Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology

Study & Evaluation Scheme

Master of Technology
(Computer Science & Engineering)

[Applicable w.e.f. Academic Session 2017-18 till Revised]

FACULTY OF ENGINEERING & TECHNOLOGY

RAMA UNIVERSITY, UTTAR PRADESH, KANPUR

Website: www.ramauniversity.ac.in

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology

Ref: RU/FET/CSE/BOS/2017/002 **Dated: 15-May-2017**

Faculty of Engineering & Technology

Department of Computer Science & Engineering

Minutes of Meeting

Boards of Studies

A meeting of Boards of Studies of Computer Science & Engineering (M. Tech) held on 15-May-2017 in Director Office. The following members were present:

1. Dr. Vivek Srivastava - Chairperson
2. Mr. Sarvesh Kumar - Member
3. Mr. Somendra Tripathi - Member
4. Ms. Lalita Mishra - Member

The following members agreed to review the minutes in Delhi.

1. Dr. Bipin Kumar Tripathi - External Member
2. Mr. Pankaj Singh Patel - External Member

Agenda:

1. Action Taken Report (ATR) on the basis of feedback from Stack holder/External member.

The BOS committee confirmed the minutes of the BOS meeting held on 15-May-2017

2. To consider and approve changes in the Evaluation Scheme and Syllabus

S. No.	Item No.	Existing		Recommendation /Action Taken
1	**RU/FET/CSE/BOS/2017/002**	The Subject code and Syllabus of the following from the existing Evaluation Scheme and Syllabus as		The BOS considered changes Syllabus and thereafter discussion, recommended such changes latest technologies in Syllabus and Course Outcomes (CO) and Program Outcomes (PO)
		Existing	Proposed	
		Semester I (Core Subject) :		
		MCS-101: Foundations of Computer Science	**MCS-105**: Deep Learning & Hybrid Intelligence	
		MCS-153: Operating System Lab	**MCS-155**: Deep Learning & Hybrid Intelligence Lab	

3. Question Paper Format

4. Any other issue with the permission of the Chair: ----

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

Date of the Next Meeting: to be decided and conveyed later

Chairperson

Signature: .....

Name : Dr. Vivek Srivastava

Date :

Internal Members

Signature: 1..... 2.....

Name: Mr. Sarvesh Kumar Mr. Somendra Tripathi

Date:

Signature: 3.....

Name: Ms. Lalita Mishra

Date:

External Members

Signature: 1..... 2.....

Name: Dr. Bipin Kumar Tripathi Mr. Pankaj Singh Patel

Date:

Encl.: Recommended Curricula attached for consideration and approval.

CC:

1. Dean

2. Registrar Office

Program Educational Objectives

At Rama University Computer Science and Engineering program will prepare its Post-graduates to:

PEO1: To produce post graduates who can contribute in research and development to the advancement of computer science and engineering.

PEO2: To impart knowledge and skills to analyze, design, test and implement diverse range of software.

PEO3: To develop team work capability so that they can work on multidisciplinary projects and exhibits high level of professional and ethical values.

Program Specific Outcomes

- Able to take on existing models, techniques, algorithm etc. for efficient solving problems.
- Able to design, develop and evaluate a new and innovative project which meet the desired needs of industry and society.
- Able to apply software engineering principles and practices to provide software solution.
- Able to take up higher studies, Research & Development and Entrepreneurships in the modern computing environment.

Program Outcomes:

The main outcomes of the M.Tech (CSE) program are given here. At the end of the program a student shall be able:

PO1: To apply fundamental and advanced scientific and engineering knowledge in the area of computer science and engineering.

PO2: To evaluate and critically analyze complex software engineering problems, identify their optimal solutions and be able to implement the solution.

PO3: To work upon unfamiliar problems through investigative studies and research and contribute to the development of technological knowledge available in the world.

PO4: To transfer technology effectively on broadly defined engineering needs with engineering community and with society by using advanced computing techniques and tools.

PO5: To work in a collaborative manner and to identify opportunities by working with others.

PO6: To work on a project using project management principle and to provide leadership to team and project.

PO7: To engage in lifelong learning adopt new developments and participate in ongoing education opportunities to endorse personal and organizational growth.

PO8: To demonstrate independent learning and scholarship by adopting research pursuits

PO9: To develop skill to express and communicate effectively while carrying out discussion, making presentation and writing reports etc.

PO10: To use the technical skills and modern engineering tools including simulation and modeling for engineering needs.

PO11: To understand professional and ethical responsibility.

ORDINANCE, RULES, REGULATIONS

of

Master of Technology Programmes

RAMA UNIVERSITY UTTAR PRADESH
KANPUR

Mater of Technology Programmes

Title

This ordinance shall be called as "The Rama University Uttar Pradesh, Faculty of Engineering &Technology Ordinance Governing Two Years M.Tech. Degree Course"

APPLICABILITY:

This ordinance shall apply to all programmes leading to Master's Degrees in Technology.

1. DEFINITIONS:

1. Academic Programme/ Programmes shall mean a programme of courses and/or any other component leading to a Master's degree in Technology.

2. An Academic Year is a period of nearly 12 months devoted to completion of requirements specified in the Scheme of Teaching and the related examinations.

3. Board of Studies (BoS) shall mean the Board of Studies of the Institute concerned.

4. Course means a component of the academic programme, carrying a distinctive code number and specific credits assigned to it.

5. University shall mean **Rama University**

6. External Examiner shall mean an examiner who is not in the employment of the University.

7. Semester System – A programme wherein each academic year is apportioned into two parts known as semesters.

8. Student shall mean a person admitted and registered for a programme in the Institutes of the University.

2. CURRICULUM

M.Tech. courses shall be of any one of the following types:

(a) M.Tech. (Residential/Full-Time/Regular): It shall be a regular four-semester course in which students will be required to spend the entire study duration in the University campus or the Industry/ Institution/ R&D Organization where they shall be doing their dissertation/ project work.

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(b) M.Tech. (Week-End): It shall be a regular four-semester course specially run by the University for working teachers, persons employed in Industry or Research and Development Organizations, who have a 5-day working week. The programme consists of three semesters of coursework in the University campus and one semester of dissertation/ project work in the University or in the Industry/ Institution/ R&D Organization. Number of contact hours in each subject will be the same as that of Residential M.Tech. Course. A candidate shall normally be required to submit a no objection certificate from his/her employer for this course.

(c) M.Tech. (Part Time): It shall be a six-semester part-time course meant for serving engineers/ teachers of the neighboring areas who can attend the classes during morning or evening hours only. A candidate shall normally be required to submit a no objection certificate from his/her employer for this course.

3. Duration of the Course

(PROGRAMMES CONTENT & DURATION)

(a) A Master's Degree programme shall comprise of a number of courses and/or other components as specified in the Teaching & Examination Scheme of the concerned programme duly approved by the Academic Council.

(b) The minimum period required for completion of a programme shall be the programme duration as specified in the Teaching & Examination Scheme for the concerned programme.

(c) The maximum permissible period for completing a programme for which the prescribed programme duration is n semesters, shall be (n+2) semesters. All the programme requirements shall have to be completed in (n+2) semesters. Under very special circumstances the duration of the total period may further be extended by a maximum of two (2) semesters with the approval of the Vice Chancellor. This excludes the period of expulsion or suspension by the University / medical leave.

(d) (i) A student may be allowed to "audit" a course(s) not included in the Teaching & Examination Scheme, or one of the elective course(s) in the Teaching & Examination Scheme, which the student is not opting for as a credit course.

(ii) The University may ask a student to audit one or more courses as pre-requisite courses so as to make up any deficiency at the entry level.

(iii) Such audited course(s) shall be shown in the final mark-sheet under a distinct head of "Audited Course(s)" provided the attendance requirement of the course is duly certified to have been met by the concerned teacher(s).

IV. However, a student shall neither be entitled to any credits for such course(s), nor these shall be considered for the purpose of declaration of results.

(e) Except for the first semester, registration for the next semester will be done during the first week of the next semester.

(f) From the second semester onwards, all students have to enroll on a specified day at the beginning of a semester. A student is eligible for enrolment if he has paid all the dues for the semester.

4. ELIGIBILITY FOR ADMISSION

B.Tech. or an equivalent degree in the relevant branch of Engineering with a minimum of 50% marks from a recognized University.

OR

MCA or M.Sc. degree in a related branch with 55% or higher aggregate marks from a recognized University

4.1 Medium of Instruction

The medium of instruction and examination shall be in English only.

4.2 Number of seats

Number of students to be admitted each year and the number of batches shall be decided and notified by the University from time to time; based upon the Rules, instructions and Notifications issued by The UGC and the Government of Uttar Pradesh.

5. Procedure for Admission

At the relevant time admission to the course shall be governed by The Acts, Statutes and Ordinances in force and issued by the University. Admission to the Course shall be made strictly on the basis of the merit of the Entrance Test. Provided that while making admission to the course reservation policy of the Government of Uttar Pradesh governing admission to higher educational Institutions issued from time to time shall be applied.

