation in the College / University / State / National / International Level Sports events with prior permission from the Head of the Department concerned, the student shall apply for condonation with a prescribed condonation fee payable per course. The condonation should be decided by a condonation recommendation committee consisting of Head of the Department of the student, Programme coordinator of the student, Student Counsellor, Faculty incharge of the course and Controller of Examinations. The committee scrutinizes the genunity of the "Condonation application Form" and conduct of the student and recommend it to the Principal and Chairman to grant of condonation after satisfying the requirements specified in clause 9.2 (ii). In such cases, his / her conduct has been certified to be satisfactory by the Faculty Advisor / Student Counsellor concerned and the Head of the Department.
 - ii. The student applied for condonation, has to compensate the shortfall periods to 80% by attending the contact classes scheduled by the Course Incharge (One week before the commencement of subsequent semester). The results of the End Semester Examination of such courses will be published only after the shortfall period is condoned by the PRINCIPAL.

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- 9.3 A student shall normally be permitted to appear for end semester examination of the course if the student has satisfied the attendance requirements (vide Clause 9.1 9.2) and has registered for examination in those courses of that semester by paying the prescribed fee.
- **9.4** Students who do not satisfy clause 9.1 and 9.2 and who secure less than 70% attendance in a course will not be permitted to write the End-Semester Examination of that course. The student has to register and repeat this course in a subsequent semester when it is offered next (vide clause 8.4).
- **9.5** In the case of reappearance registration for a course (vide Clause 8.4), the attendance requirement as mentioned in Clauses 9.1 9.3 is not applicable. However, the student has to register for examination in that course by paying the prescribed fee.
- **9.6** A student who has already appeared for a course in a semester and passed the examination is not entitled to reappear in the same course for improvement of grades.

10. PROVISION FOR WITHDRAWAL FROM EXAMINATION

A student may, for valid reasons (medically unfit / unexpected family situations / Sports person representing TamilNadu / India with prior permission for participation from Principal / CoE / DEC), be granted permission to withdraw (after registering for the examinations) from appearing for any course or courses in the End Semester Examination of a particular semester. The student may withdraw by following the due process of the CoE's office before the commencement of examination. This facility can be availed only once during the entire duration of the degree programme.

Withdrawal from ESE will be valid only if the student is, otherwise, eligible to write the examination and the application for withdrawal is made to the CoE, prior to the examination in the course or courses concerned. The application for withdrawal should be recommended by the Head of the Department concerned and approved by the Head of the Institution.

11. TEMPORARY BREAK OF STUDY FROM A PROGRAMME

- 11.1 Break of study is normally not permitted. However, if a student intends to temporarily discontinue the programme in the middle of a semester / year for valid reasons (such as Internships, accident or hospitalization due to prolonged ill health) and wishes to re-join the programme in the next academic year, he / she shall apply in advance to the Principal through the Head of the Department, stating the reasons. The application shall be submitted not later than the last date for registering for the semester examinations. Break of study is permitted only once during the entire period of the degree programme.
- **11.2** The student permitted to re-join the programme after the break shall be governed by the rules and regulations in force, at the time of re-joining.
- 11.3 The duration specified for passing all the courses for the purpose of classification of degree (vide clause 20) shall be increased by the period of such break of study permitted (vide clause 11)
- **11.4** If a student is detained for want of requisite attendance, academic progress and good conduct, the period spent in that semester shall not be considered as permitted Break of Study and Clause 11.3 is not applicable for such cases.

A student may, for valid reasons (medically unfit / unexpected family situations / Sports person representing TamilNadu / India with prior permission for participation from

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Principal / CoE / DEC), be granted permission to withdraw (after registering for the examinations) from appearing for any course or courses in the End Semester Examination of a particular semester. The student may withdraw by following the due process of the CoE's office before the commencement of examination. This facility can be availed only once during the entire duration of the degree programme.

Withdrawal from ESE will be valid only if the student is, otherwise, eligible to write the examination and the application for withdrawal is made to the CoE, prior to the examination in the course or courses concerned. The application for withdrawal should be recommended by the Head of the Department concerned and approved by the Head of the Institution.

12. ASSESSMENT PROCEDURES FOR AWARDING MARKS

All PG Programmes consists of different categories of courses as mentioned in table 4. Appearance in End Semester Examination is mandatory for all courses excluding the courses for which only continuous assessment is recommended as mentioned in table 4. Performance in each course of study shall be evaluated based on (i) Continuous assessments throughout the semester and (ii) End Semester Examination at the end of the semester. (i.e.) Each course shall be evaluated for a maximum of 100 marks as shown below :

SI. No.	Category of Course	Continuous Assessment Marks	End - Semester Examination Marks
1.	Theory	40	60
2.	Theory cum Practical COIMBAT	DRE 50	50
3.	Practical	60	40
4.	Project Work	40	60
5.	Online SWAYAM / NPTEL Courses (Optional)	Marks offered by S shall be direc	SWAYAM / NPTEL tly considered
6.	All EEC Courses (Except Practical Courses and Project Work)	100	_
7.	Mandatory Courses (Except Induction Program [#])	100	_

Table 3 – Categories of Courses

* Value Added Courses (comes under EEC) No assessment for Induction program.

Every course coordinator is required to maintain an ATTENDANCE AND ASSESSMENT RECORD' for every semester which consists of attendance marked in each Theory / practical / EEC class etc, the assessment marks and the record of class work (topics covered), separately for each course handled by the course coordinator. This should be submitted to the HOD periodically (at least two times in a semester) for checking the syllabus coverage and the records of assessment marks and attendance. The HOD will affix his/her signature and date after due verification. At the end of the semester, the record should be verified by the HOD who shall keep this document after the approval

from the Principal for five years. The records of attendance and assessment of both current and previous semesters should be available for inspection whenever required.

12.1 Assessment for Theory Courses Including Mandatory Courses

Theory Courses including mandatory courses are to be assessed out of 100 marks, the maximum marks for CIA is fixed as 40 and the ESE carries 60 marks.

The ESE for theory courses including mandatory courses will be of 3 hours duration and shall normally be conducted for a maximum of 100 marks during the Odd and Even Semesters. Every student should appear for the ESE for all the courses excluding the courses for which only continuous assessment is recommended.

A minimum of two tests would be conducted in a day (in the case of tests and they would be of two hours duration each) students will have two hours of coaching session followed by the CIA. In case a student misses the assessment due to medical reasons (hospitalization / accident / specific illness) or due to participation in the College / University / State / National / International level Sports events with prior permission from the HOD, a Reassessment may be given at the end of the semester after getting approval from the HOD through the Course Coordinator concerned.

To arrive the Continuous Assessment Marks, the following guidelines should be followed. **Table : 4 Theory Courses : Continuous Assessment Marks**

Assessme (100 Mar	ssessment - I Assessment - II (100 Marks) (100 Marks)		t - I Assessment - II s) (100 Marks)		ıt - III (s)	Total
Individual Assignment / Case Study / Seminar / Mini project	Written Test	Individual MB Assignment / Case Study / Seminar / Mini project	ATORE Written Test	Individual Assignment / Case Study / Seminar / Mini project	Written Test	Total Continuous Assessment Marks
40	60	40	60	40	60	300*

* The weighted average shall be converted into 40 marks for Continuous Assessment

A minimum of three Continuous assessments will be conducted as a part of continuous assessment during the semester by the respective department. Each Continuous assessment is to be conducted for 100 marks and will have to be distributed in two parts viz., Individual Assignment/Case study/Seminar/Mini project and Test with each having a weightage of 40% and 60% respectively. The tests shall be in written mode. The total Continuous assessment marks of 200 shall be converted into a maximum of 40 marks and rounded to the nearest integer.

12.2 Assessment for Practical Courses

For practical including virtual practical Courses, out of 100 marks, the maximum marks for Continuous Assessment is fixed as 60 and the End Semester Examination carries 40 marks.

Every practical exercise / experiment shall be evaluated (as per the rubrics approved by the class committee) based on conduct of experiment / exercise and records. There shall be at least one model test. The criteria for arriving at the Continuous Assessment marks of 60 is as follows :

Continuous Assessment (100 Marks)*	
Evaluation of Laboratory Observation, Record	Test
75	25

Table : 5 Practical Courses : Continuous Assessment Marks

*Continuous Assessment marks shall be converted into 60 marks

The End Semester examinations for practical courses shall be of 3 hours duration and normally be conducted for a maximum of 100 marks during the odd and Even Semesters.

12.3 Assessment for Theory cum Practical Courses

Weightage of Continuous Assessment and end semester examination marks will be 50% each. The distribution of marks for the theory and laboratory components in the Continuous Assessment and end semester examination for different types of courses are provided in the table 7.

	т	Б	C	Continu	ESE		
L	1	F	0	I	II	II	ESE
1	0	4	3	Laboratory (15%)	Laboratory (15%)	Theory (20%)	Laboratory only (50%)
1	0	2	2	Laboratory (15%)	Laboratory (15%)	Theory (20%)	Laboratory only (50%)
2	0	2	3	Theory (15%)	Theory (15%)	Laboratory (20%)	Theory (25%) Laboratory (25%)
3	0	2	4	Theory (15%)	Theory (15%)	Laboratory (20%)	Theory (35%) Laboratory (15%)
2	0	4	4	Theory (15%)	Theory (15%)	Laboratory (20%)	Theory (15%) Laboratory (35%)

Table : 6 Theory Courses with Practical Component : Continuous Assessment Marks

The procedure for the conduct of Continuous Internal Assessment for theory and laboratory components shall be as per the clause 13.1 and 13.2 respectively. The weighted average shall be converted into 50 marks for Continuous Assessment.

12.4 Assessment for Project Work

The Project work such as mini project and final year project shall be carried out under the supervision of a faculty in the department concerned.

The students who completed their final semester courses (except project work) in advance, shall be permitted to carry out their final semester Project Work for six months in an industry/research organization on the recommendations of the HoD. In such cases the approval should be obtained from the industry concerned, the project work shall be jointly guided by a supervisor of the department and an expert as joint supervisor from the respective organization. The student shall be instructed to meet the supervisor periodically and to attend the review committee meetings and shall submit attendance particulars from the joint supervisor for evaluating the progress

For Project Work, out of 100 marks, the maximum marks for CIA is fixed as 40 and the ESE (Project Report evaluation and Viva-Voce examination) carries 60 marks. Project work may be carried out by a single student.

There shall be three reviews during the semester. The student shall make presentation on the progress made by him / her before the "Project Review Committee". The total marks obtained in the three reviews shall be reduced for 40 marks and rounded to the next integer. The HoD shall constitute a "Project Review Committee" for each Programme. There shall be a minimum of three members in the Review Committee. The Project Guide will be one of the members of the Review Committee.

The student is expected to submit the Project Report on or before the notified date. The ESE for Project Work shall consist of evaluation of the final Project Report submitted by the student of the Project and viva-voce examination by an external examiner and internal examiner.

The project report shall carry a maximum of 20 marks. The project report shall be submitted as per the approved guidelines as given by the CoE. Same marks shall be awarded to every student within the project group for the project report. The viva-voce examination shall carry 40 marks. Marks are awarded to each student of the project group is based on the individual performance in the viva-voce examination.

The CIA and ESE marks for Project Work and the Viva-Voce Examination will be distributed as indicated below.

Continuous Internal Assessment Marks (40)		End Se	mester Exan	ninations Ma	rks (60)	
Review I	Review II	Review III	Project Report Viva-Voce Examina			Examination
10	15	15	Internal	External	Internal	External
10	10 15 15	10	10	20	20	

Table 7 : Project Work : CIA and ESE

The last date for submission of the project report is on the last working day of the semester. If a student fails to submit the project report on or before the specified deadline or the student has submitted the project report but did not appear for the viva-voce examination, it will be considered as fail in the Project Work and the student shall re-register for the same in the subsequent semester.

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The Project Report prepared according to approved guidelines as given by the Institution and duly signed by the supervisor, Programme Co-ordinator and the Head of the Department. The evaluation of the Project work Phase - I and Phase - II will be based on the project report submitted in each of the Phase – I and Phase - II semesters respectively and a Viva- Voce Examination by a team consisting of the supervisor and External Examiner. The external examiner shall be appointed by the Office of the Controller of Examinations from the panel of examiners recommended by the HOD for Phase - I and Phase - II project evaluation.

If the student fails to obtain 50% of the continuous assessment marks in the phase - I and Phase - II project work, he / she will not be permitted to submit the report for that particular semester and has to re-enroll for the same in the subsequent semester.

The Project Report / Thesis / Dissertation report / Drawings prepared according to approved guidelines and duly signed by the supervisor(s), the Programme Coordinator and the Head of the Department shall be submitted at the end of the IIIrd and IVth semester. If a candidate submits the project report/thesis report/dissertation after the specified deadline, he/ she is deemed to have failed in the Project Work/Thesis/Dissertation and shall re-enroll for the same in a subsequent semester.

If a student fails to submit the project report on or before the specified deadline, student is deemed to have failed in the project work and shall re-enroll for the same in a subsequent (next) semester. This applies to both phase - I and phase - II project work. In case of students not completing phase - I of the project work successfully, the students can undertake phase - I again in the subsequent (next) semester. In such cases, the students can enroll for Phase - II, only after successful completion of Phase I.

12.5 Assessment for Industrial Training / Practical Training / Internship

The Industrial training / Practical Training /Internship shall carry 100 marks and shall be evaluated through Continuous Assessment only. At the end of Industrial training / Practical Training/Internship, the student shall submit a detailed report including attendance on the training undergone and a certificate from the organization concerned. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a three-member Departmental Consultative Committee constituted by the HOD consisting of Programme Coordinator, Faculty Advisor concerned and Senior Faculty. The evaluation report duly signed by the departmental consultative committee and HOD shall be submitted to the office of the COE.

12.6 Assessment for other Career Enhancement Courses

The Seminar / Case Study shall carry 100 marks and shall be evaluated through Continuous Assessment only. Every student is expected to present a minimum of 2 seminars per semester before the evaluation committee and for each seminar, marks can be equally apportioned. A three member committee appointed by the Head of the Department, consisting of the course coordinator and two experts from the Department, will evaluate the seminar and at the end of the semester, the marks shall be consolidated and taken as the final mark. The

evaluation shall be based on the seminar paper (40%), presentation (40%) and response to the questions asked during presentation (20%).

12.7 Assessment for SWAYAM / NPTEL Courses

The students may be permitted to credit online courses which are offered through SWAYAM / NPTEL platform with the approval of Board of Studies concerned (vide Clause 6.5.4). The course shall carry 100 marks and the marks awarded by the SWAYAM / NPTEL shall be directly considered for grading of the course. No grades shall be awarded for the attendance in the grade sheet for the online course. The attendance requirement as mentioned in Clauses 7 of Regulations 2023 is not applicable for the SWAYAM / NPTEL course.

12.8 Research Publication

The student can register for the Research Publication as a value added course of respective credits with the approval of BoS concerned. Maximum of two students can form a team under the guidance of a faculty member and complete the publication in SCI / SCI expanded / SCOPUS indexed / UGC Care list. Credits for the publication will be awarded as mentioned in Table 09. The students are not allowed for credit transfer for the research publication. The research publication completed in a semester during the course of study is eligible for including in the grade sheet in the immediate next EVEN / ODD by registering it.

SI. No.	Category of Journal	Credits
1.	One Research Publication in SCI / SCI - Expanded Journal	3
2.	One Research Publication in SCOPUS indexed Journal	2
3.	One Research Publication in UGC Care list Journal	1

Table : 8 Research Publication : Award of Letter Grade

13. MARKS DISTRIBUTION

13.1 Question paper pattern

Table : 9 End Semester Examinations

1 Mark (Objective or any type)	2 Marks	13 Marks	Total Marks			
15	10	5 (Either or Type)	100			
For Mathematics paper only						
2 Marks 16 Marks Total Marks						
10	5 (E	100				

14. PASSING REQUIREMENTS

14.1 A student who secures not less than 50% of total marks prescribed for the course [Continuous Assessment + End semester Examinations] with a minimum of 50% of the marks prescribed for the end-semester Examination, shall be declared to have passed the course and acquired

the relevant number of credits. This is applicable for theory, theory with practical component and practical courses (including project work).

- 14.2 If a student fails to secure a pass in a theory course / theory with practical component / practical course (except electives), the student shall register and appear only for the end semester examination in the subsequent semester. In such case, the Continuous assessment marks obtained by the student in the first appearance shall be retained and considered valid for all subsequent attempts till the student secures a pass. However, from the third attempt onwards if a student fails to obtain pass marks (Continuous Assessment + End Semester Examination), then the student shall be declared to have passed the examination if he/she secures a minimum of 50% marks prescribed for the end semester examinations alone.
- **14.3** If the course, in which the student has failed, is a Professional Elective or Open Elective course, the student may be permitted to register for the same or any other elective course in the subsequent semesters.

If any other Professional Elective or Open Elective course is opted by the student, the previous registration is cancelled and henceforth it is to be considered as a new Professional Elective or Open Elective course. The student has to register and attend the classes, earn the continuous assessment marks, fulfil the attendance requirements as per clause 9 and appear for the end semester examination.

- **14.4** If a student fails to secure a pass in project work, the student shall register for the course in the subsequent semester/when offered next and repeat the course.
- **14.5** The passing requirement for the courses which are assessed only through purely internal assessments (EEC courses except Project Work and laboratory), is 50% of the internal assessment (continuous assessment) marks only

14.6 Valued Answer Script review by the students

All the students are allowed to review their valued answer scripts with the faculty incharge of the course on the specified date (usually the reopening day). Any discrepancies in the valuation can immediately be brought to the notice of the Controller of Examinations.

14.7 Revaluation

A student can apply for revaluation in a theory course within 2 working days from the date of review of valued answer scripts by the students on payment of a prescribed fee along with prescribed application to the COE through the HOD. The COE will arrange for the revaluation and the following procedure is followed in awarding Grade Points after revaluation:

- i. If there is a change from fail to pass for a Candidate in a Course, Grade Point is awarded as per the applicable (relative/absolute) grading.
- ii. If a passed candidate in a course obtains more marks after revaluation, Revised Grading is used only when the candidate gets Higher Grade, otherwise no change in the grade awarded before the revaluation.

The results will be intimated to the student concerned through the HOD within 5 working days from the last date of application of revaluation. Revaluation is not permitted for practical course, practical component of theory with practical component courses and project work.

14.8 Photocopy

Photo Copies of answer script for theory subjects can be obtained from the office of the Controller of Examinations on payment of a prescribed fee specified for this purpose through proper application.

14.9 Challenge Revaluation

Challenging the revaluation is permitted for those students who have applied for photocopy of answer script. The copy of the answer script is to be valued by a competent authority and the valued script should be submitted to the office of the COE along with prescribed fee for challenging the revaluation within 2 working days after the declaration of the Re-valuation results

15. AWARD OF LETTER GRADES

15.1 The award of letter grades will be decided based on relative grading principle. The relative grading is applicable to ONLY those students who have passed the examination as per the passing requirements enumerated above (vide clause 14). For those students who have not passed the examination, Reappearance (U) shall be awarded as shown in the below Table 10. For those students who have passed the course, the relative grading shall be done. The marks of those students who have passed only shall be considered for relative grading. The evolved relative grading method normalizes the results data using the BOX-COX transformation method and computes the grade range for each course separately and awards the grade to each student. For a given course, if the students' strength is greater than 30, the relative grading method shall be adopted. However, if the students' strength is less than 30 then the absolute grading shall be followed with the grade range as specified below.

0	A+	А	B+	В	С	RA
91 - 100	81 - 90	71 - 80	61 - 70	56 - 60	50 - 55	< 50

Table : 10 Letter Grades and Range of Ma	arks
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The performance of a student shall be reported using letter grades, each carrying certain points as detailed below :

LETTER GRADE	GRADE POINTS	RESULT
O (Outstanding)	10	
A+ (Excellent)	9	
A (Very Good)	8	DASS
B+ (Good)	7	PASS
B (Average)	6	
C (Satisfactory)	5	

Table : 11 Letter Grades and Grade Points

U (Re-appearance)	0	RA (Re-appearance)
SA (Shortage of Attendance)	0	RC (Repeat Course)
WD (Withdrawal)	0	EA (Extended Appearance)
AB (Absent)	0	RA (Re-appearance)
WH (Withheld)	0	RA (Re-appearance)

- **15.2** For a student who does not meet the minimum passing requirements, the term "RA" against the course will be indicated in his/her grade sheet. He/she shall reappear in the subsequent examinations for the course as arrear or re-register for the course when offered .
- **15.3** For a student who is absent for end-semester theory / practical / project viva-voce, the term "RA" will be indicated against the corresponding course. He/she shall reappear for the End Semester Examination of that course as arrear in the subsequent semester or when offered next. .
- **15.4** The letter grade "W" will be indicated for the courses for which the student has been granted authorized withdrawal (refer Clause 10).
- **15.5** For mandatory courses (non-credit), the student must satisfy the minimum attendance requirement & passing criteria as specified for the course as detailed in clause 9.

16. METHODS FOR REDRESSAL OF GRIEVANCES IN EVALUATION

Students who are not satisfied with the grades awarded in the End Semester Examination of Theory for regular and arrear exams can seek redressal as illustrated in Table 11.

SI.	Podrossal Sought	Methodology			
No.	Redressal Sought		Regular Exam	Arrear Exam	
1.	Revaluation	 Apply for viewing of answer booklet and then apply for revaluation after course expert recommendation 			
2.	Challenge of Evaluation	 Apply for viewing of answer booklet and then apply for revaluation after course expert recommendation. Next apply for challenge of evaluation 			

Table 12 : Grievance Redressal Mechanism

Note : All applications to be made to COE along with the payment of the prescribed fee.

16.1 Challenge of Evaluation – Flow Process

Table 13 : Evaluation – Flow Process

Step 1	A student can make an appeal to the CoE for the review of answer scripts after paying the prescribed fee.				
Step 2	CoE will issue the viewing of answer scripts to the student.				

Step 3	The faculty who had handled the subject will evaluate the script and HoD will recommend.
Step 4	A committee consisting of 2 evaluators appointed by CoE will review and declare the result.
Step 5	If the result is in favour of the student, the fee collected will be refunded to the student.
Step 6	The final mark will be announced by CoE.

16.2 Grading for Mandatory Courses

Mandatory Courses are courses that are required to be completed to fulfill the degree requirements (e.g. Human excellence, Environmental science, etc.). They are normally non – credit based. These courses will not be taken in to consideration for the SGPA / CGPA calculations. Each of these courses is assessed continuously and internally for a total mark of 100. The pass mark is 50%. Students, who fail to pass this course, are required to repeat the course, when offered next.

- **16.2.1** For Mandatory non-credit courses the student must satisfy the minimum attendance requirement & passing criteria as specified for the course. These courses do not carry credits but needs to be completed to fulfill the degree requirements.
- **16.2.2** For the Mandatory non-credit courses student completing the course will be awarded Pass grade (P) and those who fail to satisfy the attendance requirement or fail to satisfy the minimum passing requirement of 50% marks, will be awarded Fail (F) grade and the student must re-register for the course when it is offered next.

16.3 Grade Sheet

After the results are declared, grade sheets will be issued to each student, which will contain the following details :

- The College Name and Affiliating University.
- **t** The list of courses registered during the semester and the grades scored.
- t The Grade Point Average (GPA) for the semester.
- The Cumulative Grade Point Average (CGPA) of all courses registered from first semesteronwards.
- On completion of a semester, each student is assigned a GPA which is computed asbelow for all courses registered for, by the student during that semester.

$$\mathbf{t} \quad \mathsf{GPA} = \frac{\sum (\mathsf{C}_i \times \mathsf{GP}_i)}{\sum \mathsf{C}_i}$$

where C_i is the credit for a course in that semester and GP_i is the Grade Point earned by the student for that course. The **SGPA** is rounded off to two decimals.

The overall performance of a student at any stage of the Degree programme is evaluated by the **CGPA** up to that point of time.

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$$CGPA = \frac{\sum (C_i \times GP_i)}{\sum C_i}$$

where C_i is the credit for each course in each of the completed semesters at that stage and GP_i is the grade point earned by the student for that course. The CGPA is rounded off to two decimals.

16.4 Formula For Calculating Percentage

$CGPA \times 9.5 = \%$ of Marks

17. ELIGIBILITY FOR THE AWARD OF DEGREE

A student shall be declared to be eligible for the award of the M.E.M.Tech. / M.B.A / M.C.A. Degree provided the student has

- i. Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.
- ii. Successfully completed the course requirements, appeared for the End- Semester examinations and passed all the subjects prescribed in clause no.7.
- iii. Successfully passed any additional courses prescribed by the Academic council
- iv. Successfully passed any additional courses prescribed by the Department & concerned whenever readmitted under regulations 2023 (R23)
- v. No disciplinary action pending against the student.
- vi. The award of Degree must have been approved by the Academic Council of KIT.

18. CLASSIFICATION OF M.E. / M.Tech. / M.B.A. / M.C.A. DEGREE

The degree awarded to eligible students will be classified as given in Table 15.

Table 14 : Classification of the M.E. / M.Tech. / M.B.A. / M.C.A. Degree

SI.No.	Class Awarded	Criteria	
1.	First class with distinction	A student who satisfies the following conditions shall be declared to have passed the examination in First class with Distinction :	
		M.E. / M.B.A. / M.C.A	
		■ Should have passed the examination in all the courses of all	
		the four semesters in the student's First Appearance within	
		three years, which includes authorised break of study of one	
		year (if availed). Withdrawal from examination will not be	
		considered as an appearance.	
		t Should have secured a CGPA of not less than 8.50.	
		t Should NOT have been prevented from writing end Semester	
		examination due to lack of attendance in any of the courses.	

2.	First Class	A student who satisfies the following conditions shall be declared		
		to have passed the examination in First class:		
		M.E. / M.B.A. / M.C.A		
		★ Should have passed the examination in all the courses of		
		all four semesters within three years, which includes one		
		year of authorized break of study (if availed) or prevention		
		from writing the End Semester Examination due to lack of		
		attendance (if applicable).		
		t Should have secured a CGPA of not less than 6.50.		
3.	Second Class	All other students (not covered in clauses SI.No. 1 and 2 under		
		clause 19) who qualify for the award of the degree (vide Clause		
		20) shall be declared to have passed the examination in Second		
		Class.		

Note : A student who is absent for the End Semester Examination in a course / project work Viva Voce after having registered for the same will be considered to have appeared for that examination (except approved withdrawal from End Semester Examinations as per Clause 9) for the purpose of classification.

19. PROVISION FOR WITHDRAWAL FROM EXAMINATION

- **19.1** A student may, for valid reasons, (medically unfit/ unexpected family situations/ sports approved by the Chairman) be granted permission to withdraw from appearing for the ESE in any Course or Courses in ANY ONE of the Semester examinations during the entire duration of the Degree Programme. The application shall be sent to the Principal and Chairman through HoD with required documents for approval.
- **19.2** Withdrawal application shall be valid only if the student is eligible to write the Examination (Clause 7) and if it is made within TEN working days before the commencement of the ESE in that Course or Courses and also recommended by the HoD.
- **19.3** Notwithstanding the requirement of mandatory TEN working days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.
- **19.4** If a student applies for withdrawal from Project Work, he/she will be permitted for the withdrawal only after the submission of project report before the deadline. However, the student may appear for the viva voce examination within 30/60 days after the declaration of results for Project Work and the same shall not be considered as reappearance.
- **19.5** Withdrawal shall not be considered as an appearance for deciding the eligibility of a student for First Class with Distinction.
- **19.6** Withdrawal is permitted for the ESE in the final semester as per Clause 7.1.

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20. BREAK OF STUDY FROM A PROGRAMME

- **20.1** A student is permitted to go on break of study for a single break of one year only.
- **20.2** The student can apply for break of study in advance, in any case, not later than the last date of the first assessment period. The application duly filled by the student shall be submitted through the HoD with the approval of the Principal.
- **20.3** The students permitted to rejoin the Programme after break of study / readmission due to lack of attendance, shall be governed by the curriculum and Regulations in force at the time of rejoining. The students rejoining in new regulations shall apply in the prescribed format through HoD at the beginning of the readmitted semester itself for prescribing additional/equivalent courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.
- **20.4** The total period for completion of the programme reckoned from, the commencement of the first semester to which the student was admitted shall not exceed the maximum period specified in Clause 6 irrespective of the period of break of study in order that the student may be eligible for the award of the Degree (vide Clause 16).
- **20.5** In case there is any period of break of study more than the permitted duration of break of study, the student shall be permitted to continue the Programme only if the approval is obtained from the Director of Technical Education / University through the concerned HoD / Principal before the end of the Semester in which the student has taken break of study.
- **20.6** If a student has not reported to the department for a period of two consecutive Semesters without any intimation, the name of the student shall be deleted permanently from the college enrollment.
- **20.7** During the break of study period, the students shall pay the prescribed tuition fees failing which the name of the student shall be deleted permanently from the enrollment. Such students are not entitled to seek readmission under any circumstances.

21. PROCEDURE FOR USING SCRIBE

If a candidate is physically handicapped (in case of accidents / ill health) at the time of examination, he/she may be permitted to use a scribe to write the examination. The compensatory (additional) time should be half hour for three hour duration of examination. The Scribe shall be a non-engineering student / graduate.

22. FACULTY MENTOR

To help the students in palnning their courses of study and for general advice on the academic matters, the HoD will attach a certain number of students (maximum 25) to a faculty member of the department. He/She shall function as Faculty Mentor for these students throughout their period of study. The faculty mentor shall,

- **t** Advice the students in registering and reappearance registering of courses
- t Monitor their attendance, academic progress and discipline of the students
- **t** Counsel periodically or during the faculty mentor meeting scheduled in the class time table.

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- Inform the students about the various facilities and activities available to enhance the student's curricular and co-curricular activities
- If necessary, the faculty mentor may also discuss with or inform the parents about the progress of the students through HoD or in Parent-Teacher meeting.

23. CLASS COMMITTEE

The objective of the Class Committee is to improve the teaching-learning process. The functions of the class committee include :

- **t** Resolving difficulties experienced by students in the classroom and in the laboratories.
- t Clarifying the regulations of the degree programme and the details of rules therein.
- **t** Discussing the progress of academic schedule and deviations if any.
- Evaluating the performance of the students of the class after each test and finding the ways and means of improvement.
- Every class in first year of study shall have a class committee consisting of faculty members who are teaching in that class, student representatives
- Cross section of students from boys and girls and a chairperson who is a faculty not handling the course for the class.

From III semester onwards, Class committee comprises of all the faculty members who are handling courses in that particular semester and two student representatives from each course. A chairperson who is a faculty not handling course for that particular semester, nominated by the HoD shall coordinate the activities of this committee.

- The class committee shall be constituted by the HoD/Chief mentor on the first week of commencement of the semester.
- The class committee shall meet three times in a semester as specified in the academic calendar.
- The Principal may participate in any class committee meeting of the institution
- During these meetings, the representative of the class shall meaningfully interact and express the opinions and suggestions of the other students of the class to improve the effectiveness of the teaching-learning process.
- t The Chairperson is required to prepare the minutes of the meeting, signed by the members and submit the same to HoD within five working days of the meeting. HoD will in turn consolidate and forward the same to the Principal, within five working days of the meeting.
- In each meeting, the action taken report of the previous meeting is to be presented by the Chairperson of the class committee.

24. COMMON COURSE COMMITTEE

t A theory course handled by more than one teacher shall have a "Common Course Committee" comprising of all teachers teaching that course and few students who have registered for thatcourse. There shall be two student representatives from each batch of that course. One of the teachers shall be nominated as Course Coordinator by the HOD concerned and duly approvedby the Principal.

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- The first meeting of the Common Course Committee shall be held within fifteen days from the date of commencement of the semester. The nature and weightage of the continuous assessments shall be decided in the first meeting, within the framework of the Regulations. Two or three subsequent meetings in a semester may be held at suitable intervals. During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to the whole batch.
- t In addition, the "Common Course Committee" (without the student representatives) shall meet to ensure uniform evaluation of continuous assessments after arriving at a common scheme of evaluation for the assessments.
- Wherever feasible, the common course committee (without the student representatives) shall also prepare a common question paper for the CIA tests. The question paper for the ESE is common and shall be set by the Course Coordinator in consultation with all the teachers or theexternal member as appointed by the CoE.

25. DETAILS OF FACULTY PEDAGOGICAL AND STUDENT ASSESSMENT RECORD

Every teacher is required to maintain a Faculty Record Book/ course file consisting of the following details as shown below ;

- t Time-table, course syllabus, program outcomes, course outcomes.
- t Details of attendance of each student marked in each theory/practical/project work class.
- ★ CIA marks, Details of Assignment/ seminar given, course delivery details, corrective and preventive actions on test performance of students and any other additional details.

The record book should be submitted to the HoD periodically (at least three times in a semester) for checking the syllabus covered, the test marks and attendance. The HoD shall put his/her signature and date in the record book after due verification. At the end of the semester, the record book shall be verified by the Principal who will also ensure safe custody of the document for at least four years. The university or any inspection team appointed by the University/UGC/AICTE may verify the records of attendance.

26. DISCIPLINE

Every student is required to maintain discipline and decorum both inside and outside the institution campus. They shall follow all the rules and regulations and should not indulge in any activity which can tarnish the reputation of the Institution. The Principal shall refer any act of indiscipline by students to the Discipline and Welfare Committee and other appropriate committees for action.

27. SPECIAL CASES

In the event of any clarification in the interpretation of the above rules and relations, they shall be referred to the Standing Committee. The standing committee will offer suitable interpretations/ clarifications/amendments required for special case on such references and get them ratified in the next meeting of the Academic Council. The decision of the Academic Council is final.