6. Fee's

A student shall pay the fee prescribed by the University from time to time

7. Attendance

All students are normally expected to have attendance of 100% in each subject (Lectures, Tutorials and Practical's). The attendance can be condoned upto 25% for genuine reasons. The Director of the concerned Institute/ Programme Coordinator may give further relaxation up to 10% on account of illness and other pre-approved occasions. Vice Chancellor may further condone attendance shortage up to 5% on genuine grounds. However, under no circumstances, a student with an attendance of less than 60% in a subject shall be allowed to appear in the semester-end examination of that subject. Provided that the late admitted students in the first semester of any course maintain at least 80% attendance (including medical and other reasons) from the date of their admission.

Director/Dean of the Institute / Programme Coordinator shall announce the names of all such students who are not eligible to appear in the subject(s) of semester-end examination, at least one week before the start of the semester-end examination and simultaneously intimate the same to the Controller of Examinations.

In case any student appears in the Examinations by default, who in fact has been detained by the Institute, his/ her result shall be treated as null and void.

8. Make-up Policy

Any student who misses any component of evaluation for genuine reasons must directly approach the instructor- in- charge/ instructor with a request for make-up examination stating the reasons, prior to the commencement of the examination. If the instructor-in-charge is satisfied with the request, he may arrange as soon as possible a make-up examination for the component of evaluation which the student had missed. If, on rare occasion, a student anticipates a genuine difficulty in meeting the date of the component of evaluation, he should take his instructor-in-charge/instructor into confidence prior to the event. The decision of the instructor-in-charge in all matters of make-up shall be final.

9. Curriculum:(basis of programmes)

9.1 The 2 year curriculum has been divided into 4 semesters in full time programme and shall include lectures, tutorials, practicals, seminars and projects etc. in addition to industrial training and educational tour etc. as defined in the scheme and executive instructions issued by the University from time to time. And programme duration shall be basis on clause 2.(a,b,c)

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

10. Change of Branch:

10.1 Change of branch may be allowed against the vacant seats in the following two stages, provided criteria at following sub clauses is satisfied: branch shall be change basis on vice chancellor approval

10.2 Further change of branch shall not be permitted.

11. Teaching

The objective of classroom education is to awaken the curiosity of the student, generate habits of rational thinking in him, gear his mind to face the unfamiliar and train him to stand on his own. Classroom instruction helps the student in the organization and correlation of facts, comprehension of ideas and the creative use of knowledge.

The teacher also has the additional responsibility to make the student search for knowledge on his own and induce him to use additional facilities like the library, laboratory and the environment, to optimize his learning process. Self-study by the student would therefore form an important factor in the planning of teaching and evaluation. The student is required to cooperate and respond to this challenge.

Every course whether single-section or multi-section is conducted by a member of the faculty called instructor-in-charge, with the assistance, wherever necessary, of the required number of instructors who will be partners with him in meeting the full academic perceptions and organizational needs of teaching the course and evaluating the students. Wherever the instructor-

in-charge is mentioned hereafter, it connotes the team of instructors, acting as one entity under his captainship.

The instructor-in-charge should make a comprehensive plan in respect of conducting the course even before the semester begins. In a multi-section course, all instructors must remain in continuous interaction in order to ensure a smooth operation of the course. While recognizing variations due to personal attitudes and styles, it is important that these are smoothened out so that the operation and grading in different sections in a course, indeed between courses across the faculty, are free from any seeming arbitrariness.

At the beginning of class work, the instructor, in-charge/instructor must announce to his class/ section through a Course Handout/Lesson Plan, the necessary information in respect of (i) the operations of the course (its pace, coverage and level of treatment, textbooks and other reading assignments, home tasks etc); (ii) various components of evaluation, such as tutorials, laboratory exercises, home assignment, several quizzes/tests/examinations (announced or unannounced, open book or closed book), regularity of attendance, etc. (iii) the frequency, duration, tentative schedule, relative weightage etc., of these various components; (iv) the broad policy which governs decisions about make-up; (v) mid-semester grading; (vi) grading procedure (overall basis, review of border line cases, effect of class average etc.) vii) Chamber consultation hours and (viii) other matters found desirable and relevant.

12. Examination:

12.1 The performance of a student in a semester shall be evaluated through continuous evaluation and end semester examination. The continuous evaluation shall be based on Mid Term Examination, assignments/tutorials, quizzes/viva-voce and attendance. The marks for continuous evaluation (Sessional marks) shall be awarded at the end of the semester. The end semester examination shall be comprised of written papers, practical's and viva-voce, inspection of certified course work in classes and laboratories, project work, design reports or by means of any combination of these methods.

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12.2 The distribution of marks for Sessional, end semester theory papers, practicals and other examinations, seminar, project, industrial training shall be as prescribed.

12.3 The marks obtained in a subject shall consist of marks allotted in end semester theory paper, practical examination and sessional work.

12.4 The minimum pass marks in each theory subject (including sessional marks) shall be 50% with a minimum of 40% marks in each theory paper in the end semester examination. If there is no provision of sessional marks in any subject, the minimum pass marks in that subject shall be 50% in the end semester examination.

12.5 The minimum pass marks in a project/practical subject (including Sessional marks if any) shall be 50%.

12.6 A candidate, in order to pass, must secure 50% marks in the aggregate in a particular academic year inclusive of both semesters of the academic year subjected to conditions as bye laws

12 (b) Carryover System:

A candidate satisfying university clause shall be required to exercise his/her choice up to a maximum of four theory papers in year which he/she desires to appear in the examination to fulfill the requirements of clause. He/she shall inform the college about his/her choice within 15 days after the start of new session.

The highest marks secured in any subject in various attempts (end semester and carryover examinations) shall be considered.

12.(c) Ex-studentship:

A candidate opting for ex-studentship shall be required to appear in all the theory & practical subjects in the end semester examinations of both semesters of the same academic year. However, the marks pertaining to Sessional, Industrial Training, and Seminar shall remain the same as those secured earlier.

A candidate opting for ex-studentship shall be required to apply to the FET by paying only examination fee within 15 days from the start of new session.

12 (D) Re-admission:

- A Candidate may be allowed for re-admission provided he/she satisfies one of the following conditions:
- A candidate is declared fail.
- A candidate did not appear in a semester examination / or he/she was not granted permission to appear in the examination.
- A candidate has been detained by the department and subsequently has been permitted to take re-admission.
- A candidate as an ex-student passed the examination of the academic year or qualified for carryover system.

A candidate promoted with carry over subjects and he/she opted for re- admission.

13. Evaluation Feedback

Just as evaluation is done in continuous manner, feedback should also be available in a continuous manner. Thus, the answer scripts must be promptly evaluated, shown to the students for them to obtain any clarification on their performance and returned to the students whenever practical. The performance of the students in the examination should be discussed in the class giving as much details as possible like the highest, lowest and average performances. Solutions with marking schemes are displayed soon after a test.

14. Promotion:

The result of a candidate shall be declared on the basis of performance of both semesters of the same academic year. However, a final year student, who is not permitted in any one of the final year semester examinations due to shortage of attendance, will be permitted in that particular semester of the next academic session to study as a regular student and appear at that semester examination.

- Result of the final year shall be declared on the basis of working out Grand Total by adding marks of all the years of study in the following ways:

Award of Division: The division shall be awarded on the basis of final year result.

15. Grace Marks:

A candidate may be awarded grace marks up to a maximum of total 5 marks, in maximum one theory subjects

The grace marks shall not be added to the aggregate marks.

16. Reports

At the end of the course, in certain situations, the instructor-in-charge may report certain events/facts in suitable words, in place of grades discussed earlier. These reports are not to be construed as grades. The various reports listed below are elaborated in the subsequent clauses.

- Incomplete (I)
- Grade Awaited (GA)
- Withdrawn (W)
- Registration Cancelled (RC), Required to Register (RR), Discontinued from the Program (DP)
- Not Cleared (NC)

Incomplete (I)

If the instructor-in-charge finds a student having not fulfilled some of the requirements of a course before the final deadline for transmitting the grade, and he is satisfied that he is able to transmit some grade or a report with or without this particular fulfillment, but at his discretion wishes to give the student an opportunity, he may, within the deadline, send a report 'I' (Incomplete) and also inform the student of the same. It shall be the responsibility of the student to contact the instructor-in-charge in time for replacement of the 'I' report within two weeks after the end of the semester (and within one week after the end of summer term, for a summer term course) which the instructor-in-charge will communicate whatever grade/report is possible

for the situation. Whenever such relaxation is made, the Dean/Director will specify at his discretion, with the consent of the instructor-in-charge, the date by which 'I' report has to be converted.