ANNEXURE - I

COURSE NUMBERING SCHEME

М	1	9	М	Е	Т	7	0	9	
Programme	Reg	ulation	Departm	ent Code	Course Type	Semester Sequence Num		e Number	
Programme :		**			Course Type	Course Type			
Masters Degre	e (M.E	./M. I ech) - IVI		I - Theory	I - Theory			
Regulation :					P - Practical /	Project/ Intel	rnsnip		
R – 19					E - Elective				
					O - Open Ele	ctive			
Department C	ode				C - One Cred	C - One Credit Courses			
AE - Applied E	lectron	ics			N - Online co	N - Online courses			
CS - Computer	Scien	ce and E	ngineering	I	S - Special E	S - Special Electives			
ED - Engineeri	ng Des	sign							
PS - Power Sys	stem E	ngineerir	ng	EYC	Semester				
VD - VLSI Des	ign		- Z.	5	1 - First Semester				
CA - Computer Application						2 - Second	Semester		
MB - Management Studies					3 - Third Semester				
EN - English					4 - Fourth Semester				
MA - Mathematics									
CE - Career Enhancement					Sequence Number				
MC - Mandatory Course					00-99				
<u> </u>									

ANNEXURE - II

POLICY ON MALPRACTICES

GENERAL

- t It shall be the endeavour of all concerned to prevent, control and take remedial action to bring about the occurrences of malpractices to "Zero" in Examinations (both Internal and External), Assignments and in all Academic class works.
- Therefore, a comprehensive approach to the malady of malpractices has to be adopted to create a mindset of integrity and honesty, and at the same time take sufficiently stern action to make it clear that such attempts are fraught with comparably very high risk.
- t In keeping with this stance, the following measures are to be taken by all concerned from class room level to the Examination Halls :

A. PREVENTION

a. Class room level :

All faculty members are to involve themselves in a psychological growth of students by personal example and self-respect and strive towards.

- Developing a sense of honour in the minds of students so that they look down upon earning undeserved marks.
- Imbibing a sense of self-respect and internal dignity that prevents him/her from succumbing to the temptation of easy marks by cheating.
- t Generating an awareness of the risks to their character and career if convicted, while also explaining the process and strict rules and regulations adopted by the educational system to prevent malpractices.
- Taking stern view of copied assignments and attempts at malpractices in internal examinations also merits equal seriousness as semester examinations.
- Setting sufficiently strong deterrent rules in place and regulations like intimation to parents and warning to students in the presence of parents etc. even in case of efforts at malpractices in internal tests and/or repeated acts despite warnings in case ofassignments also.

Examination Halls

Detailed instructions on Invigilation, question paper setting and evaluation and such other instructions will be issued for Invigilation, vigilance, which are to be brought to the notice of allstudents prior to the examinations.

B. PENAL ACTION FOR MALPRACTICES

All instances of malpractices will be forwarded to the Principal/ Chief Superintendents. The offences will be investigated by a Standing Enquiry Committee constituted by Principal, The committee is to summon and give the student an opportunity to present / plead his/her case. The Committee may also summon anybody else, if it so deems necessary for the conduct of enquiry, in the interest of proper investigation and dispensation of the case. The tenure of the committee would be a complete Academic year.

The Committee is to be guided by the following :

- The seriousness of the malpractice, in terms of deviousness, and culpability/ criminality of motive.
- The seriousness in terms of effort and degree of deviousness and culpability / criminality of effort.
- Any FIR/ Police case that has been registered in the first instance by the Principal/ Chief Superintendent.
- **t** Any other special consideration either mitigating or to the contrary.

C. PENALTY FOR OFFENSES

The penalties awarded will depend on the seriousness of the offence. A list of offences and penalties are placed at Annexure III.

The enquiry report with findings and recommendations of the committee are to be forwarded to the Controller who will undertake necessary follow up action. Based on the recommendations of the CoE, the Principal is empowered to award penalties for offences classified as belonging to categories 1 to 7 of the offence table. The cases falling in categories from S.No. 8 onwards are to be put up to the Principal for consideration and award of suitable penalty.

ANNEXURE - III

SI.No.	Nature of Malpractice	Maximum Punishment	
1.	Appeal by the candidate in the answer script to show mercy by way of awarding more than deserving marks.		
2.	The candidate writing his/her name in the answer script.		
3.	The candidate writing his/her registration number / college name in places other than specified in the answer script		
4.	Any special marking in the answer script by the candidate.	Fine of Rs. 1000/- per subject.	
5.	The candidate communicating with neighbouring candidate orally or non- verbally; the candidate causing suspicious movement of his/her body.	Dets	
6.	Irrelevant writing by the candidate in the answer script.	RE	
7.	The candidate writing answer on his/her question paper or making use of his/her question paper for rough work.		
8.	The candidate possessing cell phones/ programmable calculator(s)/any other electronic storage device(s) gadgets	Invalidating the examination of the particular subject written by the candidate.	
9.	The candidate possessing any incriminating material(s) (whether used or not). For example:- Written or printed materials, bits of papers containing written information, writings on scale, calculator, handkerchief, dress, part of the body, Hall Ticket, etc.	Invalidating the examination of the subject concerned and all the theory and the practical subjects of the current semester registered by the candidate. Further the candidate is not considered for revaluation of answer scripts of the arrears- subjects. If the candidate has registered for arrears – subjects only, invalidating the examinations of all the arrears – subjects registered by the candidate.	
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10.	The candidate possessing cell phone(s)/ programmable calculator(s)/any other electronic storage device(s) gadgets and containing incriminating materials (whether used or not).	Invalidating the examination of the subject concerned and all the theory and the practical subjects of the current semester registered by the candidate.
11.	The Candidate possessing the question paper of another candidate with additional writing on it.	revaluation of answer scripts of the arrears- subjects.
12.	The candidate passing his/her question paper to another candidate with additional writing on it.	subjects only, invalidating the examinations of all the arrears – subjects registered by the candidate.
13.	The candidate passing incriminating materials brought into the examination hall in any medium (hard/soft) to other candidate(s).	
14.	The candidate copying from neighbouring candidate.	
15.	The candidate taking out of the examination hall answer booklet(s), used or unused.	DET
16.	Appeal by the candidate in the answer script coupled with a promise of any form of consideration.	
17.	Candidate destroying evidence relating to an alleged irregularity.	 Invalidating the examinations of the subject concerned and all the theory and the practical subjects of the current semester registered by the candidate. Further the candidate is not considered for revaluation of answer scripts of the arrears-subjects. If the candidate has registered for arrears – subjects only, invalidating the examinations of all the arrears – subjects registered by the candidate. Additional Punishment : i. If the candidate has not completed the programme, he/she is debarred from continuing his/her studies for one year i.e., for two subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects during the debarred period. ii. If the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears-subjects for two subsequent semesters.

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18.	Vulgar / offensive writings by the candidate in the answer script.	Invalidating the examinations of all the theory and practical subjects of the current semester
19.	The candidate possessing the answer script of another candidate.	and all the arrears –subjects registered by the candidate.
20.	The candidate passing his /her answer script to another candidate.	
21.	Involved in any one or more of the malpractices of serial no. 8 to 21 for the second or subsequent times.	Invalidating the examinations of all the theory and practical courses of the current semester and all the arrears- courses registered by the
22.	The candidate substituting an answer sheets prepared outside the examination hall for the one already distributed to the candidate.	 candidate. Additional Punishment : If the candidate has not completed the programme, he/she is debarred from continuing his/her studies for one year i.e., for two subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects during the debarred period. If the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears - subjects for two subsequent semesters.
23.	The candidate indulge in any disruptive conduct including, but not limited to, shouting, assault of invigilator, officials or students using abusive and /or threatening language, destruction of property.	Invalidating the examinations of all the theory and practical courses of the current semester and all the arrears- courses registered by the candidate. Additional Punishment :
24.	The candidate harass or engage others to harass on his/her behalf an invigilator, official, witnesses or any other person in relation to an irregularity by making telephone calls, visits, mails or by any other means.	 If the candidate has not completed the programme, he/she is debarred from continuing his/her studies for two years i.e., for four subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects
25.	Candidate possessing any firearm / weapon inside the examination hall.	 during the debarred period. ii. If the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears - courses for four subsequent semesters.

26.	Cases of Impersonation	i. Handing over the impersonator to the police
		with a complaint to take appropriate action
		against the person involved in the
		impersonation by the Chief Supt.
		If a student is found to impersonate a 'bonafide
		student', the impersonating student is
		debarred from continuing his/ her studies and
		writing the examinations permanently. He/ she
		is not eligible for any further admission to any
		programme.
		Debarring the 'bonafide student' for whom the
		impersonation was done from continuing
		his/her studies and writing the examinations
	BEION	permanently. He/she is not eligible for any
		further admission to any programme.

APPENDIX IV

Process to Consider the Application for Revocation of Detainment

The process to consider the application for revocation of detainment on account of lack of attendance in 3 or more courses, due to genuine reasons (viz. sports participation, NCC, Medical Grounds etc.) is as follows :

The student submits an application for consideration via a request letter to the CoE,not later than 3 days from the last working day, along with the HoD's recommendation, Class Advisor's report and Mentor's recommendation. A committee consisting of the Principal, CoE, HoD (Respective Department) and HoD's-2 from departments other than the student's own. The committee shall meet within 4 working days,to consider the case. Stakeholders may be called to be present in the meeting as may be required, and Decision arrived at. The decision approved by Principal shall be final.

APPENDIX IV

Academic Evaluation Committee (AEC)

The committee includes the Principal, CoE, HoD concerned. The committee meets to carry out business related to academic matters which require central decision making and approval viz. retest approval of missed CIA, addressing the feedback collected from the various departments' class committee meetings.

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Department Evaluation Committee (DEC)

The committee includes HoD (need basis), and a few faculty members of the department from various levels. The committee meets to carry out business related to academic matters that can be addressed within the department viz. course equivalence of common courses for readmitted students; approval of new courses to be offered by the department; consider and approve the credit equivalence of courses offered by industry, review the course offerings; consider the merit of applications involving lack of attendance in PE/OE courses to take up another PE or OE; approve CIAM only courses every semester; approve scheme of assessment for each course; Approval for and Mapping credits of certification courses; approval of list of nationally or internationally recognized professional certification courses with prometric testing.



Curriculum

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Conceptual Frame work (For Students admitted from the Academic Year 2023-24 and onwards)											
Conceptual Frame work (For Students admitted from the Academic Year 2023-24 and onwards)											
Semester Level of Course Hrs. / No of Range of Week Courses Courses	Total Credits										
PART – I											
A – Foundation Courses											
I-III Foundation Courses (FC) 4 1 4	4										
B – Professional Core Courses											
I to III Professional Core (PC) 3 20 2 - 3	52										
C – Elective Courses											
I to III Professional Elective (PE) 3 3 3	9										
D – Project Work											
III & IV Project Work (PW) 3 - 24 2 2 - 12	14										
Total Credit	79										
PART – II COIMBATORE											
F- Career Enhancement Courses (CEC)											
I Communication SkillsEnhancement - I 3 1 2	2										
II Communication SkillsEnhancement - II 3 1 2	2										
IV MOOC Course 2 1 1	1										
Total Credit	5										
Total Credit to be Earned											



Curriculum and Scheme of Assessment

(For Students admitted from the Academic Year 2023-24 and onwards)

Semester - I										
Course	Course Name	CT	I	nstruc	tional	Hour	s	Assessment		
Code	Course Name	CI	СР	L	т	Ρ	С	CIA	ESE	Total
Theory / Theory with Practical										
M23MAT104	Mathematical Foundations for Computer Applications	FC	4	3	1	0	4	40	60	100
M23CAT101	Problem Solving and Python Programming	PC	3	3	0	0	3	40	60	100
M23CAT102	Web Development Technologies	PC	3	3	0	0	3	40	60	100
M23CAT103	Advanced Data Structures and Algorithms	PC	3	3	0	0	3	40	60	100
M23CAT104	Software Engineering	PC	3	3	0	0	3	40	60	100
Practical					0					
M23CAP101	Python Programming Laboratory	РС	4	0	0	4	2	60	40	100
M23CAP102	Web Development Laboratory COIME	РС	4	0	0	4	2	60	40	100
M23CAP103	Advanced Data Structures Laboratory	PC	4	0	0	4	2	60	40	100
M23CAP104	Communication Skills Enhancement - I	CEC	3	1	0	2	2	60	40	100
Total credits to be earned										



Semester - II											
Course	Course Name	CT	I	nstruc	tional	Hour	s	Assessment		ient	
Code	Course Name	CI	СР	L	т	Р	С	CIA	ESE	Total	
Theory / Theo	bry with Practical				•						
M23CAT201	Database Management Systems	PC	3	3	0	0	3	40	60	100	
M23CAT202	Programming with Java	PC	3	3	0	0	3	40	60	100	
M23CAT203	Computer Networks	PC	3	3	0	0	3	40	60	100	
M23CAT204	Artificial Intelligence	PC	3	3	0	0	3	40	60	100	
	Professional Elective - I	PE	3	3	0	0	3	40	60	100	
Practical											
M23CAP201	Database Management Systems Laboratory	PC	4	0	0	4	2	60	40	100	
M23CAP202	Java Laboratory	РС	4	0	0	4	2	60	40	100	
M23CAP203	Open Laboratory	PC	4	0	0	4	2	60	40	100	
M23CAP204	Communication Skills Enhancement - II	CEC	3	1	0	2	2	60	40	100	
	Total credits to be earned	k					23				
	The second secon										



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Semester - III												
Course		OT	I	nstruc	tional	Hour	s	As	sessn	nent		
Code	Course Name		СР	L	т	Ρ	С	CIA	ESE	Total		
Theory / Theo	bry with Practical											
M23CAT301	Machine Learning	РС	3	3	0	0	3	40	60	100		
M23CAT302	Internet of Things	PC	3	3	0	0	3	40	60	100		
M23CAT303	Mobile Application Development	PC	3	3	0	0	3	40	60	100		
M23CAT304	Cyber Security and Digital Forensics	PC	3	3	0	0	3	40	60	100		
	Professional Elective - II	PE	3	3	0	0	3	40	60	100		
	Professional Elective - III	PE	3	3	0	0	3	40	60	100		
Practical			7									
M23CAP301	Mobile Application Development Laboratory	PC	4	0	0	4	2	60	40	100		
M23CAP302	Technical Seminar and Report Writing Laboratory	PC	4	0	0	4	2	60	40	100		
M23CAP303	Mini Project	PW	4	0	0	4	2	40	60	100		
	Total credits to be earned	b					24					
	Semes	ster - N	/		2							
Course	Course Name	СТ	l	nstruc	tional	Hour	s	As	sessm	nent		
Code			СР	L	т	Ρ	С	CIA	ESE	Total		
Practical												
M23CAP401	Project Work	PW	24	0	0	24	12	40	60	100		
M23CAP402	MOOC Course (NPTEL/Online Courses minimum 4 weeks)	CEC	2	0	0	2	1	-	-	-		
Total credits to be earned												



Foundation Courses (FC)												
Course		CT.	l	nstruc	tional	Hour	s	Assessment				
Code	Course Name	CI	СР	L	т	Р	С	CIA	ESE	Total		
M23MAT10/	Mathematical Foundations for	FC	1	3	0	1	4	40	60	100		
WZJWAT TO-	Computer Applications	10	7	5	U	1	-	40	00	100		
	Professiona	al Cor	e (PC)									
Course		OT	l	nstruc	tional	Hour	s	As	sessn	nent		
Code	Course Name	CI	СР	L	Т	Ρ	С	CIA	ESE	Total		
M23CAT101	Problem Solving and Python Programming	PC	3	3	0	0	3	40	60	100		
M23CAT102	Web Development Technologies	PC	3	3	0	0	3	40	60	100		
M23CAT103	Advanced Data Structures and Algorithms	PC	3	3	0	0	3	40	60	100		
M23CAT104	Software Engineering	PC	3	3	0	0	3	40	60	100		
M23CAP101	Python Programming Laboratory	PC	4	0	0	4	2	60	40	100		
M23CAP102	Web Development Laboratory	PC	4	0	0	4	2	60	40	100		
M23CAP103	Advanced Data Structures Laboratory	PC	4	0	0	4	2	60	40	100		
M23CAT201	Database Management Systems	PC	3	3	0	0	3	40	60	100		
M23CAT202	Programming with Java	PC	3	3	0	0	3	40	60	100		
M23CAT203	Computer Networks	PC	3	3	0	0	3	40	60	100		
M23CAT204	Artificial Intelligence COIME	PC	3	3	0	0	3	40	60	100		
M23CAP201	Database Management Systems Laboratory	PC	4	0	0	4	2	60	40	100		
M23CAP202	Java Laboratory	PC	4	0	0	4	2	60	40	100		
M23CAP203	Open Laboratory	PC	4	0	0	4	2	60	40	100		
M23CAT301	Machine Learning	PC	3	3	0	0	3	40	60	100		
M23CAT302	Internet of Things	PC	3	3	0	0	3	40	60	100		
M23CAT303	Mobile Application Development	PC	3	3	0	0	3	40	60	100		
M23CAT304	Cyber Security and Digital Forensics	PC	3	3	0	0	3	40	60	100		
M23CAP301	Mobile Application Development Laboratory	PC	4	0	0	4	2	60	40	100		
M23CAP302	Technical Seminar and Report Writing Laboratory	PC	4	0	0	4	2	60	40	100		



	PROFESSIONAL ELECTIVE (PE)										
SEMESTER – II											
PROFESSIONAL ELECTIVE – I											
Course Course Name CT Instructional Hours Assess						sessn	nent				
Code	Course Name	G	СР	L	Т	Ρ	С	CIA	ESE	Total	
M23CAE201	Soft Computing	PE	3	3	0	0	3	40	60	100	
M23CAE202	Software Project Management	PE	3	3	0	0	3	40	60	100	
M23CAE203	Security in Computing	PE	3	3	0	0	3	40	60	100	
M23CAE204	Game Programming	PE	3	3	0	0	3	40	60	100	

SEMESTER – III										
PROFESSIONAL ELECTIVE – II										
Course	ĊŢ	I	nstruc	tional	Hour	s	As	ssessment		
Code	le Course Name C1	СР	L	т	Ρ	С	CIA	ESE	Total	
M23CAE301	Cryptocurrency and Blockchain Technologies	PE	3	3	0	0	3	40	60	100
M23CAE302	Cloud Computing	PE	3	3	0	0	3	40	60	100
M23CAE303	Human Resource Management	PE	3	3	0	0	3	40	60	100
M23CAE304	Digital Image Processing COIMB	PE	3	3	0	0	3	40	60	100

	SEMESTER – III											
PROFESSIONAL ELECTIVE – III												
Course	Course Name	ст	I	nstruc	tional	Hour	s	As	sessn	nent		
Code	Course Name	CI	СР	L	т	Ρ	С	CIA	ESE	Total		
M23CAE305	Data Mining and Data Warehousing Techniques	PE	3	3	0	0	3	40	60	100		
M23CAE306	Professional Ethics	PE	3	3	0	0	3	40	60	100		
M23CAE307	Big Data Analytics	PE	3	3	0	0	3	40	60	100		
M23CAE308	Software Quality and Testing	PE	3	3	0	0	3	40	60	100		



PROJECT WORK (PW)										
Course Code	Course Name	CT	Instructional Hours Assessment							
			СР	L	т	Р	С	CIA	ESE	Total
M23CAP303	Mini Project	PW	4	0	0	4	2	40	60	100
M23CAP401	Project Work	PW	24	0	0	24	12	40	60	100

CAREER ENHANCEMENT COURSE (CEC)										
Course	Course Course Name CT	CT	Instructional Hours				Assessment			
Code		СР	L	т	Р	С	CIA	ESE	Total	
M23CAP104	Communication Skills Enhancement - I	CEC	3	1	0	2	2	60	40	100
M23CAP204	Communication Skills Enhancement - II	CEC	3		0	2	2	60	40	100
M23CAP402	MOOC Course (NPTEL / Online Courses minimum 4 weeks)	CEC	2	0	0	2	1	-	-	-



Syllabus

Semester – I

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M.C	.A M230	AT101 – PROBLEM SOLVING AND PYTHON PROGRAMMING	T 3	P 0	TU 0	C 3
Course Objectives						
1.	To develop Python programs with conditionals, loops and functions.					
2.	To use Python data structures - lists, tuples, dictionaries.					
3.	To do input/output with files in Python					
4.	To use modules, packages and frameworks in python					
5.	To define a class with attributes and methods in python					

UNIT - I	ALGORITHMIC PROBLEM SOLVING	9
Algorithms, b	uilding blocks of algorithms - algorithmic problem solving - simple strategies for dev	eloping
algorithms - (Graphical authoring tool RAPTOR - Illustrative problems : find minimum in a list - i	nsert a
card in a list of	of sorted cards - guess an integer number in a range - Towers of Hanoi using MIT s	cratch.

UNIT -	II
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BASICS OF PYTHON

Introduction to Python Programming - Variables and Identifiers – Arithmetic Operators – Values and Types – Statements - Operators - Operator Precedence – Expression – Conditionals : If - Else Constructs – Loop Structures / Iterative Statements – While Loop – For Loop – Break Statement - Continue statement – Function Call and Returning Values – Parameter Passing – Local and Global Scope – Recursive Functions.

UNIT - III

LISTS, TUPLES, DICTIONARIES

Lists : list operations - list slices - list methods - list loop - mutability - aliasing, cloning lists, list parameters; Tuples : tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension;

UNIT - IV

FILE HANDLING AND EXCEPTION HANDLING

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Files: Introduction – File Path – Opening and Closing Files – Reading and Writing Files – File Position – Exception : Errors and Exceptions, Exception Handling, Multiple Exceptions



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UNIT - V

MODULES, PACKAGES AND FRAMEWORKS

Modules: Introduction – Module Loading and Execution – Packages – Making Your Own Module – Tkinter, NUMPY, Matplotlib, - Frameworks - Django, Flask

Total Instructional hours : 45

	Course Outcomes : Students will be able to					
CO1	Outline algorithmic solutions to simple computational problems					
CO2	Experiment with compound data using Python lists, tuples and dictionaries.					
CO3	Relate data from/to files in Python Programs.					
CO4	Build simple Python programs using libraries, modules etc.					
CO5	Develop program by bundling related properties and behaviors into individual objects.					

	Reference Books					
1.	John V Guttag, "Introduction to Computation and Programming Using Python", Third Edition, MIT Press, 2021					
2.	Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, 2019					
3.	Allen B. Downey, "Think Python : How to Think Like a Computer Scientist", Second Edition, Shroff, O'Reilly Publishers, 2016					
4.	Sofía De Jesús, Dayrene Martinez, "Applied Computational Thinking with Python", Packt Publishing, 2020					
5.	Muhammad Asif, "Python for Geeks", Packt Publishing, 2021					



						cationy			
М	C A		Т	Р	TU	С			
W.O.A		W23CATTUZ - WEB DEVELOFMENT TECHNOLOGIES	3	0	0	3			
Course Objectives									
1.	1. To understand the concepts and architecture of the World Wide Web.								
2.	To apply and practice markup languages.								
3.	To de	velop dynamic scripting on client-side Internet Programming.							
4.	То ар	ply and practice web development techniques on server-side.							
5.	5. To Implement basic PHP syntax to perform common tasks and Embed within HTML to display dynamic data.								
UNIT - I INTRODUCTION TO WWW 9						9			
Intern Proto	et Stan col - Ov	dards – Introduction to WWW – WWW Architecture – SMT erview of HTTP, HTTP request – response – Generation of dy	FP - P ynamic	OP3 – web pa	File Tra ges.	ansfer			
UNI	T - II	UI DESIGN				9			
Markup Language (HTML5) : Basics of Html - Syntax and tags of Html - Introduction to HTML5 - Semantic / Structural Elements - HTML5 style Guide and Coding Convention – Html Svg and Canvas – Html API"s - Audio & Video - Drag / Drop - Local Storage - Web socket API – Debugging and validating Html. Cascading Style Sheet (CSS3) : The need for CSS – Basic syntax and structure Inline Styles – Embedding Style Sheets - Linking External Style Sheets - Introduction to CSS3 – Backgrounds - Manipulating text - Margins and Padding - Positioning using CSS - Responsive Web Design - Introduction to LESS / SASS									
UNI	T - III	JAVASCRIPT				9			
Introd	luction -	Data types and Variables - Operators, Expressions, and Sta	tement	s Funct	ions - O	bjects			

Introduction to jQuery – Introduction to AJAX - Bootstrap - Bootstrap components.

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- Array, Date and Math Related Objects - Document Object Model - Event Handling - Controlling Windows & Frames and Documents - Form validations- Introduction to JSON – JSON Structure –

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UNIT - IV	ANGULAR JS AND REACT JS	9
Angular JS: I	ntroduction – Environmental setup – Expressions – Modules – Directives – Models	_
Controllers –	Filters – Scopes – Tables – Select – DOM – Events – Forms – AJAX – Validation -	- API –
Animations.		
Controllers – Animations.	Filters – Scopes –Tables – Select – DOM – Events – Forms – AJAX – Validation -	- API –

React JS : Introduction – architecture – render HTML – JSX – Components – Class – Props – events – Conditionals – Lists – Forms – Styling.

NIT - V	PHP	9				
Introduction - How web works - Setting up the environment (LAMP server) - Programming basics						
Print/echo - Variables and constants – Strings and Arrays – Operators, Control structures and looping						
structures – Functions – Reading Data in Web Pages - Embedding PHP within HTML - Establishing						
connectivity with MySQL database.						

Total Instructional hours : 45

	Course Outcomes : Students will be able to					
CO1	Create a basic website using HTML and Cascading Style Sheets.					
CO2	Design and implement dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms.					
CO3	Design rich client presentation using JavaScript and AJAX.					
CO4	Design and implement simple web page by using AngularJS and ReactJS.					
CO5	Design front end web page and connect to the back end databases.					



Reference Books						
1.	Er. Meera Goyal, Er. Nishit Mathur, "Internet & World Wide Web", SBPD Publications, 2020					
2.	Mike McGrath, "HTML, CSS & JavaScript in easy steps", In Easy Steps Limited, 2020					
3.	David Flanagan, "JavaScript: The Definitive Guide: Master the World's Most-Used Programming Language", O'Reilly Media, 2020.					
4.	Giovanni c.Gentry, "Ajax: The Complete Reference", CreateSpace Independent Publishing Platform, 2017.					
5.	"Angular : Up & Running : Learning Angular Step by Step"/ Shyam Seshadri, O'Reiley publishers, 2018.					
6.	"React.js Book: Learning React JavaScript Library From Scratch", River Tigris LLC; 3 rd edition ,2017.					
7.	Jon Duckett, "PHP & MySQL: Server-side Web Development", Wiley, 2022.					

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M.C.A	M23CAT103 – ADVANCED DATA STRUCTURES	т	Ρ	TU	С
	AND ALGORITHMS	3	0	0	3

	Course Objectives		
1.	To understand the usage of algorithms in computing.		
2.	To learn and use hierarchical data structures and its operations.		
3.	To learn the usage of graphs and its applications.		
4.	To apply and design data structures and algorithms that is appropriate for problems.		
5.	To study about NP Completeness of problems and analyze its efficiency.		

UN	IT -	- 1
UNI		

ALGORITHM ANALYSIS AND DATA STRUCTURES

Algorithm Analysis – Time and Space complexity of algorithms - Asymptotic Notations - Importance of efficient algorithms - Linear Data structures - Introduction - Abstract Data Types (ADT) – Stack – Queue – Evaluating Arithmetic Expressions - Linked Lists and its types – Applications of Stack, Queue and Linked list – Polynomial Manipulation.

UNIT - II

UNIT - III

HIERARCHICAL DATA STRUCTURES

GRAPHS

Binary Tree – expression trees – Binary tree traversals – applications of trees – Huffman Algorithm -Binary search tree - Balanced Trees - AVL Tree - B-Tree - Splay Trees – Heap - Heap operations -Binomial Heaps - Fibonacci Heaps - Hash set.

Representation of graph - Graph Traversals - Depth - first and breadth - first traversal - Applications of graphs - Topological sort – shortest - path algorithms - Dijkstra"s algorithm – Bellman - Ford algorithm – Floyd's Algorithm - minimum spanning tree – Prim's and Kruskal's algorithms.

UNIT - IV

ALGORITHM DESIGN TECHNIQUES

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Divide and Conquer – Merge Sort – Quick Sort - Binary Search - Greedy Algorithms – Knapsack Problem – Dynamic Programming – Optimal Binary Search Tree - Warshall's Algorithm for Finding Transitive Closure.



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UNIT - V

ADVANCED ALGORITHM DESIGN AND ANALYSIS

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Backtracking – N-Queen's Problem - Branch and Bound – Assignment Problem - P & NP problems – NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman problem - Amortized Analysis.

Total Instructional hours : 45

	Course Outcomes : Students will be able to
CO1	Understand to compute time and space complexity of algorithms and to learn about linear Data Structures.
CO2	Understand the characteristics and applications of non-linear data structure Trees and its types.
CO3	Apply Graph Data structure and algorithm techniques to effectively solve real-world problems.
CO4	Understand various algorithm design techniques and their applications.
CO5	Apply advanced algorithms techniques to solve complex problems.

	Reference Books		
1.	Sandeep Sen, Amit Kumar, "Design and Analysis of Algorithms", Cambridge University Press, 2019		
2.	Anany Levitin "Introduction to the Design and Analysis of Algorithms" Pearson Education, 2015		
3.	Sachi Nandan Mohanty, Pabitra Kumar Tripathy, "Data Structure and Algorithms Using C++", Wiley, 2021.		
4.	T.H. Cormen, C.E. Leiserson, R.L. Rivest and C.Stein, & quot; Introduction to Algorithms & quot; Prentice Hall of India, 4 th Edition, 2022.		
5.	Amol M. Jagtap, Ajit S. Mali, "Data Structures Using C", CRC Press, 2021.		
6.	Tanaenbaum A.S., Langram Y. Augestein M.J, "Data Structures using C", Pearson Education, 2019.		



M.C.A	M23CAT104 – SOFTWARE ENGINEERING	т	Ρ	TU	С
		3	0	0	3

	Course Objectives				
1.	To provide an insight into software life cycle and various software process models.				
2.	To know the concept of various modeling and Design Engineering.				
3.	To understand the core principles and frameworks of Agile development.				
4.	To demonstrate the various software testing techniques and its tools.				
5.	To understand the models and metrics of software quality and reliability.				

UNIT - I SOFTWARE DEVELOPMENT AND PROCESS MODELS	
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Software Engineering Concepts – A Generic view of the process - Categories of Software - Software Development Process - Requirements Engineering and SRS – Requirements Analysis and its Techniques – Prescriptive and Process Models.

UNIT - II

DESIGN ENGINEERING and MODELLING

Software Design and Quality – Design Concepts – Data Modelling – Flow Oriented Modelling – Behavioral Modelling – Cohesion - Coupling – OOAD - Web Engineering - Attributes, Layers

UNIT - III

AGILE DEVELOPMENT

Agile definition and roles in Agile, agile manifesto, 12 principles of the Agile manifesto, agile characteristics - agile iteration planning – Agile Frameworks – SCRUM Mechanism – Extreme Programming (XP).

UNIT - IV

TESTING TECHNIQUES & TEST CASE DESIGN

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Software testing : Fundamentals and Strategies – Manual Testing, Automation Testing – Verification and Validation Unit – Functional Testing: User, Integration, System, Smoke, Testing, and Non – Functional Testing: Security, Performance, Scalability Testing, Test Case Design Strategies – Testing tools – Testing using Selenium tool – Selenium tool suite.



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UNIT - V

SOFTWARE TESTING AND QUALITY METRICS

9

Six-Sigma – TQM – Quality Management - Metrics - Defect Removal Effectiveness - FMEA - Quality Function Deployment – Taguchi Quality Loss Function – Cost of Quality. Case Study for Complexity and Object - Oriented Metrics.

Total Instructional hours : 45

	Course Outcomes : Students will be able to
CO1	Able to understand the problem domain to choose process models and to develop SRS.
CO2	Able to model software projects using appropriate design notations and agile.
CO3	Able to measure the product and process performance using various metrics.
CO4	Able to evaluate the system with various testing techniques and strategies.
CO5	Able to understand the concepts of metrics and software models.

	Reference Books
1.	Roger S. Pressman, Bruce R. Maxim, "Software Engineering : A Practitioner's Approach", McGraw - Hill Education, 2020
2.	Amiya Kumar Rath, Hitesh Mohapatra, "Fundamentals of Software Engineering", BPB PUBN, 2020
3.	Rajib Mall, "Fundamentals of Software Engineering", Fifth Edition, PHI Learning Private Limited, 2018
4.	Ralf Bierig, Stephen Brown, Edgar Galván, Joe Timoney, "Essentials of Software Testing", Cambridge University Press, 2021
5.	Roger Y. Lee, "Object-oriented Software Engineering with UML", Nova Science Publishers, Incorporated, 2019



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M.C.A		M23CAP101 – PYTHON PROGRAMMING	T	Р	TU	С
		LABORATORY	0	4	0	2
		Course Objectives				
1.	To un	derstand the problem solving approaches.				
2.	To lea	arn the basic programming constructs in Python.				
3.	To art world	iculate where computing strategies support in providing Pytho problems.	on-base	ed soluti	ons to r	eal
4.	To use	e Python data structures - lists, tuples, dictionaries.				
5.	To do	input / output with files in Python.				
		LIST OF EXPERIMENTS				
1.	Identif flow c	fication and solving of simple real life or scientific or technical harts for the same.	probler	ns, and	develo	ping
2.	Python programming using simple statements and expressions.					
3.	Scient	tific problems using Conditionals and Iterative loops.				
4.	Practi	cal - Implementing real-time/technical applications using Lists	, Tuples	6.		
5.	Practi	cal - Implementing real-time/technical applications using Sets,	Dictior	naries.		
6.	Practi	cal - Implementing programs using Functions.				
7.	Practi	cal - Implementing programs using Strings.				
8.	Practi	cal - Implementing programs using written modules and Pytho	on Stan	dard Lik	oraries.	
9.	Practi	cal - Implementing real-time/technical applications using File h	nandling	<u>j</u> .		
10.	Practi	cal - Implementing real-time/technical applications using Exce	ption h	andling.		
11.	Explo	ring Pygame tool.				
12.	Devel	oping a game activity using Pygame like bouncing ball, car ra	ce etc.			
		Тс	otal Ins	tructio	nal hou	ırs: 60



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	Course Outcomes : Students will be able to		
CO1	Develop algorithmic solutions to simple computational problems		
CO2	Construct simple Python programs for solving problems.		
CO3	Interpret a Python program into functions.		
CO4	Illustrate compound data using Python data structures.		
CO5	Apply Python features in developing software applications.		