The requirement envisaged in the above clause must be completed within the time allowed. If the extra time given goes beyond the registration in the next semester/term, registration in the next semester/term, is not possible. The student in such a situation should seek permission to stay away as per the above clause

Grade Awaited (GA)

There are many situations where operational and practical difficulties may cause a delay in the communication of a grade. Certain situations which are visualized in this connection are: (i) where a case of unfair means is pending; (ii) where a case of indiscipline is pending, and (iii) where the courses are being conducted at an off campus centre for IP students, where precise co-ordination between the Institute and these centres may not work in a timely manner. In these circumstances the Dean may authorize the instructor-in-charge to report GA (Grades Awaited).

A student may also get a "GA" report if he has, due to a genuine reason not been able to appear for an examination on the scheduled date and his request for make-up has been granted. In such a case, the student should ensure by the end of the term that either:

- He takes the make-up examination and convert the "GA" report onto a letter grade or
- He makes an application to the Dean/Director, through Instructor in Charge to convert "GA" report into a "NC" report.

Whenever the report GA appears in the grade sheet, a student will not be allowed to register for the subsequent semester, until the student takes steps to convert "GA" report into a letter grade or "NC" report.

Withdrawn (W)

A student may seek withdrawal from the course(s) in a semester for any of the following reasons:

- The student is unable to register for the course(s) for a genuine reason.

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- The student is unable to cope up with the normal load and withdraws from the course(s) to reduce his academic load for a particular semester.

The request for withdrawal should be made to the Dean of the faculty, within two weeks of the commencement of the semester in case of (i) above and within the stipulated duration as specified in the academic calendar in the case of (ii) In such cases the grade sheet/transcript of the student will indicate 'W' (Withdrawn against the course(s) from which the student has withdrawn his registration. The student will have to register for the course(s) when it is offered next and obtain a valid letter grade. If the course with 'W' report is a prerequisite course for another course, the registration to the course is possible only on obtaining a valid letter grade in the prerequisite course with 'W' report. If the withdrawal is made after the due date, the event will be reported as "RC" or "DP" as the case may be.

Registration Cancelled (RC) or Required to Register (RR) or Discontinued from the Programme (DP)

If a student's registration for a course has to be cancelled, this fact will be reported in the grade sheet as RC (Registration Cancelled). Registration would be cancelled and an RC is issued in the following cases:

- Cancellation is recommended as a part of disciplinary action for resorting to unfair means during examination or other unprofessional behaviour.
- Cancellation is recommended due to less than the minimum required percentage of attendance.
- Cancellation is recommended if a provisionally admitted student fails to submit the proof of necessary documents required for registration and/or does not satisfy the minimum eligibility requirements for the admission within the prescribed time limit.
- Cancellation is recommended when a student persistently and/or deliberately does not pay his dues.

RC itself has many meanings and may be reported as the following:

- When it is clearly known that the student will be required to register again in the same course, the event will be reported as RRA (Required to Register Again).

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- If RC amounts to discontinuation from the program it will be reported as DP (Discontinued from the Program)
- If the cancellation of registration is not reported either as RRA or as DP but is reported as RC, it does not necessarily mean that it is free from any constraint. The meaning of the constraint has to be construed from the context in which the RC is reported.

Not Cleared (NC)

If a student continued to remain registered in a course but gave the instructor inadequate opportunity to evaluate him by absenting himself from quizzes/tests/examinations/other components of evaluation, or by appearing in the same for the sake of appearance without applying himself to the task in hand or by submitting a blank script (answer book), these events would be reported as NC (Not Cleared).

Whenever a student gets a NC report in a course irrespective of whether he has a grade in the course or not earlier to this event, the following will govern further action. It is to be noted that a NC cannot be ignored, except under the situations described in (b) and (c) below:

- Whenever a student gets a NC report in a course which is in the compulsory package of his program, he is required to register again in the some course and get a valid grade therein.
- If a student has a NC report in a course taken as elective, he can either repeat the course to get a valid grade or ignore it to choose another course. However, a student must get valid grades in at least the prescribed number of electives in his program.
- Whenever a student's record has an NC in a course which remains unaccounted after a process of transfer has been completed it will not be possible for him to wipe out the NC report in such a course because this course is not a part of his program anymore; and he can graduate with this NC.
- If a student is reported NC in a project course, it will be administratively converted to RC by the Dean and future registration in project courses will be done only if the Dean is satisfied with the genuineness of the candidate's interest in the course.
- If a student is reported NC in Thesis or Seminar, he will be required to register in the same for one more semester. Operationally, this is to be achieved by requiring him to

register once again in as many units of Thesis or Seminar in which he had registered when he was awarded NC. If these two courses get separated due to NC in one of them, there is no need to register in the other.

17. Grade Sheet

A student's grades, reports, CGPA, etc., at the end of every semester/term will be recorded on a grade sheet, a copy of which will be issued to him. The grade sheet will be withheld when a student has not paid his dues or when there is a case of breach of discipline or unfair means pending against him.

While registration with approval of appropriate authority consistent with these regulations is a token of permission to pursue studies, the grade sheet is a complete record of the outcome of what was intended in the original/amended/ revised registration. The various grades and reports discussed above would be appropriately used to tally the grade sheet with original/ amended/revised registration. It would be evident that this tally between what was registered for and what was obtained in terms of grades and reports will apply to all courses except the course, which was originally registered for, but subsequently replaced by another course through substitution.

The tally is made on a course basis at the end of semester/term to determine which of the courses have been cleared. A course is deemed to have been cleared if the student obtains a grade in the course. However, mere clearing of the prescribed courses does not tantamount to fulfilling the requirements of graduation.

While all the grades secured and other pertinent information for semesters are given in a grade sheet, the chronologically organized information from the grade sheets of a student with the necessary explanation constitutes his transcript which is issued at the time he leaves the Institute or at an intermediate point on request.

18. Scrutiny and Revaluation:

18.1Scrutiny shall be allowed in three theory papers.

18.2Revaluation of theory/practical papers is not permitted.

19. Unfair means:

Cases of unfair means shall be dealt as per the rules of the University and The U.P. Public Examination (Prevention of Unfair means) Act if any in prevalence.

20. Award of Sessional Marks:

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

All courses of M. Tech. shall be evaluated for 150 marks, of which 50 marks shall be for Internal Assessment and 100 for Comprehensive Semester End Examination. Internal Assessment for 50 marks shall be as per the criteria given below:

Criteria	**Marks**
Class Test I	15
Class Test II	15
Assignments, class participation and discussion	10
Attendance	10
Total Internal Assessment	**50**

Marks for Practical Assessment shall be awarded as per the criteria given below:

Criteria	**Marks**
Attendance	5
File Record	5
Practical Perform/Execution	5
Viva-Voce	5
Total Practical Assessment	**20**

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All students should have a minimum of 75% attendance in all subjects, in order to appear in term end examination / viva voce. The 75% criterion includes all leaves of absence – whether approved or not approved.

Students failing to obtain 75% attendance shall be required to repeat the course in the subsequent year, along with the next batch, to make up for the shortage of attendance.

Under extraordinary circumstances, a student with attendance below 75% shall be allowed to appear in the term end exams / viva voce. This will be at the discretion of the Vice Chancellor of the University. Circumstances when such leniency shall be shown include:

a. Death of a blood relative – father, mother, grandfather, grandmother, brother or sister.
b. Extreme cases of health adversity requiring hospitalization of the student.

In such cases, the student shall be required to give a written application to the Vice Chancellor of the University, along with appropriate proof. In case of death of blood relative, an application from the parent(s) shall be considered.

All faculty members shall maintain appropriate records and make them available to the University's Examination Centre at the end of the semester.

Credits

The M. Tech. Program has a total of 80 credits and students are required to complete all courses. On completion of all courses, the students shall earn 80 credits and would be eligible for award of the M.Tech. Degree.

Final Year Dissertation-I Work (M. Tech 3rd Semester)

During the 3rd semester, each student shall undertake a pre thesis work to be pursued by him/ her under the supervision of a guide/ supervisor. The guide/ supervisor shall be appointed by the Dean, Faculty of Engineering & Technology. Minimum four copies of Project Report along with one soft copy on a CD shall be submitted at least two weeks prior to the commencement of the Term End Examination of the 3rd Semester. The Dissertation-I Work shall carry 500 marks and shall be evaluated by a Board of Internal and External Examiners, appointed by the Dean. The Dissertation-I Work shall be evaluated in the following manner:

Criteria	Internal	External	Total
Pre-Thesis Report	100	150	250
Viva Voce	100	150	250

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Total	200	300	**500**

Note: to move into fourth semester, the candidate will have to opt minimum E Grade in Dissertation-I.