SOFTWARE REQUIREMENTS			
1.	Python 3		
2.	Python IDLE / Visual Studio code		





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M			ТР	Ρ	ΤU	С
WI.C.A		WIZSCAPTUZ - WEB DEVELOPINIENT LABORATORT	0	4	0	2
	Course Objectives					
1.	1. To develop interactive web pages using HTML and CSS					
2.	To understand and practice web development techniques on client-side Web applications using technologies such as HTML, CSS, JavaScript, AJAX, JQuery and JSON.					
3.	To Construct web applications using Database tools and validate it.					

		LIST OF EXPERIMENTS		
1.	Crea	Create your own Resume using HTML 5 Tags		
2.	Deb (http	Debug and validate your HTML document (Resume) using W3C validator and fix the issues. (https://validator.w3.org/#validate_by_upload).		
3.	Add	Styles to your Resume using CSS 3 Properties.		
	a.	Add External, Internal and Inline CSS styles to know the priority.		
	b.	Add CSS3 Animation to your profile.		
4.	a.	Add functionalities that use any 2 of HTML 5 API's.		
	b.	Create a student Registration form for Job Application and validate the form fields using JavaScript		
5.	Create a CGPA Calculator in Web Brower using HTML, CSS and JavaScript. Use functions in JavaScript			
6.	Create an online video Player which will allow you to play videos from the system and also create custom playlist using JQuery.			



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7.	Using Angular JS Implement:
	i) Username and Email Input Validation.
	ii) Login Backend building
8.	Build a Search Filter for given list of items using ReactJS
9.	Using PHP and MySQL, develop a program to accept book information viz. Accession number,
	title, authors, edition and publisher from a web page and store the information in a database
	and to search for a book with the title specified by the user and to display the search results
	with proper headings.
10.	Develop a Social Media Web Application using HTML5, CSS3, JQuery, AJAX & PHP.
	Total Instructional hourse CO

Total Instructional hours: 60

	Course Outcomes : Students will be able to
CO1	Develop simple web applications using HTML5 and CSS3.
CO2	Build server side and client side programming using JavaScript and JQuery
CO3	Design Web applications using various technologies such as AJAX and JSON.
CO4	Develop an applications by using AngularJS and ReactJS
CO5	Construct web applications and connected with MySQL as backend

SOFTWARE REQUIREMENTS				
1.	Sublime Text (Text Editor)			
2.	XAMP			
3.	Oracle / MySQL			



M.C.A		M23CAP103 – ADVANCED DATA STRUCTURES	T	Р	TU	C
		LABORATORT	0	4	0	2
		Course Objectives				
1.	To lear	n and how to use advanced data structures.				
2.	To und	lerstand and work with different types of data structures like lis	sts, tree	s, and g	graphs.	
3.	To illus	strate how sets and graphs can be used in different application	NS.			
4.	To stuc	dy and compare different sorting methods.				
5.	To use	data structures and algorithms to solve real-world problems.				
		LIST OF EXPERIMENTS				
1.	Array	implementation of stack				
2.	Linke	d list implementation of Queue				
3.	Polyn	omial Addition using Linked List				
4.	Binary Search tree operations					
5.	. Graph Traversals					
6.	Shortest Path using Dijkstra's Algorithm					
7.	7. Minimum Spanning Tree using Prim's Algorithm					
8.	Dictionary application using any of the data structures					
9.	Divide	e and Conquer Method – Merge Sort				
10.). Back Tracking - 8 - Queen's Problem					
		То	tal Inst	ruction	al hou	rs : 60



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	Course Outcomes : Students will be able to
CO1	Apply basic data structures like stack, queue, and linked lists to manage and manipulate data efficiently.
CO2	Analyze Binary Search Tree operations and understand how to organize and traverse data.
CO3	Apply graph traversal, shortest path algorithms, and Minimum Spanning Tree techniques to solve problems.
CO4	Develop dictionary-based applications and apply sorting methods like Merge Sort for efficient data storage, retrieval, and optimization.
CO5	Solve the 8-Queens problem using Backtracking to understand constraint satisfaction problems.

SOFTWARE REQUIREMENTS





Semester – II

M.C.A		т	Ρ	TU	С
	WZSCATZUT- DATABASE MANAGEMENT STSTEMS	3	0	0	3

Course Objectives				
1.	To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram.			
2.	To construct relational database schemas and understand the purpose of normalizations.			
3.	To develop and implement queries for temporal and spatial databases.			
4.	To understand the principles behind NoSQL database and CRUD operations			
5.	To construct and validate XML documents using DTDs and XML Schema			

UNIT - I	INTRODUCTION	9
File systems	versus Database systems – Data Models – DBMS Architecture – Data Independe	nce –

Data Modeling using Entity – Relationship Model – Enhanced E-R Modeling.

UNIT - II	RELATIONAL MODEL AND QUERY EVALUATION	9

Relational Model Concepts – Relational Algebra – SQL – Basic Queries – Complex SQL Queries – Views – Constraints – Functional Dependencies – Normal Forms – 1NF – 2NF - 3NF - BCNF – 4NF - 5NF - Triggers - Stored procedure - MS Crystal report

UNIT - III

SPATIAL AND TEMPORAL DATABASES

Active Databases Model – Design and Implementation Issues - Temporal Databases - Temporal Querying - Spatial Databases : Spatial Data Types, Spatial Operators and Queries – Spatial Indexing and Mining – Applications -– Mobile Databases : Location and Handoff Management, Mobile Transaction Models – Deductive Databases - Multimedia Databases

UNIT - IV

NOSQL DATABASES

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NoSQL – CAP Theorem – Sharding - Document based – MongoDB Operation : Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding – Cassandra : Data Model, Key Space, Table Operations, CRUD Operations, CQL Types.


UNIT - V

XML DATABASES

Structured, Semi structured, and Unstructured Data – XML Hierarchical Data Model – XML Documents

 $- \ {\rm Document} \ {\rm Type} \ {\rm Definition} - {\rm XML} \ {\rm Schema} - {\rm XML} \ {\rm Documents} \ {\rm and} \ {\rm Databases} - {\rm XML} \ {\rm Querying} - {\rm XPath}$

XQuery

Total Instructional hours : 45

9

Course Outcomes : Students will be able to				
CO1	Understand the fundamentals of DBMS concepts, data models, and DBMS architecture.			
CO2	Solve relational model concepts, SQL queries, and normalization techniques to address database problems.			
CO3	Apply active databases, temporal databases, and spatial databases with their respective querying techniques.			
CO4	Utilize NoSQL concepts, including MongoDB and Cassandra operations, in real-world database applications.			
CO5	Construct XML databases, XML schema, and querying.			

	Reference Books
1.	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw- Hill Education, 2020
2.	Ramez Elmasri, Navathe Georgia, "Fundamentals of Database Systems", 7th edition, Published by Pearson, 2021
3.	Doug Bierer, "MongoDB 4 Quick Start Guide", Packt Publishing, 2018
4.	Andreas Meier, Michael Kaufmann, "SQL & NoSQL Databases", Springer Fachmedien Wiesbaden, 2019
5.	Frank. P. Coyle, "XML, Web Services and The Data Revolution", Pearson Education, 2012.
6.	Brett Neutreon, "Mastering XML: Essential Techniques" Lulu.com, 2024.



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МСА	M23CAT202 – PROGRAMMING WITH JAVA	т	Ρ	TU	С
WI.C.A	WZSCATZUZ – PROGRAMIMING WITH JAVA	3	0	0	3

	Course Objectives				
1.	To understand the overview of working principles of internet, web related functionalities				
2.	To apply the fundamentals core java, packages, database connectivity for computing				
3.	To apply and enhance the knowledge to server side programming.				
4.	To understand the OOPS concept & how to apply in programming.				
5.	To apply advanced Java concepts to develop efficient, scalable, and maintainable software solutions.				

UNIT - I	BASICS OF JAVA

Classes & Objects – Overloading Methods – Passing and returning objects – Controlling access to members – this, static, and final keywords, String handling. Types of Inheritance - Method Overriding, Dynamic Method Dispatch – Abstract classes – Interfaces, Packages – Access Specifiers – importing packages

UNIT - II

EXCEPTION HANDLING AND MULTITHREADING

Exception handling Model – Built in exceptions – User defined exceptions. Multithreading - Thread creation - Thread class - Runnable interface.

UNIT - III

GUI & GENERIC CLASSES

Applet Programming, AWT Programming, Event handling – Swing Components. Generic methods, generic classes – Collection Interfaces - Collection Classes – Collection Algorithms.

UNIT	- IV
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FILES & JDBC

FILE class – Its Methods; I/O Streams - Byte Stream and Character Stream classes – Random Access file. JDBC Statement - Callable and Prepared object – Processing Result set.



UNIT - V

ADVANCE JAVA PROGRAMMING

RMI – creating stubs, skeleton – Remote Method Invocation; Servlets – Life Cycle – Client Request - Accessing Form Data – database access. JSP - Hibernate - spring with examples

Total Instructional hours : 45

	Course Outcomes : Students will be able to				
CO1	Develop Java programs for simple calculations.				
CO2	Make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API				
CO3	Utilize the frameworks like JSP, Hibernate and Spring in web applications				
CO4	Construct server side programs using Servlets and JSP.				
CO5	Solve Real time Problems using Advance Java Programming				

Reference Books			
1.	Herbert Schildt, "Java The Complete Reference", Eleventh Edition, Tata McGrawHill, 2020		
2.	Amritendu De, "Spring 4 and Hibernate 4 : Agile Java Design and Development", McGraw-Hill Education, Illustrated Edition, 2015		
3.	R. NageswaraRao, "Core Java : An Integrated Approach", DreamTech Press, Edition, 2016		
4.	Joyce Farrell, "Java Programming", Cengage Learning, Seventh Edition, 2014		
5.	John Dean, Raymond Dean, "Introduction to Programming with JAVA – A Problem Solving Approach", Tata McGraw Hill, Second Edition, 2014.		



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M.C.A	M23CAT203 – COMPUTER NETWORKS	т	Р	TU	С
		3	0	0	3

Course Objectives		
1.	To understand the basic concepts of networks, communication models, and protocols.	
2.	To understand data link layer protocols, error control, and media access.	
3.	To outline the principles of network layer, including routing, switching, and IP addressing.	
4.	To demonstrate transport layer services, including connection establishment, flow control, and congestion control.	
5.	To explain the application protocols, network security issues and security services.	

UNIT - I	NETWORK FUNDAMENTALS	9
Uses of Netw	orks – Categories of Networks - Communication model – Data transmission conce	ots and

terminology - Protocol architecture - Protocols - OSI - TCP/IP - LAN Topology - Transmission media - SDL concepts in Networks

UNIT - II	DATA LINK LAYER	9		
Data link con Wireless LAN	Data link control - Flow Control – Error Detection and Error Correction - MAC – Ethernet, Token ring, Wireless LAN MAC – Blue Tooth – Bridges. COMBATORE			
UNIT - III		9		

Network layer - Switching concepts - Circuit switching - Packet switching - IP - Datagrams -IP addresses - IPV6 - ICMP - Routing Protocols - Distance Vector - Link State - BGP.

UNIT	- IV
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TRANSPORT LAYER

Transport layer - service - Connection establishment - Flow control - Transmission control protocol -Congestion control and avoidance – User datagram protocol – Transport for Real Time Applications (RTP).



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UNIT - V

APPLICATIONS AND SECURITY

9

Applications - DNS - SMTP – WWW – SNMP - Security – threats and services - DES - RSA

Total Instructional hours : 45

	Course Outcomes : Students will be able to	
CO1	Classify various types of networks, communication models, and protocols used in networking.	
CO2	Explain the fundamental functions of data link protocols, focusing on error handling, flow control, and media access control.	
CO3	Compare different routing protocols and switching techniques, and describe the role of IP addressing in the network layer.	
CO4	Demonstrate the services and mechanisms in the transport layer, such as flow control and congestion control.	
CO5	Analyze network application protocols and security services, focusing on encryption and managing security threats.	
Reference Books		
1.	James F. Kurose, Keith W. Ross, "Computer Networking : A Top-down Approach", Pearson, 2022	
2.	Andrew S. Tanenbaum, Nickolas Feamster, "Computer Networks", Pearson Education, 2019	
3.	Andrew S. Tannenbaum, David J. Wetherall, "Computer Networks", Pearson Education, 2021.	
4.	Behrouz A. Forouzan, "Data Communications and Networking with TCP / IP Protocol Suite", McGraw Hill, 2021	
5.	Gurdeep S. Hura, Mukesh Singhal, "Data and Computer Communications", CRC Press LLC, 2019	



МСА	т	Р	TU	С
WI.C.A	3	0	0	3

Course Objectives		
1.	To explain the foundations and Principles of Artificial intelligence	
2.	To understand the various searching techniques used in Artificial intelligence.	
3.	To apply the machine learning techniques for real world problems.	
4.	To illustrate the different types of Artificial intelligence planning.	
5.	To understand logical formulation of various learning and validation techniques.	

UNIT - I INTELLIGENT AGENTS AND KNOWLEDGE REPRESENTATION

Foundation of AI - History of AI - State of Art - Intelligent Agents : Agents and Environments – Good Behavior : The Concepts of Rationality – The Nature of Environments – The Structure of Agents – Knowledge Representation – Object Oriented Approach – Semantic Nets – Frames – Semantic Web – Ontology.

UNIT - II	SEARCH TECHNIQUES	9

Problem Solving by Search – Uninformed Search – Searching with Costs – Informed State Space Search – Heuristic Search – Problem Reduction Search – Game Search – Constraint Satisfaction Problems.

UNIT - III REASONING WITH LOWER ORDER LOGICS

Logical Agents : Knowledge Based Agents - Logic - Propositional Logic - Propositional Theorem Proving - Model Checking - Agent based on Propositional Logic. First - Order Logic : Syntax and Semantics -Using First - Order Logic - Knowledge Engineering. Inference in First - Order Logic : Prepositional Vs. First - Order Inference - Unification and Lifting - Forward Chaining - Backward Chaining – Resolution.

UNIT - IV

ARTIFICIAL INTELLIGENCE PLANNING

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Classical Planning – Partial Order Planning – Graph Plan and SAT Plan – Hierarchical Planning – Planning and Acting in Nondeterministic Domains – Multi Agent Planning.



UNIT - V

LEARNING TECHNIQUES AND ML

Logical Formulation of Learning – Knowledge in Learning – Explanation-Based Learning - Learning using Relevance Information – Inductive Logic Programming – Statistical Learning with Complete Data – Learning with Hidden Data –Applications- ML Techniques Overview - Validation Techniques - Cross Validations - Feature Reduction/ Dimensionality reduction - Principal components analysis - Eigen vectors

Total Instructional hours : 45

9

	Course Outcomes : Students will be able to	
CO1	Understand the Basic Concepts of Artificial Intelligence.	
CO2	Apply Artificial Intelligence search techniques to practical applications.	
CO3	Apply the reasoning techniques to real world problems.	
CO4	Classify the Various Planning Techniques.	
CO5	Apply Learning Techniques in developing real world applications.	

Reference Books William F. Lawless (Editor), Ranjeev Mittu (Editor), Donald A. Sofge (Editor), Thomas Shortell 1. (Editor), Thomas A. McDermott, "Systems Engineering and Artificial Intelligence", 1st ed. 2021 Edition Stuart J Russell, Peter Norvig. Artificial Intelligence: A Modern Approach. 4th ed. Pearson 2. Publishers, 2020. Elaine Rich, Kevin Knight, and Shivashankar B. Nair. Artificial Intelligence. 3rd ed. McGraw Hill 3. Education, 2017. 4. Dheepak Khemani, "A first course in Artificial Intelligence", McGraw-Hill Education, 2013. Murphy, K. P, "Machine learning: A probabilistic perspective", 2nd ed. MIT Press. 2022 5.

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МСА	M23CAP201 – DATABASE MANAGEMENT	T P TU C	С		
M.C.A	SYSTEMS LABORATORY	0	4	0	2

Course Objectives	
1.	To understand the concepts of database design and management using SQL.
2.	To construct SQL queries for data manipulation, subqueries, and control commands.
3.	To utilize stored procedures, functions, and use cursors for database automation.
4.	To make use of NoSQL databases like MongoDB and perform CRUD operations.
5.	To develop applications by using frontend tools with database connectivity

	LIST OF EXPERIMENTS	
1.	Creation of base tables and views	
2.	Data Manipulation INSERT, DELETE and UPDATE in Tables. SELECT, Sub Queries	
3.	Data Control Commands	
4.	Use of Cursors, Procedures and Functions	
5.	Embedded SQL or Database Connectivity	
6.	Oracle or SQL Server Triggers – Block Level – Form Level Triggers	
7.	MySQL Database Creation, Table Creation, Query	
8.	MySQL Replication – Distributed Databases	
9.	MongoDB – CRUD operations, Indexing and Sharding	
10.	XML Databases, XML table creation,	
11.	Working with Forms, Menus and Report Writers for an application project in any domain	
12.	Write SQL queries to retrieve details of all books in the library – id, title, name of publisher,	
	Total Instructional hours : 60	



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	Course Outcomes : Students will be able to
CO1	To build relational databases using SQL commands.
CO2	To develop complex SQL queries with subqueries, views, and control commands.
CO3	To construct stored procedures, functions, triggers, and cursors in relational databases.
CO4	To experiment with NoSQL databases for managing unstructured data using MongoDB.
CO5	To Develop secure and efficient database-driven applications that meet user needs and organizational requirements.

SOFTWARE REQUIREMENTS	
1.	NET / Java / Python
2.	Oracle / MySQL / MongoDB.





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МСА		т	Ρ	TU	С
WI.C.A	WIZSCAPZUZ - JAVA LABORATORT	0	4	0	2

	Course Objectives
1.	Try and develop the most important technologies that are being used today by web developers to build a wide variety of web applications.
2.	To develop Java based web programming.
3.	To understand and apply the fundamentals core java, packages, database connectivity for computing.
4.	To enhance the knowledge to server-side programming.
5.	To provide knowledge on advanced features like Swing, Java Beans, Sockets.

	LIST OF EXPERIMENTS		
1.	Writing Java programs by making use of class, interface, package, etc. for the following # Different types of inheritance study # Uses of "this" keyword # Polymorphism # Creation of user specific packages COIMBATORE # User specific exception handling		
2.	Window based GUI applications using frames and applets such as Calculator application, Fahrenheit to Centigrade conversion, etc.		
3.	Application of threads examples		
4.	Personal Information System using Swing		
5.	Event Handling in Swing		
6.	Reading and writing text files		
7.	RMI application to access a remote method		



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8.	Servlet program with database connectivity for a web-based application such as Students result status checking, PNR number enquiry etc.
9.	Creation and usage of Java bean
10.	Application to search Phone Number using contact Name Using HashMap.
11.	Application which finds the Duplicates in E-mail using Set Interface.
12.	FTP Using Sockets.
	Total Instructional hours: 60

	Course Outcomes : Students will be able to
CO1	Apply the Object Oriented features of Java for programming on the internet
CO2	Implement, compile, test and run Java program
CO3	Make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API
CO4	Understand the components and patterns that constitute a suitable architecture for a web application using java servlets
CO5	Demonstrate systematic knowledge of backend and front end by developing an appropriate application.
CO6	Implement socket programming and Client side scripting in Java
	SOFTWARE REQUIREMENTS
1.	JAVA
2.	NETBEANS
3.	Apache Server / GlassFish Server



МСА	M23CAP203 – OPEN LABORATORY	т	Ρ	TU	С
WI.C.A		0	4	0	2

	Course Objectives
1.	Explain the process and methods used in solving practical problems using relevant technology.
2.	Demonstrate an understanding of how different software tools and systems interact in an open lab setting.
3.	Apply theoretical knowledge to real-world scenarios through hands-on experiments, coding exercises, or lab simulations.

LIST OF DOMAINS		
1.	Animation	
2.	Bio-informatics DB	
3.	Artificial Intelligent	
4.	Web GIS	
5.	Image Processing	
6.	Machine Learning	

SOFTWARE REQUIREMENTS		
1.	3ds Max (Autodesk), After Effects (Adobe), Animate (Adobe)	
2.	Array Express, BLAST, Biopython	
3.	Amazon Web Services, Al-one, OpenNN	
4.	Esri ArcGIS, Google Earth Pro, ArcGIS Online	
5.	Open CV, ImageJ, Photoshop (Adobe)	
6.	Pandas, matplotlib, Tableau	
	Total Instructional hours: 60	



	Course Outcomes : Students will be able to
CO1	Make Use of the different software tools or programming languages to solve practical problems or complete lab exercises.
CO2	Apply programming languages, frameworks, and tools to design and implement a functional mini project.
CO3	Students will apply theoretical knowledge to real-world laboratory situations



Professional Elective – I

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МСА		т	Р	ΤU	С
IVI.C.A	WIZSCREZUT - SOFT COWFOTING	3	0	0	3

	Course Objectives			
1.	To understand the key aspects of Soft computing.			
2.	2. To explain the components and building block hypothesis of Genetic algorithm.			
3.	3. To understand the features of neural network and its applications.			
4.	4. To Apply fuzzy logic concepts to solve real-world problems using fuzzy sets and membership functions.			
5. To Apply soft computing techniques to solve real-world problems such as handwritten script recognition, image processing, and data compression.				
UNI	UNIT - I INTRODUCTION TO SOFT COMPUTING 9			

Evolution of Computing – Introduction to Artificial Intelligence – Example problems – tic-tac-toe – question answering – Turing test - Prepositional and Predicate Calculus Rule Based Knowledge Representation - Knowledge acquisition – Expert system

UNIT - II

GENETIC ALGORITHMS

Introduction, Building block hypothesis, working principle, Basic operators and terminologies such as individual, gene, encoding, fitness function and reproduction, Genetic modelling : Significance of Genetic operators, Inheritance operator, cross over, inversion & deletion, mutation operator, bitwise operator, GA optimization problems

UNIT	- 111
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NEURAL NETWORKS

Machine learning using Neural Network, Adaptive Networks – Feed Forward Networks Defuzzification – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in Neural

Networks



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UNIT - IV

FUZZY LOGIC

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Defuzzification - Fuzzy Inference Systems – Mamdani Fuzzy Model – Takagi – Sugeno - Kang Fuzzy Model - Fuzzy Expert Systems – Fuzzy Decision

UNIT - V

APPLICATIONS OF SOFT COMPUTING

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Case study : Handwritten Script Recognition - Image Processing and Data Compression - Automotive Systems and Manufacturing - Soft computing-based Architecture - Decision Support System - Power System Analysis - Bioinformatics - Investment and Trading.

Total Instructional hours : 45

	Course Outcomes : Students will be able to
CO1	Apply AI concepts to solve basic problems in gaming and other question-answering systems.
CO2	Understand the underlying principles and working mechanisms of Genetic Algorithms
CO3	Apply neural network models such as feed-forward networks and radial basis function networks to real-world problems
CO4	Make Use of fuzzy inference systems to model and solve real-world problems
CO5	Explain how soft computing-based architectures enhance decision support systems and bioinformatics applications.

	Reference Books
1.	Eyal Wirsansky, "Hands-On Genetic Algorithms with Python : Applying Genetic Algorithms to Solve Real-world Deep Learning and Artificial Intelligence Problems", Packt Publishing, 2020
2.	Oliver Kramer, "Genetic Algorithm Essentials", Springer International Publishing, 2017
3.	"Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms : Industrial Applications", CRC Press, 2020
4.	Amit Konar, "Artificial Intelligence and Soft Computing: Behavioral and Cognitive Modeling of the Human Brain", CRC Press, 2018
5.	Timothy Ross, "Fuzzy Logic with Engineering Applications", Wiley Publications, 4 th Edition, 2016.



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МСА		т	Р	TU	С
WI.C.A	WZSCAEZUZ - SOFTWARE PROJECT MANAGEMENT	3	0	0	3

	Course Objectives
1.	To understand the fundamentals of software project management and planning techniques.
2.	To Understand various cost estimation methods for software projects.
3.	To learn how to estimate the effort and resources needed for software projects.
4.	To Understand the risks in software projects and how to manage them.
5.	To explain the challenges of managing software projects globally and the impact of the internet.

UNIT - I SOFTWARE PROJECT MANAGEMENT CONCEPTS

Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and allocate resources - TQM, Six Sigma, Software Quality : defining software quality, ISO9126, External Standards.

UNIT - II

SOFTWARE EVALUATION AND COSTING

Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach : Choosing technologies, choice of process models, structured methods.

UNIT - III

SOFTWARE ESTIMATION TECHNIQUES

Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning : Project schedules, projects and activities, sequencing and scheduling Activities, networks planning models, formulating a network model.

This
Approved by BoS Chairman

UNIT - IV

RISK MANAGEMENT

Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control : Creating Framework, cost monitoring, prioritizing monitoring.

UNIT - V GLOBALIZATION ISSUES IN PROJECT MANAGEMENT

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Globalization issues in project management: Evolution of globalization - challenges in building global teams - models for the execution of some effective management techniques for managing global teams. Impact of the internet on project management: Introduction – the effect of internet on project management – managing projects for the internet – effect on project management activities. Comparison of project management software's: dot Project, Launch pad, openProj. Case study : PRINCE2.

Total Instructional hours : 45

	Course Outcomes : Students will be able to
CO1	Summarize key concepts of software project management, such as planning, scope, and
	objectives.
CO2	Explain software evaluation methods like cost-benefit analysis and risk evaluation.
CO3	Apply estimation techniques like expert judgment and analogy in project planning.
CO4	Identify risks in project management and describe ways to manage and reduce them
CO5	Summarize the impact of globalization on project management and the challenges of managing
	global teams

	Reference Books
1.	Hughes, "Software Project Management, 5e", McGraw-Hill Education, 2021
2.	Shriram K. Vasudevan, R.M.D. Sundaram & Prashant R. Nair, "Software Project Management", Alpha Science International Ltd, 2017
3.	Project Management Institute Project Management Institute, "A Guide to the Project Management Body of Knowledge", Project Management Institute, 2021

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4.	Donald J. Reifer, Richard Hall Thayer, Heinz Weihrich, "Software Engineering Project Management Knowledge Areas : Volume 12 : The Engieering of Software Projects", Software Management Training, 2017
5.	Greg Horine, "Project Management Absolute Beginner's Guide", Pearson Education, 2017

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МСА		т	Ρ	TU	С
WI.C.A	MZSCAEZUS - SECORITT IN COMPOTING	3	0	0	3

	Course Objectives
1.	To understand the basics of cryptography
2.	Learn to find the vulnerabilities in programs and to overcome them,
3.	Know the different kinds of security threats in networks and its solution
4.	Understand the security requirements of database systems and explore techniques for finding and confirming SQL injection vulnerabilities
5.	Develop an understanding of the models and standards contribute to securing information systems

UNIT - I	ELEMENTARY CRYPTOGRAPHY	9
Terminology	and Background - Substitution Ciphers - Transpositions - Making Good Enc	ryption
Algorithms -	Data Encryption Standard - AES Encryption Algorithm - Public Key Encryption	otion –
Cryptographi	c Hash Functions – Key Exchange – Digital Signatures.	

UNIT - II

LINIT - I

PROGRAM SECURITY

Secure programs – Non-malicious Program Errors – Viruses – Targeted Malicious code – Controls Against Program Threat - Control of Access to General Objects - User Authentication - Good Coding Practices – Open Web Application Security Project Flaws.

UNIT - III

SECURITY IN NETWORKS

Threats in networks – Virtual Private Networks – PKI – SSL – IPSec – Content Integrity – Access Controls – Honeypots – Traffic Flow Security – Firewalls – Intrusion Detection Systems – Secure e-mail.

UNIT - IV

SECURITY IN DATABASES

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Security requirements of database systems - Reliability and Integrity in databases - Redundancy -Recovery - Concurrency / Consistency - Monitors - Sensitive Data - Types of disclosures - Inference - finding and confirming sql injection.



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UNIT - V

SECURITY MODELS AND STANDARDS

Secure SDLC – Security architecture models – Bell-La Padula Confidentiality Model – Biba Integrity Model – Graham - Denning Access Control Model – Harrison - Ruzzo - Ulman Model – Secure Frameworks – COSO – CobiT – Security Standards - ISO 27000 family of standards – NIST.

Total Instructional hours : 45

	Course Outcomes : Students will be able to
CO1	Understand the basic terminology and concepts in cryptography.
CO2	Apply best practices for securing programs and applications against common security threats.
CO3	Build effective access control mechanisms to secure network resources.
CO4	Develop the ability to ensure reliability and integrity in database systems.
CO5	Apply security models and standards effectively to safeguard information systems and ensure regulatory compliance.

	Reference Books
1.	William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson, 2016
2.	Michael E. Whitman, Herbert J. Mattord, "Management of Information Security", Cengage Learning, 2018
3.	Loren Kohnfelder, "Designing Secure Software: A Guide for Developers", No Starch Press, 2021
4.	Education Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Pearson, 2018
5.	Matt Bishop, "Computer Security : Art and Science", Addison- Wesley, 2015.

Approved by BoS Chairman

МСА		т	Ρ	τU	С
WI.C.A	MZ3CAEZ04 - GAME PROGRAMMING	3	0	0	3

Course Objectives		
1.	To understand the game design and development, which includes the processes and mechanics.	
2.	To explain the issues and principles in game design.	
3.	To understand the game engine development.	
4.	To illustrate the modelling, techniques, handling situations, and logic.	
5.	To develop interactive games with various platforms and frameworks.	

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics - based Simulation.

UNIT - II

GAME DESIGN PRINCIPLES

Game Logic, Game AI, Path Finding, Game Theory, Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection.

UNIT - III

GAMING ENGINE DESIGN

Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics.

UNIT - IV

GAMING PLATFORMS AND FRAMEWORKS

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Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DX Studio, Unity.



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UNIT - V

GAME DEVELOPMENT

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Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

Total Instructional hours : 45

	Course Outcomes : Students will be able to	
CO1	Illustrate the concepts behind game programming techniques.	
CO2	Implement game programming techniques to solve game development tasks.	
CO3	Construct a basic game engine using open-source programming libraries.	
CO4	Understand different Platforms and Frameworks for Game development	
CO5	Develop different games in 2D and 3D using OpenGL	

	Reference Books
1.	Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", Course Technology, 2020
2.	Chetna S. Suthar, Rafat Khan Bagawan, "Game Programming", ech-Neo Publications LLP, 1 st Edition, 2019
3.	Nystrom, Robert, "Game Programming Patterns", Genever Benning, 1 st Edition, 2014
4.	David H. Eberly, "3D Game Engine Design, Second Edition : A Practical Approach to Real-Time Computer Graphics" Morgan Kaufmann, 2 nd Edition, 2006
5.	Dino Dini, "Essential 3D Game Programming", Morgan Kaufmann, 1 st Edition, 2012
6.	Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", Prentice Hall, 1 st Edition, 2006



Semester – III

МСА		L	т	Ρ	С
WI.C.A	WZSCATSUT - WACHINE LEARNING	3	0	0	3

	Course Objectives
1.	To gain knowledge on foundations of machine learning and apply suitable dimensionality reduction techniques for an application.
2.	To select the appropriate model and use feature engineering techniques.
3.	To gain knowledge on Probability and Bayesian Learning to solve the given problem.
4.	To design and implement the machine learning techniques for real world problems.
5.	To analyze, learn and classify complex data without predefined models.

Human Lear	ning - Machine Learning - supervised, unsupervised and semi supervised Lear	ning -
Applications -	Languages / Tools - Issues - Preparing to Model : Introduction - Machine Learning Ac	tivities
- Types of da	ta - Exploring structure of data - Data quality and remediation - Data Pre-processing	g.

INTRODUCTION

UNIT - II MODEL EVALUATION AND FEATURE ENGINEERING

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Model Selection - Training Model - Model Representation and Interpretability - Evaluating Performance of a Model - Improving Performance of a Model - Feature Engineering : Feature Transformation - Feature Subset Selection.

UNIT - III

UNIT - I

BAYESIAN LEARNING

Basic Probability Notation- Inference – Independence - Bayes' Rule. Bayesian Learning : Maximum Likelihood and Least Squared error Hypothesis - Maximum Likelihood hypotheses for predicting probabilities- Minimum description Length principle - Bayes optimal classifier - Naïve Bayes classifier - Bayesian Belief networks - EM algorithm.



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UNIT - IV

PARAMETRIC MACHINE LEARNING

12

Logistic Regression: Classification and representation – Cost function – Gradient descent – Advanced optimization – Regularization - Solving the problems on overfitting. Perceptron – Neural Networks – Multi – class Classification - Backpropagation – Non-linearity with activation functions (Tanh, Sigmoid, Relu, PRelu).

UNIT - V

NON-PARAMETRIC MACHINE LEARNING

12

K - Nearest Neighbors - Decision Trees – Branching – Greedy Algorithm - Multiple Branches – Continuous attributes – Pruning. Random Forests: ensemble learning. Boosting – Support Vector Machines – Large Margin Intuition – Loss Function - Hinge Loss – SVM Kernels.

Total Instructional hours : 45

	Course Outcomes : Students will be able to
CO1	Understand about Data Pre-processing and Dimensionality reduction.
CO2	Identify appropriate machine learning models and feature engineering techniques.
CO3	Make use of Probability Technique to solve the given problem.
CO4	Understand the role of non-linearity in activation functions.
CO5	Apply suitable algorithms to classify and learn from data.

	Reference Books		
1.	Ethem Alpaydin, "Introduction to Machine Learning", Forth Edition, MIT Press, 2020.		
2.	Harsh Bhasin, "Machine Learning for Beginners", 2 nd Edition, BPB Publications, 2023.		
3.	Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow", O"Reilly, 2022.		
4.	John Winn, "Model-Based Machine Learning", CRC Press, 2023.		
5.	Mark Stamp, "Introduction to Machine Learning with Applications in Information Security", CRC Press, 2022.		



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MCA		L	Т	Р	С
WI.C.A	WZSCATSUZ - INTERNET OF THINGS	3	0	0	3

Course Objectives		
1.	To understand the concepts of IoT and its working models.	
2.	To explain the various IoT protocols.	
3.	To understand about various IoT Physical devices and Endpoints.	
4.	To explain the security and privacy issues connected with IoT.	
5.	To apply the concept of Internet of Things in a real world scenario.	

UNIT - IFUNDAMENTALS OF IoT9Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols,
IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor
Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs –
Home, City, Environment, Energy, Agriculture and Industry.