Final Year Dissertation-II Work (M.Tech. 4th Semester)

During the fourth semester, each student shall undertake a Thesis work to be pursued by him/ her under the supervision of a guide/ supervisor. The guide/ supervisor shall be appointed by the Dean, Faculty of Engineering & Technology. Minimum four copies of Project Report along with one soft copy on CD shall be submitted at least two weeks prior to the commencement of the Term End Examination of the 4th Semester. The Dissertation-I Work shall carry 800 marks and shall be evaluated by a Board of Internal and External Examiners, appointed by the Dean/ VC. The Board shall be consisting of two Internal Faculty Members. The Dissertation-II work shall be evaluated in the following manner:

Criteria	**Internal**	**External**	**Total**
Thesis Report	100	200	300
Viva Voce	200	300	500
Total	300	500	**800**

Note: for getting degree, the candidate will have to opt. minimum E grade in Dissertation-II.

Guide Lines for Dissertation Work:

Student will follow any one of given below to complete M.Tech. Dissertation Work:

1. Candidate should present/ publish at least two papers in International Conferences.
2. Candidate should publish at least one paper in International Journals.
3. Candidate should publish at least one paper in National Journals & at least one paper present/ publish in International/ National Conferences.

Note: Dissertation Work Report should be documented in University Format & Norms.

21. Results:

- The result of a candidate shall be declared on the basis of performance of both semesters of the same academic year. However, a final year student, who is not permitted in any one of the final year semester examinations due to shortage of attendance, will be permitted in that particular semester of the next academic session to study as a regular student and appear at that semester examination.

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- Result of the final year shall be declared on the basis of working out Grand Total by adding marks of all the years of study in the following ways:

Award of Division: The division shall be awarded on the basis of final year result

22. How to Calculate of Semester Grade Point Average:

- Computation of the Semester Grade Point Average (SGPA) and Cumulative Performance Index (CPI):

  The SGPA is an indicator of the overall academic performance of a student in all the courses he/she has registered during a given semester. It is computed as follows: If the grades awarded to a student are G_1, G_2 etc in courses with corresponding credits C_1, C_2 etc, the SGPA is given by:

$$SGPA = \frac{C_1 \times G_1 + C_2 \times G_2 + \cdots + C_n \times G_n}{C_1 + C_2 + \cdots + C_n}$$

- The CPI indicates the overall academic performance of a student in all the courses registered up to and including the latest completed semester/summer term. It is computed in the same manner as the SGPA, considering all the courses (say, n) and is given by:

$$CPI = \frac{\sum_{i=1}^{n} C_i \times G_i}{\sum_{i=1}^{n} C_i}$$

- Percentage conversion of CPI :

$$\textbf{\textit{Percentage of Marks}} = \textbf{\textit{CPI}} \times \mathbf{10}$$

- Students should get a minimum grade E in each subject with 5CPI to clear the semester.
- CPI conversion

≥8 CPI	**Ist Division with Honours**
≥6 CPI	**Ist Division**
≥5 CPI	**IInd Division**
<5 CPI	**Fail**

- In case a student gets a F grade in more than one subject, he / she has to repeat one or more of the subjects by registering for "Guided Study" in the semester the courses are offered. Registration for Guided Study shall be made on the payment of Rs. 500 per subject as well as registering for the examination with a payment of Rs. 1000 per subject.
- If the students get F grade in four subjects in an academic session then he/ she will repeat the year.

Sarvesh Pankaj

- M. Tech. Course should be completed within Four Years. If a student does not complete the M. Tech. program in stipulated time, he / she will have to appear freshly in the program.

23. CANCELLATION OF ADMISSION

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

(i) He / She are not found qualified as per the eligibility criteria prescribed by the University.

OR

(ii) He / She are involved in ragging.

OR

(iii) He / She are found involved in creating indiscipline in the Institute/Institute or in the University.

24. BOARD OF STUDIES

The constitution of the Board of Studies of each Institute shall be:

(a) The Director/ Dean of the Institute (Chairperson)

(b) Two Professors

(c) Two Associate Professors

(d) Two Assistant Professors

(e) Two External Expert Members

25. ACADEMIC PROGRAMME COMMITTEE

(a) There shall be an Academic Programme Committee in the Institute/ Department/ Constituent Institutions of the University.

(b) All the teachers of an Institute of Study shall constitute the Academic Programme Committee of which the Director of the Institute shall act as its Chairperson. This Committee shall coordinate the implementation of the courses for optimum utilization of resources and shall also

take care of the coordination of the Institute's programmes with the other programmes run by the different Institutes of the University.

(c) The Academic Programme Committees shall also perform other tasks as assigned to it by the Board of Studies of the concerned Institute of the University.

(d) The Academic Programme Committee shall meet as and when required but at least once every semester. The Chairperson of the Committee will convene the meetings

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

Sarvesh Pandey Vc Tripathi Jalist 13/2

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology

Study & Evaluation Scheme

Master of Technology
(Computer Science & Engineering)

[Applicable w.e.f. Academic Session 2017-18 till Revised]

FACULTY OF ENGINEERING & TECHNOLOGY

RAMA UNIVERSITY, UTTAR PRADESH, KANPUR

Website: www.ramauniversity.ac.in

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

Course Detail & Evaluation Scheme

M.Tech. First Year (Computer Science & Engineering)

(Effective from the session 2017-18)

SEMESTER-I

S. No	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional			Examination		
			L	T	P	CT	TA	Total	ESE		
1	MCS 102	Advance Computer Organization & Architecture	3	1	0	30	20	50	100	150	4
2	MCS 103	Advance Concept In Operating System Design	3	1	0	30	20	50	100	150	4
3	MCS 104	Advance Computer Network	3	1	0	30	20	50	100	150	4
4	MCS 105	Deep Learning and Hybrid Intelligence	3	1	0	30	20	50	100	150	4
PRACTICALS / LABS											
			L	T	P	Internal Assessment			ESE	Total	
5	MCS 154	Computer Network Lab	0	0	4	20			30	50	2
6	MCS 155	Deep Learning and Hybrid Intelligence Lab	0	0	4	20			30	50	2
		TOTAL	**12**	**4**	**8**					**700**	**20**

L- Lecture, T -Tutorial, P-Practical , CT-Cumulative Test, AT-Teacher's Assessment, ESE-End Semester Examination.

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 30 Marks

1. Attendance: 5 Marks
2. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 100 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks
Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks
a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Chairperson

Signature: .....

Name : Dr. Vivek Srivastava

Date :

Internal Members

Signature:

1..... 2.....

Name: Mr. Sarvesh Kumar Mr. Somendra Tripathi

Date:

Signature: 3.....

Name: Ms. Lalita Mishra

Date:

External Members

Signature:

1..... 2.....

Name: Dr. Bipin Kumar Tripathi Mr. Pankaj Singh Patel

Date:

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

Course Detail & Evaluation Scheme

M.Tech. First Year (Computer Science & Engineering)
(Effective from the session 2017-18)

SEMESTER-II

S. No	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional			Examination		
			L	T	P	CT	TA	Total	ESE		
1	MCS 201	Design and Analysis of Parallel Algorithms	3	1	0	30	20	50	100	150	4
2	MCS 202	Artificial Intelligence & Knowledge discovery	3	1	0	30	20	50	100	150	4
3	MCS 203	Advance Data Base Technology	3	1	0	30	20	50	100	150	4
4	MCS 020 to MCS 029	Departmental Elective-I	3	1	0	30	20	50	100	150	4
PRACTICALS/LABS											
			L	T	P	Internal Assessment			ESE	Total	
5	MCS 252	AI Lab	0	0	4	20			30	50	2
6	MCS 253	Distributed DBMS Lab	0	0	4	20			30	50	2
		TOTAL	12	4	8					700	20

L- Lecture, T -Tutorial, P-Practical , CT-Cumulative Test, AT-Teacher's Assessment, ESE-End Semester Examination.

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 30 Marks

3. Attendance: 5 Marks
4. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 100 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks
a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Chairperson

Signature: .....

Name : Dr. Vivek Srivastava

Date :

Internal Members

Signature:

1..... 2.....

Name: Mr. Sarvesh Kumar Mr. Somendra Tripathi

Date:

Signature: 3.....

Name: Ms. Lalita Mishra

Date:

External Members

Signature:

1..... 2.....

Name: Dr. Bipin Kumar Tripathi Mr. Pankaj Singh Patel

Date:

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

Course Detail & Evaluation Scheme

M.Tech. Second Year (Computer Science & Engineering)

(Effective from the session 2018-19)

SEMESTER-III

S. No	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional			Examination		
			L	T	P	CT	TA	Total	ESE		
1	MCS 030 to MCS 039	Departmental Elective-II	3	1	0	30	20	50	100	150	4
2	MCS 040 to MCS 049	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3	MCS 301	Dissertation-1	0	0	16			200	300	500	12
		TOTAL	6	2	16					800	20

L- Lecture, T -Tutorial, P-Practical , CT-Cumulative Test, AT-Teacher's Assessment, ESE-End Semester Examination.