UNIT - II

IoT PROTOCOLS

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4 – BACNet Protocol – Modbus – KNX – Zigbee – Network layer – Data Link Layer Protocols - APS layer – Security.

UNIT - III

IOT PHYSICAL DEVICES AND ENDPOINTS

Introduction to sensors and its types - Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, and reading input from pins.

UNIT - IV

INTERNET OF THINGS PRIVACY, SECURITY AND GOVERNANCE

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Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT - Data - Introduction of Industry 4.0 - Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security.



UNIT - V	APPLICATIONS	9
IOT APPLICA	ATIONS - IoT applications for industry : Future Factory Concepts, Brownfield IoT, S	Smart

Total Instructional hours : 45

	Course Outcomes : Students will be able to
CO1	Define the infrastructure for supporting IoT deployments.
CO2	Understand the usage of IoT protocols for communication between various IoT devices.
CO3	Design portable IoT using Arduino/Raspberry Pi /equivalent boards.
CO4	Understand the basic concepts of security and governance as applied to IoT.
CO5	Analyze and illustrate applications of IoT in real time scenarios.

Objects, Smart Applications. Study of existing IoT platforms / middleware, IoT- A, Hydra etc.

Reference Books		
1.	Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press, 2021.	
2.	Milan Milenkovic, "Internet of Things: Concepts and System Design", Springer International COMBATORE	
3.	Simon Monk, "Raspberry Pi Cookbook", O'Reilly Media, 2022.	
4.	Veena S. Chakravarthi, "Internet of Things and M2M Communication Technologies", Springer International Publishing, 2021.	
5.	Gulshan Shrivastava, Himani Bansal, Kavita Sharma, Meenakshi Sharma, Sheng-Lung Peng, "New Age Analytics - Transforming the Internet Through Machine Learning, IoT, and Trust Modeling", Apple Academic Press, 2020.	



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МСА		L	Т	Р	
WI.C.A	WZ3CAT303 - WOBILE AFFLICATION DEVELOPMENT	3	0	0	

	Course Objectives
1.	To understand the basic concepts, aware of the GSM, SMS and GPRS Architecture.
2.	To outline the right user interface for mobile applications.
3.	To understand the design issues in the development of mobile applications.
4.	To understand the development procedure for mobile applications.
5.	To develop mobile applications using various tools and platforms.

UNIT - I WIRELESS COMMUNICATION FUNDAMENTALS, ARCHITECTURE

Frequency Spectrum - Multiplexing - Spread spectrum - GSM vs CDMA - Comparison of 2G, 3G, 4G - 5G - GSM Architecture - Entities - Call Routing - Address and identifiers - GSM Protocol architecture -Mobility Management - Frequency Allocation - Security – GPRS Architecture (entity and Protocol).

UNIT - II USER INTERFACE 9 Mobile Application Model - Erameworks and Tools - Generic III Development - Multimodal and

Mobile Application Model - Frameworks and Tools - Generic UI Development - Multimodal and Multichannel UI – Gesture Based UI – Screen Elements and Layouts – Voice XML.

UNIT - III

APPLICATION DESIGN

Memory Management – Design Patterns for Limited Memory – Workflow for Application development – Java API – Dynamic Linking – Plugins and rule of thumb for using DLLs – Multithreading in Java - Concurrency and Resource Management.

UNIT - IV

MOBILE OS

Mobile OS : Android, iOS – Android Application Architecture – Understanding the anatomy of a mobile application - Android basic components – Intents and Services – Storing and Retrieving data – Packaging and Deployment – Security and Hacking.



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UNI	Τ-V	APPLICATION DEVELOPMENT	9		
Comm Event	Communication via the Web – Notification and Alarms – Graphics and Multimedia : Layer Animation, Event handling and Graphics services – Telephony – Location based services.				
		Total Instructional hou	urs : 45		
		Course Outcomes : Students will be able to			
CO1	Unde	rstand the various types of Wireless Data Networks and Voice Networks.			
CO2	Deve	lop a User Interface for mobile applications.			
CO3	Deve	lop mobile applications that manage memory dynamically.			
CO4	Build	applications based on mobile OS like Android, iOS.			
CO5	Deve	lop location based services.			
		Reference Books			
1.	Dawn	Griffiths, David Griffiths, "Head First Android Development", O'Reilly Media, 2021.			
2.	G. Bla and C	ake Meike, Lawrence Schiefer, "Inside the Android OS- Building, Customizing, Man Operating Android System Services", Pearson Education, 2021.	aging		
3.	Barry	Burd, "Android Application Development All-In-One for Dummies", 3rd Edition, 2021	Ι.		
4.	Bryar Nerd	n Sills, Brian Gardner, Kristin Marsicano, Chris Stewart, "Android Programming - Th Ranch Guide", Pearson Education, 2022.	ie Big		
5.	Willia	m Stallings, "Wireless Communications and Networks", Pearson, 2020.			



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M C A M23CAT304 – CYBER SECURITY AND L I P	C
DIGITAL FORENSICS 3 0 0	3

Course Objectives			
1.	To understand the principles of cyber security and to identify threats and risks.		
2.	To learn how to secure physical assets and develop system security controls.		
3.	To understand how to apply security for Business applications and Network Communications.		
4.	To explain the security issues network layer and transport layer.		
5.	To analyze and validate forensics data.		

UNIT - I PLANNING FOR CYBER SECURITY Best Practices - Standards and a plan of Action - Security Governance Principles, components and Approach - Information Risk Management - Asset Identification - Threat Identification Vulnerability Identification - Risk Assessment Approaches - Risk Determination, Evaluation and Treatment - Security Management Function Security Policy.

UNIT - II

SECURITY CONTROLS

Human Resource Security - Security Awareness and Education Information Management - Information Classification and handling - Privacy - Documents and Record Management - Physical Asset Management - Industrial Control Systems - Mobile Device Security - System Development - Incorporating Security into SDLC.

UNIT - III

BUSINESS APPLICATIONS AND NETWORKS

Business Application Management - Corporate Business Application Security - End user Developed Applications - System Access - Authentication Mechanisms - Access Control System Management -Virtual Servers - Network Storage Systems - Network Management Concepts - Firewall.

UNIT - IV

DIGITAL FORENSICS

9

Digital Forensics - Uses - Tools for Digital Forensics - Process - Standards and methodologies -Locard's Exchange Principle – Scientific 71 Method – Role of Forensic examiner in Judicial System - Key technical concepts - Bits, bytes and numbering schemes - File extension and file signatures - Storage and memory - computing environment - Legal, Professional and Ethical aspects of Cyber Forensics.



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UNIT - V

COMPUTER FORENSICS

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Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques – Incident and incident response methodology – Forensic duplication and investigation.

Total Instructional hours : 45

Course Outcomes : Students will be able to				
CO1	Develop a set of risk and security requirements to ensure that there are no gaps in an organization's security practices.			
CO2	Achieve management, operational and technical means for effective cyber security.			
CO3	Audit and monitor the performance of cyber security controls.			
CO4	Understand the digital forensic process and to play the role of forensic examiner.			
CO5	Explore the computer forensics, network forensics and mobile device forensics.			

Reference Books			
1.	William Stallings, "Information Privacy Engineering and Privacy by Design", Addison-Wesley, 2020.		
2.	Hinne Hettema, "Agile Security Operations- Engineering for Agility in Cyber Defense, Detection, and Response", Packt Publishing, 2022.		
3.	Ben Buchanan, "The Hacker and the State- Cyber Attacks and the New Normal of Geopolitics", Harvard University Press, 2022.		
4.	Chuck Easttom, "Digital Forensics, Investigation, and Response", Jones & Bartlett Learning, 2021.		
5.	Kim-Kwang Raymond Choo, Nhien-An Le-Khac, "Cyber and Digital Forensic Investigations : A Law Enforcement Practitioner's Perspective", Springer International Publishing, 2020.		



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M.C.A	M23CAP301 – MOBILE APPLICATION	L	т	Ρ	С
	DEVELOPMENT LABORATORY	0	0	4	2

Course Objectives			
1.	To understand the basics of the components and structure of mobile application development frameworks		
2.	To understand how to work with various mobile application development frame works.		
3.	To apply industry best practices for mobile app development, addressing design issues such as responsiveness, scalability, and accessibility.		
4.	To understand the capabilities and limitations of mobile devices.		
5.	To make use of the best practices in mobile app development		

LIST OF EXPERIMENTS				
1.	Develop an application that uses Layout Managers.			
2.	Develop an application that uses event listeners.			
3.	Develop an application that uses Adapters, Toast.			
4.	Develop an application that makes use of database.			
5.	Develop an application that makes use of RSS Feed.			
6.	Implement an application that implements Multi-threading.			
7.	Develop a native application that uses GPS location information.			
8.	Implement an application that writes data to the SD card.			
9.	Implement an application that creates an alert upon receiving a message.			
10.	Develop a game application.			
	Total Instructional hours : 60			



	Course Outcomes : Students will be able to				
CO1	Understand and implement various layout managers				
CO2	Build Adapters to manage and display data in views like ListView and RecyclerView				
CO3	Apply Java programming concepts to Android application development.				
CO4	Utilize the device's GPS functionality to fetch and display real-time location data within a mobile app.				
CO5	Apply game development principles to design and implement an interactive games				

Requirements for a Batch of 30 Students				
SI. No.	Description of the Equipment	Quantity required (Nos.)		
1.	Java JDK - later version Java Runtime Environment (JRE) , Android Studio	30		




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MCA	M23CAP302 – TECHNICAL SEMINAR AND	L	т	Ρ	С
IVI.C.A	REPORT WRITING LABORATORY	0	0	4	2

	Course Objectives
1.	To Understand the students to select a current research topic and evaluate it based on primary sources.
2.	To develop students ability to analyze and synthesize research findings through critical reviews
3.	To develop students' skills in presenting, justifying, and defending their research work in front of a committee

List of Activities for Research Paper Development and Defense

1.	Every student selects a topic related to current trends and the same should be approved by the respective committee. This selection should have at least 5 distinct primary sources.		
2.	Every student must write a short review of the topic and present it to fellow students and faculty (discuss the topic – expose the flaws – analyze the issues) every week.		
3.	The faculty should evaluate the short review and award marks with respect to the following.		
	a. Has the student analyzed-not merely quoted-the most significant portions of the primary sources employed?		
	b. Has the student offered original and convincing insights?		
	c. Plagiarism to be checked.		
4.	Every student should re-submit and present the review article including issues/comments/ conclusions which had arisen during the previous discussion.		
5.	Every student should submit a final paper as per project specifications along with all short review reports (at least 4 internal reviews) and corresponding evaluation comments.		
6.	Every student should appear for a final external review exam to defend themselves.		
	Course Outcomes : Students will be able to		
1.	Classify key trends and gaps in research literature through the analysis of primary sources.		
2.	Develop a well-structured review article based on continuous feedback from peers and faculty.		
3.	Justify research findings and effectively defend them during the final external review.		
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Professional Elective – II

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МСА	M23CAE301 – CRYPTOCURRENCY AND	L	т	Р	С
WI.C.A	BLOCKCHAIN TECHNOLOGIES	3	0	0	3

Course Objectives		
1.	To understand how blockchain works, focusing on the architecture and data structure used to store and validate blocks.	
2.	To explain the key components of Bitcoin transactions and the process of Bitcoin mining.	
3.	To develop proficiency in using Truffle for testing, deploying, and managing smart contracts on the Ethereum network.	
4.	To compare Hyperledger Fabric with other blockchain frameworks.	
5.	To understand Blockchain Frameworks and Their Applications.	

Introduction -	The Structure of Blockchain - Data Structure of Blockchain - Data Distribution in B	lock
chain - Block	Validation. Block Validators : Consensus - Proof of Work – Proof of Stake - Proof of A	Activity
- Proof of Ela	psed Time - Proof of Burn.	

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UNIT - II
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UNIT - I

CRYPTOCURRENCY

OVERVIEW OF BLOCKCHAIN

Bitcoin : Bitcoin Working - Bitcoin Transactions - Bitcoin Mining - Value of Bitcoin - Community, Politics and Regulations – Advantages – Disadvantages. Ethereum : Overview – Decentralized Application. Components of Ethereum : Smart contracts – Ether - Ethereum Clients - Ethereum Virtual Machine – Etherscripter.

UNIT - III

DEVELOPMENT FRAMEWORKS

Digital Tokens : Overview - Initial Coin Offering – OmiseGO – EOS – Tether. Meta Mask: Wallet Seed – Meta Mask Transactions. Mist : Overview - Mist wallet. Truffle: Features of Truffle – Development Truffle boxes - Community truffle box.

UNIT - IV

HYPERLEDGER

Hyperledger Fabric : Introduction - Fabric v/s Ethereum – Hyperledger Iroha - Features of Iroha. Hyperledger Sawtooth : Components of sawtooth - Proof of Elapsed time.



UNIT - V

BLOCKCHAIN PLATFORMS

9

Multichain - HydraChain. Future Blockchain : IOTA – Corda - Chain Core. Blockchain Framework : CoCo Framework – Tierion – BigchainDB.

Total Instructional hours : 45

	Course Outcomes	
CO1	Understand how the structure and data distribution in blockchain contribute to its decentralized and secure nature.	
CO2	Identify how Bitcoin mining operates and contributes to the network's security.	
CO3	Develop smart contracts using Truffle and deploying them to Ethereum test networks.	
CO4	Understand the role of permissioned blockchain frameworks like Hyperledger in addressing real-world challenges	
CO5	Plan the key use cases of these platforms in various industries, including finance, IoT, and supply chain.	
Reference Books		
1.	Chellammal Surianarayanan, Kavita Saini, Pethuru Raj, "Blockchain Technology and Applications", CRC Press, 2020.	
2.	Shahid Shaikh, "Building Decentralised Applications Using Blockchain's Core Technology", Bpb Publications, 2021.	
3.	Abhishek Verma, "Intelligent Analytics for Industry 4.0 Applications", CRC Press, 2023.	
4.	Antony Lewis, "The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them", Mango Media, 2021.	
5.	Eppo Luppes, "Blockchain Foundation Courseware", Van Haren Publishing, 2020.	



МСА		L	т	Р	С
WI.C.A	WZSCALSUZ - CLOUD COWFOTING	3	0	0	3

	Course Objectives		
1.	To explain the broad perceptive of cloud architecture and model.		
2.	To understand the concept of Virtualization and design of cloud Services.		
3.	To explain the lead players in Cloud Infrastructure and IOT.		
4.	To understand the features of cloud simulator.		
5.	To apply different cloud programming model as per need. To learn to design the trusted cloud Computing system.		

UNIT	- 1
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CLOUD ARCHITECTURE AND MODEL

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Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models : Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

UNIT - II

VIRTUALIZATION

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

UNIT - III

CLOUD INFRASTRUCTURE AND IOT

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Global Exchange of Cloud Resources - Enabling Technologies for the Internet of Things – Innovative Applications of the Internet of Things.

UNIT - IV

PROGRAMMING MODEL

9

Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative Map Reduce – Hadoop Library from Apache – Mapping Applications - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Aneka, CloudSim.



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UNIT - V

SECURITY IN THE CLOUD

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Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – DataSecurity – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

	Course Outcomes : Students will be able to
CO1	Compare the strengths and limitations of cloud computing.
CO2	Classify the architecture, infrastructure and delivery models of cloud computing
CO3	Apply suitable virtualization concept.
CO4	Select the optimal cloud player, programming models, and approach to meet specific business requirements
CO5	Outline the key considerations for setting up a private cloud, addressing security, privacy, and interoperability
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	Reference Books
1.	Ganesh Kumar R, Rituraj Jain, Amit Shrivastava, S.V.N. Sreenivasu, "Mastering Cloud Computing Technology", INSC International Publisher (IIP), 2021.
2.	John G. Mooney, Jörg Domaschka, Keith A. Ellis, Theo Lynn, "Managing Distributed Cloud Applications and Infrastructure : A Self-Optimising Approach", Springer International Publishing, 2020.
3.	Agarwal, Sanyam, "Improving Security, Privacy, and Trust in Cloud Computing", IGI Global, 2024.
4.	John R. Vacca, "Cloud Computing Security : Foundations and Challenges", CRC Press, 2020.
5.	Douglas Comer, "The Cloud Computing Book : The Future of Computing Explained", CRC Press, 2021.



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MCA		L	Т	Р	С
WI.C.A	M23CAE303 - HOMAN RESOURCE MANAGEMENT	3	0	0	3

	Course Objectives
1.	To understand the importance of human resources.
2.	To explain the steps involved in the human resource planning process.
3.	To understand the stages of employee socialization and training needs.
4.	To explain about the purposes of performance management systems and appraisal.
5.	To apply the list of occupational safety and health administration enforcement priorities.

UNIT - I	UNDERSTANDING HRM WITH LEGAL & ETHICAL CONTEXT	9		
Introduction - Importance of HRM – functions – Structure of HRM Department - Trends and opportunities				
- External Influences Affect HRM - HRM in global environment - The Changing World of Technology				
- HR & Corporate Ethics – Equal Employment Opportunities - Laws Affecting discriminatory practices –				
Enforcing Equal Opportunity Employment - Discipline & Employee Rights.				