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 30 Marks

1. Attendance: 5 Marks
2. Assignments/ Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 100 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

a. First Mid Term Examination: 10 marks
b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology

Chairperson

Signature: .....

Name : Dr. Vivek Srivastava

Date :

Internal Members

Signature:

1..... 2.....

Name: Mr. Sarvesh Kumar Mr. Somendra Tripathi

Date:

Signature: 3.....

Name: Ms. Lalita Mishra

Date:

External Members

Signature:

1..... 2.....

Name: Dr. Bipin Kumar Tripathi Mr. Pankaj Singh Patel

Date:

:

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

Course Detail & Evaluation Scheme

M.Tech. Second Year (Computer Science & Engineering)

(Effective from the session 2018-19)

SEMESTER-IV

S. No	Course Code	Subject	Periods			Evaluation Scheme		Subject Total	Credit
						Sessional	Examination		
			L	T	P	Internal Assessment	ESE		
1	MCS 401	Dissertation-2	0	0	24	200	600	800	20
		TOTAL	0	0	24			800	20

L- Lecture, T -Tutorial, P-Practical , CT-Cumulative Test, AT-Teacher's Assessment, ESE-End Semester Examination.

Internal Assessment: 200 Marks

ETE - End Term Examination: 600 Marks

Chairperson

Signature: .....

Name : Dr. Vivek Srivastava

Date :

Internal Members

Signature:

1..... 2.....

Name: Mr. Sarvesh Kumar Mr. Somendra Tripathi

Date:

Signature: 3.....

Name: Ms. Lalita Mishra

Date:

External Members

Signature:

1..... 2.....

Name: Dr. Bipin Kumar Tripathi Mr. Pankaj Singh Patel

Date:

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

First Semester

MCS-102: Advance Computer Organization & Architecture

L	T	P	
3	1	0	**Credits: -4**

Objective: To study the basic organization and architecture of digital. Such knowledge leads to better understanding and utilization of digital computers, and can be used in the design and application of computer systems or as foundation for more advanced computer-related studies.

Contents:

UNIT I Pipelining and IIP **08 Hours**

Fundamentals of Computer Design - Measuring and Reporting Performance - Instruction Level Parallelism and Its Exploitation - Concepts and Challenges - Overcoming Data Hazards with Dynamic Scheduling – Dynamic Branch Prediction - Speculation - Multiple Issue Processors – Case Studies.

UNIT II Advanced Techniques for Exploiting ILP **08 Hours**

Compiler Techniques for Exposing ILP - Limitations on ILP for Realizable Processors - Hardware versus Software Speculation - Multithreading: Using ILP Support to Exploit Thread-level Parallelism - Performance and Efficiency in Advanced Multiple Issue Processors - Case Studies.

UNIT III Multiprocessors **08 Hours**

Symmetric and distributed shared memory architectures – Cache coherence issues – Performance Issues– Synchronization issues – Models of Memory Consistency - Interconnection networks – Buses, crossbar and multi-stage switches.

UNIT IV Multi-Core Architectures **08 Hours**

Software and hardware multithreading – SMT and CMP architectures – Design issues – Case studies – Intel Multi-core architecture – SUN CMP architecture – IBM cell architecture.- hp architecture.

UNIT V Memory Hierarchy Design **08 Hours**

Introduction- Optimizations of Cache Performance- Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

Text & Reference Books:

- John L. Hennessey and David A. Patterson, "Computer Architecture– A quantitative approach", Morgan Kaufmann / Elsevier, 4th. edition, 2007.
- David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture : A hardware/ software approach" , Morgan Kaufmann / Elsevier, 1997.
- William Stallings, " Computer Organization and Architecture – Designing for Performance", Pearson Education, Seventh Edition, 2006.

Outcomes:

- Design a pipeline for consistent execution of instructions with minimum hazards.
- Design an interconnection networks and multiprocessors.
- Understand memory hierarchy and its impact on computer cost/performance.

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Faculty of Engineering & Technology

MCS-103: Advanced Concepts in Operating Systems Design.

L	T	P	
3	1	0	**Credits: -4**

Objective: The aim of this module is to study, learn, and understand the main concepts of advanced operating systems (Database Operating Systems, distributed systems, real time systems, Multiprocessor Operating Systems, and open source operating systems.

Contents:

UNIT I **08 Hours**

Multiprocessor Operating Systems: System Architectures- Structures of OS – OS design issues –Process synchronization – Process Scheduling and Allocation- memory management.

UNIT II **08 Hours**

Distributed Operating Systems: System Architectures- Design issues – Communication models – lock synchronization – mutual exclusion – election algorithms- Distributed Deadlock detection

UNIT III **08 Hours**

Distributed scheduling - Distributed shared memory - Distributed File system – Multimedia file systems - File placement - Caching

UNIT IV **08 Hours**

Database Operating Systems: Requirements of Database OS – Transaction process model – Synchronization primitives - Concurrency control algorithms

UNIT V **08 Hours**

Mobile Operating Systems: ARM and Intel architectures - Power Management - Mobile OS Architectures - Underlying OS - Kernel structure and native level programming – Runtime Issues - Approaches to power management

Text book:

- M Singhal and NG Shivaratri, Advanced Concepts in Operating Systems, Tata McGraw Hill Inc, 2001

Reference Books:

- A S Tanenbaum, Distributed Operating Systems, Pearson Education Asia, 2001
- Source Wikipedia, Mobile Operating Systems, General Books LLC, 2010

Outcomes:

- **Knowledge and understanding**

  -Outline the potential benefits of distributed systems

  -Summarize the major security issues associated with distributed systems along with the range of techniques available for increasing system security

- **Cognitive skills (thinking and analysis).**

  -Apply standard design principles in the construction of these systems

  -Select appropriate approaches for building a range of distributed systems, including some that employ middleware

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Faculty of Engineering & Technology

MCS-104: Advance Computer Network

L	T	P	
3	1	0	**Credits: -4**

Objective: Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Contents:

UNIT-1: Review of Networking Concepts **08 Hours**

MAC layer issues, Ethernet 802.3, ARP, IP addressing and Subnetting, NAT and PAT, Variable Length Subnet Masking, CIDR

UNIT-2: End to End protocols **08 Hours**

TCP connection establishment and termination, Sliding window concepts, other issues: wraparound, silly window syndrome, Nagle's algorithm, adaptive retransmission, TCP extensions. Congestion and flow control, Queuing theory, TCP flavors: Tahoe, Reno, New-Reno, TCP-SACK, TCP-RED and TCP-Vegas.Transport protocol for real time (RTP), Quality of service: Integrated Services, Differentiated services

UNIT-3: Routing and Multicast **08 Hours**

Structure of internet: Autonomous systems, Intra-domain routing: OSPF and RIP, Inter-domain routing: BGP.

Multicasting: Group Management (IGMP), Internet scale multicasting: Reverse path broadcast, MOSPF, DVMPRP, PIM.

UNIT-4 : Peer to peer and overlay networks **08 Hours**

Concept of overlays, Unstructured Overlays: Gnutella, Concepts of Distributed Hash Table, Structured Overlays: Chord, CAN, Pastry.

Sarvesh Pankaj Vk Lalita 1812 Tripathi

Text Books

- Computer Networks: A Systems Approach, by Peterson and Davie, 5th Ed. Morgan Kauffman, 2011
- Computer Networking: Top Down Approach, by Kurose and Ross, 6th Ed. Pearson, 2011

Reading List

- V. Paxson. "End-to-end Internet packet dynamics," in IEEE/ACM Transactions on Networking, Vol 7, No 3, June, 1999.
- W. Stevens, "TCP Slow Start, Congestion Avoidance, Fast Retransmit, and Fast Recovery Algorithms," RFC2001.
- K. Fall and S. Floyd, "Simulation-based comparison of Tahoe, Reno, and SACK TCP," Computer Communication Review, vol. 26, pp. 5--21, July 1996.

Outcomes:

- Understand and explain Data Communications System and its components.
- Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Sarvesh Pankaj Vk Tripathi Lalita

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Faculty of Engineering & Technology

MCS-105: Deep Learning & Hybrid Intelligence

L	T	P	
3	1	0	**Credits: -4**

Objective: This course will develop your coding and problem-solving skills with a focus on data and data science. You will learn algorithm design as well as fundamental programming concepts such as data, selection, iteration and functional decomposition, data abstraction and organization.

Contents:

UNIT 1: INTRODUCTION **08 Hours**

Introduction to Deep Learning, Historical Overview in Deep Learning, Deep Learning: Overview of Methods, Applied Math and Machine Learning Basics, Linear Algebra for Machine Learning, Machine Learning Basics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Challenges in Deep Learning.

UNIT 2: DEEP LEARNING ARCHITECTURES **08 Hours**

Deep network training, deep learning architecture, deep belief network, DBN gready training, deep botzmann machine, Deep Feed-forward Networks, Regularization, Convolutional Networks, The Convolution Operation and CNNs, Sequence Modeling: Recurrent and Recursive Nets, Recurrent Neural Networks, Recurrent Neural Networks, Deep Recurrent Networks

UNIT 3: COMPUTATIONAL INTELLIGENCE **08 Hours**

Neural Network, back propagation learning algorithm, Evolutionary algorithm, evolutionary strategy, evolutionary programming, genetic algorithms and its operations. Fuzzy logic, fuzzy membership function, fuzzy operations. K-means and fuzzy c-means clustering.

UNIT 4: HYBRID INTELLIGENCE **08 Hours**

Hybrid intelligence, combination /fusion of two or more techniques, neuro-fuzzy system,

Sanyesh Pandey Vk Tripathi Jalist

evolutionary fuzzy system, evolutionary neuro system, evolutionary neuro fuzzy sytem, evolutionary fuzzy clustering. Hybrid intelligent model.

UNIT 5: APPLICATIONS **08 Hours**

Applications of deep learning and hybrid intelligence: audio signal processing, image processing, computer vision, biometrics, Large Scale Systems, Computer Vision, Natural Language Processing, High Dimensional Outputs, Deep Learning Research, Autoencoders, Deep Generative Models.

Text/Reference book:

- Computational intelligence by Andries P. Engelbrecht, Willey publication.
- Deep learning by Ian Goodfellow, MIT press

Outcomes:

- Design, implement and test algorithms using fundamental programming constructs and data structures.
- Translate between machine level representations and demonstrate how data is represented in computers.

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Faculty of Engineering & Technology

MCS-154: Computer Network Lab

L	T	P	
0	0	4	**Credits: -2**

Objective:

- To understand the working principle of various communication protocols.
- To analyze the various routing algorithms.
- To know the concept of data transfer between nodes.

Contents:

1. Identifying well known ports on a Remote System: By trying to listen to the various well known ports by opening client connections. If the exception does not occur then the remote port is active else the remote port is inactive.

2. Writing a Chat application:

i). One-One: By opening socket connection and displaying what is written by one party to the other.

ii). Many-Many (Broad cast): Each client opens a socket connection to the chat server and writes to the socket. Whatever is written by one party can be seen by all other parties.

3. Data retrieval from a Remote database: At the remote database a server listens for client connections. This server accepts SQL queries from the client, executes it on the database and sends the response to the client.

4. Mail Client:

i). POP Client: Gives the server name , user name and password retrieve the mails and allow manipulation of mail box using POP commands.

ii). SMTP Client: Gives the server name, send e-mail to the recipient using SMTP commands- (Core Java 2 pg: 163.)

5. Simulation of Telnet: Provide a user interface to contact well-known ports, so that client-server interaction can be seen by the user.

6. Simple file transfer between two systems (without protocols): By opening socket connection to our server on one system and sending a file from one system to another.

7. TFTP- Client: To develop a TFTP client for file transfer. (Unix Network programming- Stevens.)
8. HTTP-Server: Develop a HTTP server to implement the following commands. GET, POST, HEAD, DELETE.

Outcomes:

- Understand fundamental underlying principles of computer networking
- Understand details and functionality of layered network architecture.
- Apply mathematical foundations to solve computational problems in computer networking
- Analyze performance of various communication protocols.
- Compare routing algorithms CO6: Practice packet /file transmission between nodes.

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Faculty of Engineering & Technology

MCS-155: Deep Learning & Hybrid Intelligence Lab

L	T	P	Credit 2
0	0	4	

Objective: Students will be able to implement Convolutional networks, LSTM based RNNs, LSTM, Auto encoder, Boltzmann Machine, Recurrent Boltzmann Machine and more. Will work on case studies from many application domains including healthcare, Business, natural language processing etc. Will be able to apply Deep Learning for solving real life problems.

Contents:

Perform following list of experiments using MATLAB/Python:

1. Implement RBFNN
2. Implement CNN with application to computer vision
3. Implement DBN
4. Implement Deep recurrent network
5. Implement Deep Boltzman Machine
6. Implement K-means clustering
7. Implement fuzzy C-mean clustering
8. Implement Evolutionary fuzzy clustering
9. Implement and demonstrate ANFIS
10. Implement Neuro-fuzzy system

Outcomes:

- Implement CNN for solving various Image Processing problems
- Construct LSTM based RNN for solving NLP, Bioinformatics applications
- Implement Autoencoders for feature extraction , denoising etc.
- Construct Deep Belief Network .
- Design models for real life problems using Deep Learning.

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology
Second Semester

MCS-201: Design and Analysis of Parallel Algorithms

L T P **Credit 4**

3 1 0

Objective: The course provides a modern introduction to design, analysis and implementation of sequential and parallel algorithms. In particular, the course is based on a pragmatic approach to parallel programming of message-passing algorithms through the C language, merging and graphs.

Contents:

UNIT I **08 Hours**

Structures and algorithms for array processors: SIMD Array Processors, Interconnection networks, Parallel algorithms for Array processors. Multiprocessor Architecture-Interconnection networks-multiprocessor control and algorithms- parallel algorithms for multiprocessors.

UNIT II **08 Hours**

Selection - broadcast- all sums- parallel selection. Searching a random sequence, sorted sequence on PRAM models, Tree and Mesh.

UNIT III **08 Hours**

Merging - A network for merging - merging on PRAM models. Sorting on a linear array, EREW, CREW, CRCW and SIMD models, MIMD Enumeration sort.

UNIT IV **08 Hours**

Matrix operations- Transposition, Matrix by matrix multiplication, matrix by vector multiplication. Numerical problems- solving systems of linear equations, finding roots of non linear equations on PRAM models.

UNIT V **08 Hours**

Graphs - Connected components- dense graphs- sparse graphs. Minimum spanning tree- Solli's algorithm, Bi-connected components, Ear decomposition, Directed graphs.

Text & Reference Books:

- Kai Wang and Briggs, "Computer Architecture and Parallel Processing", McGraw Hill, 1985.
- S. G. Akl, "Design and Analysis of Parallel Algorithms", Prentice Hall Inc., 1992.
- Joseph Jaja, "An Introduction to parallel Algorithms", Addison Wesley, 1992.

Outcomes:

- Design, prove the correctness and analyze the computational complexity of sequential algorithms.
- Understand the differences among several algorithms solving the same problem and recognize which one is better under different conditions.
- Describe and use basic parallel algorithms.

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

MCS-202: Artificial Intelligence & Knowledge Discovery

L	T	P	Credit 4
3	1	0	

Objective: The objective of the course is developing a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, and learning. Students will implement a small AI system in a team environment.

Contents:

UNIT-1 Introduction **08 Hours**

What is intelligence? Foundations of artificial intelligence (AI). History of AI; Problem Solving- Formulating problems, problem types, states and operators, state space, search strategies.

UNIT-2 Informed Search Strategies **08 Hours**

Best first search, A* algorithm, heuristic functions, Iterative deepening A*(IDA), small memory A*(SMA); Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning

UNITt-3 Reasoning **08 Hours**

Representation, Inference, Propositional Logic, predicate logic (first order logic), logical reasoning, forward chaining, backward chaining; AI languages and tools - Lisp, Prolog, CLIPS

UNIT-4 Planning **08 Hours**

Basic representation of plans, partial order planning, planning in the blocks world, hierarchical planning, conditional planning, representation of resource constraints, measures, temporal constraints Basic probability, Bayes rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic; Decision making- Utility theory, utility functions, Decision theoretic expert systems.

UNIT-5 Uncertainty **08 Hours**

Inductive learning - decision trees, rule based learning, current-best-hypothesis search, least-commitment search, neural networks, reinforcement learning, genetic algorithms; Other learning methods - neural networks, reinforcement learning, genetic algorithms.

Communication - Communication among agents, natural language processing, formal grammar, parsing, grammar

Text Books:

- Stuart Russell and Peter Norvig. Artificial Intelligence – A Modern Approach, Pearson Education Press, 2001.
- Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, 2008.

Reference Books:

- George F. Luger, Artificial Intelligence, Pearson Education, 2001.
- Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002.98

Outcomes:

Upon successful completion of this course student will

- be able to design a knowledge based system,
- have read and analyzed important historical and current trends addressing artificial intelligence.

Sanveer Pandey Vk Lalita Tripathi 13/12

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Faculty of Engineering & Technology

MCS-203: Advance Database Technology

L	T	P	Credit 4
3	1	0	

Objective: This module aims to give the concepts and mobile databases, object and object relational databases, techniques for data storage, query processing, concurrency control and transaction management. Introduce research development ability in databases through technical survey and presentation.

Contents:

UNIT -I Parallel and Distributed Databases **08 Hours**

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture- Case Studies.

UNIT -II Object and Object Relational Databases **08 Hours**

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model –ODL – OQL – Object Relational and Extended – Relational Systems : Object Relational featuresin SQL/Oracle – Case Studies.