UNIT - II

STAFFING, RECRUTING AND FOUNDATIONS OF SELECTION

Introduction – An Organizational Framework - Job analysis - Methods - Purpose – Recruiting Goals – Recruiting Sources – Recruiting A Global Perspective - Selection Process – Selection from Global Perspective - job offers – Avoiding hiring mistakes - key element for successful predictors.

UNIT - III

TRAINING AND DEVELOPMENT

Introduction – Socialization Process - Purpose of New employee orientation, Employee training -Employee Development – Organization development Calm Waters Metaphor – White - Water Rapids Metaphor – Evaluating training and Development Effectiveness - international training and development issues – Career Development - Value for organization and individual – mentoring and coaching – traditional career stages.



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UNIT - IV PEI

PERFORMANCE EVALUATION, REWARDS AND BENEFITS

Appraisal process – methods – factors distort appraisal – team appraisal – international appraisal – rewards – Theories of motivation - compensation administration – job evaluation and pay structure – special cases of compensation – executive compensation programs – employee benefits Voluntary Benefits - International Compensation.

UNIT - V

SAFE AND HEALTHY WORK ENVIRONMENT

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Occupational safety and health act - Contemporary Health and Safety Issues – Employee assistance program – International Safety & Health - labor management - employee unions – labor legislation - Unionizing Employees - Collective Bargaining.

Total Instructional hours : 45

	Course Outcomes : Students will be able to
CO1	Identify the primary external influences affecting HRM.
CO2	Outline the components and the goals of staffing, training and development.
CO3	Understand the significance of training and development in a organization.
CO4	Understand the practices used to retain the employees and able to evaluate their performance.
CO5	Identify and evaluate current health and safety concerns affecting the modern workforce.

	Reference Books				
1.	V.S.P. Rao, "Taxmann's Human Resource Management", Taxmann Publications Private Limited, 2023.				
2.	Vibrant Publishers, "Human Resource Management Essentials You Always Wanted To Know", 2020.				
3.	Gary Dessler, Biju Varkkey, "Human Resource Management", Pearson India Education Services, 2020.				
4.	Susan L. Verhulst, David A. DeCenzo, "Fundamentals of Human Resource Management", Wiley, 2021.				
5.	Greg L. Stewart, Kenneth G. Brown, "Human Resource Management: Linking Strategy to Practice", Wiley, 2020.				



МСА	A M23CAE304 – DIGITAL IMAGE PROCESSING	L	т	Р	С
WI.C.A		3	0	0	3

Course Objectives				
1.	Understand the elements of visual perception and how humans interpret digital images			
2.	Explain the concepts and Applications of 1D and 2D Discrete Fourier Transforms			
3.	Apply image enhancements in the spatial and frequency domain.			
4.	Understand the importance of image segmentation and Feature Extraction			
5.	Outline the different type of compression techniques			

DIGITAL IMAGE FUNDAMENTALS

Elements of visual perception, Image Acquisition Systems, Sampling and Quantization, Image Formation, Image Geometry, Different types of digital images. Relationship between pixels, Basic concepts of distance transform, Color Image fundamentals - RGB - HIS Models, Different color models - conversion.

UNIT - II IMAGE TRANSFORMS

1D Discrete Fourier Transform (DFT), 2D transforms – DFT, Discrete Cosine Transform, Walsh and PCA – Wavelet transform - Hough Transform.

UNIT - III

UNIT - I

IMAGE ENHANCEMENT

Histogram Equalization, Spatial Domain : Basics of Spatial Filtering : smoothing and sharpening spatial filters. Frequency domain : smoothing and sharpening frequency domain filters, Ideal, Gaussian filters.

UNIT - IV

IMAGE SEGMENTATION AND FEATURE EXTRACTION

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Segmentation : Point detection, line detection, edge detection, Region based segmentation, Region. Splitting and Merging Technique. Thresholding Techniques : multilevel thresholding, optimal thresholding using Bayesian classification. Feature Extraction : GLCM, Morphological operation.



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UNIT - V

IMAGE COMPRESSION

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Lossy and lossless compression schemes, prediction based compression schemes, sub-band encoding schemes, JPEG compression standard, Fractal compression scheme, Wavelet compression scheme - Medical Image Processing – Satellite Image Processing.

Total Instructional hours : 45

	Course Outcomes : Students will be able to				
CO1	Understand the impact of different sampling rates and quantization levels on image quality and storage.				
CO2	Apply filtering and enhancement of images using frequency domain techniques with DFT				
CO3	Construct a method for image enhancement using spatial domain and frequency domain techniques.				
CO4	Apply Morphological Image Processing techniques by extract the features of an image.				
CO5	Apply the different image compression techniques in various applications.				

Reference Books				
1.	"Digital Image Processing and Applications", Horizon Books (A Division of Ignited Minds Edutech P Ltd), 2021.			
2.	A Baskar, Muthaiah Rajappa, Shriram K Vasudevan, T S Murugesh, "Digital Image Processing", CRC Press, 2023.			
3.	Dougherty, "Digital Image Processing Methods", CRC Press, 2020.			
4.	Paulo Ambrosio, "Digital Image Processing Applications", Intech Open, 2022.			
5.	Dr. S. Rajakumaran, " Advanced Digital Image Processing", Academic Guru Publishing House, 2023.			



Professional Elective – III

M.C.A	M23CAE305 – DATA MINING AND	L	т	Р	С
	DATA WAREHOUSING TECHNIQUES	3	0	0	3

Course Objectives			
1.	To explain different patterns discovered through association rule mining.		
2.	To illustrate classification techniques for handling large datasets		
3.	To understand prediction techniques in data mining.		
4.	To understand various clustering techniques and how they are applied in real-world scenarios		
5.	To illustrate data warehousing architecture and its implementation.		

DATA MINING & DATA PREPROCESSING

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Data Mining – Concepts, DBMS vs Data mining, kinds of Data, Applications, Issues and Challenges – Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

UNIT - II	ASSOCIATION RULE MINING AND CLASSIFICATION	9
UNIT - II	ASSOCIATION RULE MINING AND CLASSIFICATION	9

Introduction to Association rules – Association Rule Mining – Mining Frequent Itemsets with and without Candidate Generation – Classification versus Prediction – Data Preparation for Classification and Prediction

UNIT - III	
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UNIT - I

CLASSIFICATION AND PREDICTION TECHNIQUES

Classification by Decision Tree – Bayesian Classification – Rule Based Classification – Bayesian Belief Networks – Classification by Backpropagation – Support Vector Machines – K-Nearest Neighbor Algorithm – Linear Regression, Nonlinear Regression

UNIT - IV

CLUSTERING TECHNIQUES

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Cluster Analysis – Partitioning Methods: k-Means and k-Medoids – Hierarchical Methods : Agglomerative and Divisive – Model Based Clustering Methods : Fuzzy clusters and Expectation Maximization Algorithm



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UNIT - V

DATA WAREHOUSE

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Need for Data Warehouse – Database versus Data Warehouse – Multidimensional Data Model – Schemas for Multidimensional Databases – OLAP operations – OLAP versus OLTP – Data Warehouse Architecture – Extraction, Transformation and Loading (ETL)

	Course Outcomes : Students will be able to		
CO1	Summarize the fundamental concepts, applications, and challenges in data mining.		
CO2	Explain association rule mining techniques and classification methods.		
CO3	Apply classification and prediction techniques to analyze datasets.		
CO4	Compare various clustering techniques based on their methodologies		
CO5	Utilize data warehousing concepts to support decision-making processes.		

	Reference Books		
1.	Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques," 4th Edition, Morgan Kaufmann, 2022.		
2.	Ketan Shah, Neepa Shah, "Practical Data Mining Techniques and Applications", CRC Press, Taylor & Francis Group, 2023.		
3.	Sonali Agarwal, M. D. Tiwari, Iti Tiwari, "E-Governance Data Center, Data Warehousing and Data Mining", River Publishers, 2022.		
4.	Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics," Wiley, 2020.		
5.	Dnyandeo Khemnar, Nilesh Thorat, "Effective Data Mining Techniques for Unstructured Data in Big Data", GRIN Verlag, 2022		



МСА		L	т	Р	С
WI.C.A	WZSCAESUU - PROFESSIONAL ETHICS	3	0	0	3

Course Objectives		
1.	To understand the concepts of Professional ethics in the work environment.	
2.	To explain the threats in computing environment.	
3.	To understand the importance of Freedom of Expression and Privacy	
4.	To outline the significance of Intellectual Property	
5.	To understand the benefits and challenges of using social networking platforms for business purposes	

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Definition of Ethics - Right, Good, Just - The Rational Basis of Ethics - Theories of Right : Intuitionist vs.		
End-Based v	End-Based vs. Duty-Based - Rights, Duties, Obligations - Theory of Value - The Importance of Integrit	
- The Differer	nce Between Morals, Ethics, and Laws - Ethics in the Business World - Corporate S	Social
Responsibility	y - Creating an Ethical Work Environment – Including Ethical Considerations in De	ecision
Making.		

INTRODUCTION TO FTHICS

UNIT - II	ETHICS IN INFORMATION TECHNOLOGY, INTERNET	
IT Profession	als - Are IT Workers Professionals - Professional Codes of Ethics - IT Professional	Ethics,
Three Codes	of Ethics, Management Conflicts. Types of Perpetrators-Federal Laws for Pros	ecuting

Computer Attacks Implementing Trustworthy Computing.

UNIT - III

UNIT - I

FREEDOM OF EXPRESSION, PRIVACY

Freedom of Expression : Key Issues - Controlling Access to Information on the Internet - Anonymity on the Internet - Information Privacy - Privacy Laws, Applications, and Court Rulings - Key Privacy and Anonymity Issues Data Breaches - Electronic Discovery-Consumer Profiling - Workplace Monitoring – Advanced Surveillance Technology.

UNIT - IV FREEDOM OF EXPRESSION, INTELLECTUAL PROPERTY

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Intellectual Property Rights - Copyrights - Copyright Term - Eligible Works - Fair Use Doctrine - Software Copyright Protection – Copyright Laws and the internet - Patents - Software Patents - Cross - Licensing Agreements - Key Intellectual Property Issues - Plagiarism - Reverse Engineering - Competitive Intelligence.



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UNIT - V

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SOCIAL NETWORKING ETHICS AND ETIQUETTES

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Social Networking Web Site - Business Applications of Online Social Networking - Social Network Advertising - The Use of Social Networks in the Hiring Process - Social Networking Ethical Issues – Cyber bullying - Online Virtual Worlds - Crime in Virtual Worlds - Educational and Business Uses of Virtual Worlds.

	Course Outcomes : Students will be able to
CO1	Understand the need for applying ethical principles, values to tackle various situations.
CO2	Develop the ability to make ethical decisions based on professional codes and industry standards.
CO3	Identify the different methods used to control access to information on the internet.
CO4	Understand the key principles of copyright protection, including fair use and exceptions.
CO5	Identify common crimes and ethical issues that occur in virtual world.
Reference Books	

	Reference books		
1.	Wade L. Robison, "Practical and Professional Ethics: Key Concepts", Bloomsbury Publishing, 2021.		
2.	Bruce Maxwell, Dianne Gereluk, Christopher Martin, "Professional Ethics and Law in Education", Canadian Scholars, 2022. A Canadian Guidebook",		
3.	Nigel Duncan, The City Law School, Oliver Hanmer, Robert McPeake, "Professional Ethics", Oxford University Press, 2020.		
4.	Dr. Gupta Shubham Lalbabuprasad, "Human Values And Professional Ethics", AG PUBLISHING HOUSE (AGPH Books), 2022.		
5.	"What is Intellectual Property?", WIPO, World Intellectual Property Organization, 2022.		



МСА		L	Т	Р	С
IVI.C.A	WZSCAESU/ - BIG DATA ANALTHUS	3	0	0	3

	Course Objectives
1.	To understand fundamentals of Big Data and analyzing data.
2.	To explain about file system configuration in HADOOP.
3.	To understand Map Reduce concept of Hadoop in executing Task.
4.	To Identify different types of queueing systems and their applications
5.	To understand the process of registering and invoking UDFs in Pig scripts.

UNIT - I	INTRODUCTION TO BIG DATA AND HADOOP
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Types of Digital Data - Introduction to Big Data - Challenges of conventional systems - Web data – Evolution of Analytic scalability - Analytic Processes and Tools - Analysis vs Reporting - History of Hadoop - Apache Hadoop - Analyzing Data with Hadoop - Hadoop Streaming.

UNIT - II

HDFS & HADOOP I/O

Hadoop Distributed File System : The Design of HDFS - HDFS Concepts - The Command - Line Interface - File Systems - Data Flow - Parallel Copying with distcp - Archives Hadoop I/O : Data Integrity - Compression - Serialization.

UNIT - III

MAPREDUCE

Analyzing the Data with Hadoop - Hadoop Pipes - MapReduce Types - Input Formats - Output Formats - MapReduce Features - MapReduce Works - Anatomy of a MapReduce Job Run – Failures - Job Scheduling - Shuffle and Sort - Task Execution.

UNIT - IV

QUEUEING AND STREAM PROCESSING SYSTEMS

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Queueing : Queueing systems, Introduction to kafka, producer consumer, brokers, types of queues - single consumer, multi consumer queue servers. Streaming systems : Stream processing – queues and workers - micro batch streaming processing - introduction to kafka streaming processing API.



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UNIT - V

HADOOP FRAMEWORKS

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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.

	Course Outcomes : Students will be able to		
CO1	Understand Big Volume of Data and Hadoop Fundamentals.		
CO2	Illustrate the concepts of HDFS and perform operations on data as files and directories.		
CO3	Apply MapReduce Concept with Big Data.		
CO4	Apply event streaming using Kafka API.		
CO5	Make use of the Hadoop framework to access a volume of data.		

	Reference Books		
1.	Dina Darwish, "Big Data Analytics Techniques for Market Intelligence", IGI Global, 2023.		
2.	Dr. T. Vijaya Saradhi, "Fundamentals of Big Data Analytics", GCS PUBLISHERS, 2022.		
3.	Amir H. Gandomi, Hemant Kumar Gianey, M. Niranjanamurthy, "Advances in Data Science and Analytics : Concepts and Paradigms", Wiley, 2022.		
4.	Amjad Shamim, Meghna Chhabra, Rohail Hassan, "Entrepreneurship and Big Data : The Digital Revolution", CRC Press, 2021.		
5.	Gwen Shapira, Todd Palino, Rajini Sivaram, Krit Petty, " Kafka : The Definitive Guide", O'Reilly Media, 2021.		



MCA		L	т	Р	С
IVI.C.A	W23CAE306 - SOFTWARE QUALITY AND TESTING	3	0	0	3

	Course Objectives
1.	To understand the behavior of testing techniques and to design test cases.
2.	To outline the importance of software testing methodologies.
3.	To explain the advanced modern software testing tools and trends.
4.	To summarize the software quality Assurance and software quality Standards
5.	To understand the significance of Statistical Methods in Software Quality and continuous improvement.

UNIT - I	INTRODUCTION	9

Basic concepts and Preliminaries – Theory of Program Testing – Unit Testing – Control Flow Testing – Data Flow Testing – System Integration Testing.

UNIT - II	SOFTWARE TESTING METHODOLOGY
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Software Test Plan – Components of Plan - Types of Technical Reviews - Static and Dynamic Testing – Software Testing in Spiral Manner - Information Gathering - Test Planning - Test Coverage - Test Evaluation - Acceptance Test – Summarize Testing Results.

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EMERGING SPECIALIZED AREAS IN TESTING

Test Process Assessment – Test Automation Assessment - Test Automation Framework – Agile Testing – Testing Center of Excellence – Onsite / Offshore Model - Modern Software Testing Tools – Software Testing Trends – Methodology to Develop Software Testing Tools.

UNIT - IV

SOFTWARE QUALITY MODELS

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Software quality – Verification versus Validation – Components of Quality Assurance – SQA Plan – Quality Standards – CMM – PCMM – CMMI – Malcolm Baldrige National Quality Award.

This
Approved by BoS Chairman

UNIT - V

QUALITY THROUGH CONTINUOUS IMPROVEMENT PROCESS

Role of Statistical Methods in Software Quality – Transforming Requirements into Test Cases – Deming's Quality Principles – Continuous Improvement through Plan Do Check Act (PDCA)

Total Instructional hours : 45

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	Course Outcomes : Students will be able to
CO1	Understand the software testing techniques to cater to the need of the project.
CO2	Utilize static techniques such as code inspections and dynamic testing methods
CO3	Apply Agile Testing principles to seamlessly integrate testing with Agile development practices.
CO4	Understand and apply software quality standards to improve software development processes.
CO5	Make use of statistical methods to track and improve software quality.

	Reference Books		
1.	Paul C. Jorgensen, Byron DeVries , "Software Testing: A Craftsman's Approach, Fifth Edition, CRC Press, 2021.		
2.	Alex Nordeen, "Learn Software Testing : Definitive Guide to Learn Software Testing for Beginners", Guru99, 2020.		
3.	Ralf Bierig, Stephen Brown, Edgar Galván, Joseph Timoney, "Essentials of Software Testing", Cambridge University Press, 2021.		
4.	Andreas Spillner, Tilo Linz, "Software Testing Foundations", 5th Edition, Rocky Nook, 2021.		
5.	Abu Sayed Mahfuz, "Software Quality Assurance: Integrating Testing, Security, and Audit", CRC Press, Taylor & Francis Group, 2021.		

This
Approved by BoS Chairman