UNIT- III XML Databases **08 Hours**

XML Databases: XML Data Model – DTD - XML Schema - XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining

UNIT -IV Mobile Databases **08 Hours**

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models Concurrency Control - Transaction Commit Protocols- Mobile Database Recovery Schemes

UNIT- V Multimedia Databases **08 Hours**

Multidimensional Data Structures – Image Databases – Text/Document Databases- Video Databases – Audio Databases – Multimedia Database Design.

Text & Reference Books:

- R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
- Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.
- Vijay Kumar, "Mobile Database Systems", John Wiley & Sons, 2006.

Outcomes:

- Discuss/explain the concepts of Distributed Databases and Data Warehousing.
- Discuss/explain some database security issues.

Departmental Elective-I

1.	Multimedia Communication and Network	MCS 020
2.	Network Engineering and Management	MCS 021
3.	Cryptography and Computer Security	MCS 022
4.	Advance Network Principal and Protocols	MCS 023
5.	Soft Computing	MCS 024
6.	Approximation Algorithms	MCS 025
7.	Complexity Theory	MCS 026
8.	Computational Geometry	MCS 027
9.	Computer Vision & Image Processing	MCS 028
10.	Real Time and Embedded System	MCS 029

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology
Departmental Elective-I

MCS-020: Multimedia Communication and Network

L	T	P	Credit 4
3	1	0	

Objective: To study the technical issues and system solutions for providing multimedia communications on the Internet.

Contents:

UNIT I IP Networks **08 Hours**

Open Data Network Model – Narrow Waist Model of the Internet - Success and Limitations of the Internet – Suggested Improvements for IP and TCP – Significance of UDP in modern Communication – Network level Solutions – End to End Solutions - Best Effort service model – Scheduling and Dropping policies for Best Effort Service model.

UNIT II Advanced Routing **08 Hours**

Intra AS routing – Inter AS routing – Router Architecture – Switch Fabric – Active Queue Management – Head of Line blocking – Transition from IPv4 to IPv6 – Multicasting – Abstraction of Multicast groups – Group Management – IGMP – Group Shared Multicast Tree-Source based Multicast Tree – Multicast routing in Internet – DVMRP and MOSPF – PIM – Sparse mode and Dense mode

UNIT III Guaranteed Service Model **08 Hours**

Best Effort service model – Scheduling and Dropping policies – Network Performance Parameters – Quality of Service and metrics – WFQ and its variants – Random Early Detection – QoS aware Routing – Admission Control – Resource Reservation – RSVP - Traffic Shaping Algorithms – Caching – Laissez Faire Approach - Possible Architectures – An Overview of QoS Architectures

UNIT IV Multimedia Communication **08 Hours**

Stream characteristics for Continuous media – Temporal Relationship – Object Stream Interactions, Media Levity, Media Synchronization – Models for Temporal Specifications –

Streaming of Audio and Video – Jitter – Fixed play out and Adaptive payout – Recovering from packet loss – RTSP — Multimedia Communication Standards – RTP/RTCP – SIP and H.263

UNIT V Wireless Multimedia Communication **08 Hours**

End to End QoS provisioning in Wireless Multimedia Networks – Adaptive Framework – MAC layer QoS enhancements in Wireless Networks – A Hybrid MAC protocol for 10 Multimedia Traffic – Call Admission Control in Wireless Multimedia Networks – A Global QoS Management for Wireless Networks

Text & Reference Books:

- Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002
- Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education, 2004.
- William Stallings, 'High Speed Networks: Performance and Quality of Service', 2nd Edition, Pearson Education, 2002.
- Kurose and Ross, 'Computer Networks : A top down Approach', Pearson Education, 2002
- Nalin K Sharda, 'Multimedia Information Networking', Prentice Hall of India, 1999
- Aura Ganz, Zvi Ganz and Kitti Wongthawaravat, 'Multimedia Wireless Networks Technologies, Standards and QoS', Prentice Hall, 2003.
- Ellen Kayata Wesel, 'Wireless Multimedia Communications: Networking Video, Voice and Data', Addision Wesley, 1998

Outcomes:

- Understand the current state-of-the-art developments in Internet technologies for multimedia communications.
- Understand the system design principles of multimedia communications systems.
- Solve problems and design simple networked multimedia systems.

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Faculty of Engineering & Technology

MCS-021: Network Engineering and Management

L	T	P	Credit 4
3	1	0	

Objective: To provide the knowledge designing and managing of communication protocols while getting a good exposure to the TCP/IP protocol suite.

Contents:

UNIT I Foundations of Networking **08 Hours**

Communication Networks – Network Elements – Switched Networks and Shared media Networks – Probabilistic Model and Deterministic Model – Datagram and Virtual Circuits – Multiplexing – Switching - Error and Flow Control – Congestion Control – Layered Architecture – Network Externalities – Service Integration – Modern Applications

UNIT II Quality of Service **08 Hours**

Traffic Characteristics and Descriptors – Quality of Service and Metrics – Best Effort model and Guaranteed Service Model – Limitations of IP networks – Scheduling and Dropping policies for BE and GS models – Traffic Shaping algorithms – End to End solutions – Laissez Faire Approach – Possible improvements in TCP – Significance of UDP in inelastic traffic

UNIT III High Performance Networks **08 Hours**

Integrated Services Architecture – Components and Services – Differentiated Services Networks – Per Hop Behavior – Admission Control – MPLS Networks – Principles and Mechanisms – Label Stacking – RSVP – RTP/RTCP

UNIT IV High Speed Networks **08 Hours**

Optical links – WDM systems – Optical Cross Connects – Optical paths and Networks – Principles of ATM Networks – B-ISDN/ATM Reference Model – ATM Header Structure – ATM Adaptation Layer – Management and Control – Service Categories and Traffic descriptors in ATM networks

UNIT V Network Management **08 Hours**

ICMP the Forerunner – Monitoring and Control – Network Management Systems – Abstract Syntax Notation – CMIP – SNMP Communication Model – SNMP MIB Group – Functional Model – Major changes in SNMPv2 and SNMPv3 – Remote monitoring – RMON SMI and MIB

Text & Reference Books:

- Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education, 2004.
- Larry L Peterson and Bruce S Davie, 'Computer Networks: A Systems Approach', Fourth Edition, Morgan Kaufman Publishers, 2007.
- Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002

Outcomes:

After completion of this course learner will be able to:

- Use appropriate network tools to build network topologies
- Install and configure an open source tool NS2

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Faculty of Engineering & Technology

MCS-022: Cryptography and Computer Security

L	T	P	Credit 4
3	1	0	

Objective: To understand the fundamentals of Cryptography, and understand the various key distribution and management schemes and understand how to deploy encryption techniques to secure data in transit across data networks and design security applications in the field of Information technology.

Contents:

UNIT 1 **08 Hours**

Introduction: need and basic goals for computer security, security threats etc.

UNIT 1I **08 Hours**

Cryptography : Elementary number theory, Finite fields, Arithmetic and algebraic algorithms, Secret key and public key cryptography, Pseudo random bit generators, Block and stream ciphers, Hash functions and message digests, Public key encryption, Probabilistic encryption, Authentication, Digital signatures, Zero knowledge interactive protocols, Elliptic curve cryptosystems, Formal verification, Cryptanalysis, Hard problems

UNIT-III **08 Hours**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, secure hash algorithm (SHA)

UNIT IV **08 Hours**

Network Security: problems in network security; kinds of attacks, PKI, key exchange protocols, example protocols such as PGP, Kerberos, IPSEC/VPN, SSL, S/MIME etc. Protocol vulnerabilities: examples of protocol vulnerabilities such as in TCP/IP, denial of service attacks etc. Tools for network security such as firewalls and intrusion detection systems.

UNIT-V **08 Hours**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Text & Reference Books:

- Cryptography, Theory and Practice, Douglas R. Stinson, CRC Press,
- Cryptography and Network Security: Principles and Practices, W. Stallings, Prentice Hall
- Applied cryptography, B. Schneier, John Wiley & Sons
- Handbook of Applied Cryptography, A. Menezes, P. Van Oorschot, S. Vanstone, CRC Press
- Network Security, C. Kaufman, R. Perlman, M. Speciner, Prentice Hall

Outcomes:

- Provide security of the data over the network.
- Do research in the emerging areas of cryptography and network security.
- Protect any network from the threats in the world

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Faculty of Engineering & Technology

MCS-023: Advance Network Principal and Protocols

L T P **Credit 4**

3 1 0

Objective: To introduce analysis and design of computer and communication networks. To understand the network layered architecture and the protocol stack.

Contents:

UNIT-I **08 Hours**

Introduction to Networks - Application of Networks - Architecture Topology Switching - SLIP, PPP -ALOHA protocols, CSMA/CD, IEEE 802.3, 802.4, 802.5

UNIT-II **08 Hours**

Network Layer Issues- Routing, Congestion control- Internetworking - Issues, Address Learning Bridges, Spanning tree, Source routing, Bridges, Routers, Gateway.

UNIT-III **08 Hours**

Network Protocol- IP datagram - hop by hop routing, ARP, RARP, DHCP -Sub net Addressing, Address Masking, ICMP, RIP, RIPV2, OSPF, DNS, LAN and WAN Multicast.

UNIT-IV **08 Hours**

Transport Layer- Design issues, Connection Management, Transmission Control Protocol (TCP) - User Datagram Protocol (UDP).

UNIT-V **08 Hours**

Application Layer Protocol- Telnet - TFTP - FTP - SMTP - Ping Finger, Bootstrap Network Time Protocol- SNMP.

Text Books

- Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", 5thEdition, Pearson, 2011
- William Stallings, "Data and Computer Communications", 9th Edition, Pearson, 2011

Reference Book

- W Richard Stevens and G. Gabrani, "TCP/IP Illustrated - Volume I, The protocols", Pearson Education, 2009

Outcomes:

- Assemble the components of a PC and install one or more network operating systems resulting in a functioning.
- Design a small or medium sized computer network including media types, end devices, and Interconnecting devices that meets a customer's specific needs.
- Perform basic configurations on routers and Ethernet switches.
- Demonstrate knowledge of programming for network communications.
- Learn to simulate computer networks and analyze the simulation results.
- Troubleshoot connectivity problems in a host.

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology
MCS-024: Soft Computing

L	T	P	Credit 4
3	1	0	

Objective: Develop the skills to gain a basic understanding of neural network theory and fuzzy Logic theory. Introduce students to artificial neural networks and fuzzy theory from an engineering Perspective.

Contents:

UNIT I

Introduction to Soft Computing And Neural Networks **08 Hours**

Evolution of Computing- Soft Computing Constituents– From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II

Genetic Algorithms **08 Hours**

Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition.

UNIT III

Neural Networks **08 Hours**

Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks Supervised Learning Neural Networks– Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

UNIT IV

Fuzzy Logic **08 Hours**

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

UNIT V

Neuro-Fuzzy Modeling **08 Hours**

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – Neuro-Fuzzy Control – Case studies.

Text & Reference Books :

- Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003.
- George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995.
- James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.

Outcomes:

Upon completion of the course, the student are expected to

- Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic.

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology
MCS-025: Approximation Algorithms

L	T	P	Credit 4
3	1	0	

Objective: Analyze the asymptotic performance of algorithms, Write rigorous correctness proofs for algorithms and demonstrate a familiarity with major algorithms and data structures. Apply important algorithmic design paradigms and methods of analysis and Synthesize efficient algorithms in common engineering design situations.

Contents:

UNIT I **08 Hours**

Introduction, Overview of Complexity Theory: Class NP, NP-Completeness, reductions, Randomized Complexity Classes, Basics of Probability Theory, Expectation and moments, basic distributions

UNIT II **08 Hours**

Vertex/set cover, Greedy algorithm, Hardness of approximating Traveling Salesman Problem (TSP), Set cover, layering algorithm, shortest superstring, Steiner tree, Metric Steiner tree, Metric TSP; Minimum weight multiway cut minimum weight k-cut , k-center

UNIT III **08 Hours**

Knapsack problem, Pseudo polynomial time algorithms PTAS, Fully polynomial time approximation scheme FPTAS, Strong NP-hardness, Bin packing, Asymptotic PTAS, Euclidean TSP, Proof of correctness

UNIT IV **08 Hours**

LP Duality, LP Duality Theorem, Dual-fitting -based analysis for the greedy set cover algorithm Rounding Algorithm: set cover, randomized rounding

UNIT V **08 Hours**

Half-integrality of vertex cover; Primal-dual Schema: set cover Scheduling on Unrelated Parallel Machines, Primal-Dual algorithms, Facility Location and the k-Median Problem, Steiner Network Design

References

- Vijay V.Vazirani, "Approximation Algorithm", Springer
- D. S. Hochbaum, "Approximation Algorithms for NP-Hard Problems", PWS 1997

Outcomes:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Describe the divide-and-conquer paradigm, Dynamic Programming and Greedy paradigm and explain when an algorithmic design situation calls for it.
- Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms.
- Derive and solve recurrences describing the performance of divide-and-conquer algorithms.

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Faculty of Engineering & Technology
MCS-026: Complexity Theory

L	T	P	Credit 4
3	1	0	

Objective: Students will learn several formal mathematical models of computation along with their relationships with formal languages. Also students will learn that not all problems are solvable by computers, and some problems do not admit efficient algorithms.

Contents:

UNIT I **08 Hours**

Models of Computation, resources (time and space), algorithms, computability, complexity;

UNIT II **08 Hours**

Complexity classes, P/NP/PSPACE, reductions, hardness, completeness, hierarchy, relationships between complexity classes

UNIT III **08 Hours**

Randomized computation and complexity; Logical characterizations, incompleteness; Approximability

UNIT IV **08 Hours**

Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs;

UNIT V **08 Hours**

Probabilistically checkable proofs; Communication complexity; Quantum computation.

Text & Reference Books:

- Christos H. Papadimitriou, "Combinatorial Optimization: Algorithms and Complexity"
- Sanjeev Arora and Boaz Barak, "Complexity Theory: A Modern Approach"
- Steven Homer, Alan L. Selman, Computability and Complexity Theory, Springer

Outcomes:

- The key elements of complexity theory (like uncertainty, emergent and unexpected behavior) and its importance for understanding complex problems.
- The implications for governance and decision making in such an environment.

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Faculty of Engineering & Technology

MCS-027: Computational Geometry

L	T	P	Credit 4
3	1	0	

Objective: This course introduces students the essentials of Computational Geometry and presents an in-depth study of the fundamental geometric structures and techniques.

Contents:

UNIT I **08 Hours**

Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs;

UNIT II **08 Hours**

Voronoi diagrams: construction and applications, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties.

UNIT III **08 Hours**

Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems.

UNIT IV **08 Hours**

Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham-sandwich cuts.

UNIT V **08 Hours**

Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements; Randomization in computational geometry: algorithms, techniques for counting; Robust geometric computing; Applications of computational geometry

Text & Reference Books:

- Franco P. Preparata, Michael Ian Shamos, "Computational Geometry: An Introduction" SpringerVerlag.
- Mark Berg, Marc van Kreveld, Mark Overmars, and Otfried Schwarzkopf, "Computational Geometry, Algorithms and Applications". Springer.

Outcomes:

- Define fundamental and advanced concepts in Geometrical objects, Computational Geometry and it's application domain, Convex Combination of points, Orthogonal Range Searching, Voronoi Diagram and Visibility Graph.
- Recognize the appropriateness of MATLAB software to implement geometrical concepts for developing applications in real world geometric applications like fractal computation and image processing.
- Analyze complex geometrical problems to find application by performing Lab Experiments.

MCS-028: Computer Vision & Image Processing

L	T	P	Credit 4
3	1	0	

Objective: To introduce students the fundamentals of image formation and introduce students the major ideas, methods, and techniques of computer vision and pattern recognition and To develop an appreciation for various issues in the design of computer vision and object recognition systems; and To provide the student with programming experience from implementing computer vision and object recognition applications.

Contents:

UNIT I **08 Hours**

Digital Image Fundamentals; Image Enhancement in Spatial Domain; Gray Level Transformation, Histogram Processing, Spatial Filters; \

UNIT II **08 Hours**

Image Transforms; Fourier Transform and their properties, Fast Fourier Transform, Other Transforms; Image Enhancement in Frequency Domain; Color Image Processing; Image warping and restoration; Image

UNIT III **08 Hours**

Compression; Image Segmentation; edge detection, Hough transform, region based segmentation; Morphological operators;

UNIT IV **08 Hours**

Representation and Description; Features based matching and Bayes classification;

UNIT V **08 Hours**

Introduction to some computer vision techniques; Imaging geometry, shape from shading, optical flow; Laboratory exercises will emphasize development and evaluation of image processing methods.

Sarveek Pankaj Vaz BKL Lalita Tripathi

Books and References

- R. GONZALEZ and R. E. WOOD, Digital Image Processing, Prentice Hall of India.
- ANDRIAN LOW, Introductory Computer Vision and Image Procession, McGraw Hill CO.
- W.K. PRATT, Digital Image Processing, McGraw Hill.
- A.K. JAIN, Fundamentals of Image Processing.

Outcomes:

- Comprehend the fundamentals of image formation.
- Comprehend the major ideas, methods, and techniques of image processing and computer vision.
- Appreciate typical pattern recognition techniques for object recognition.
- Implement basic image processing and computer vision techniques.
- Develop simple object recognition systems.

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MCS-029: Real Time and Embedded System

L	T	P	Credit 4
3	1	0	

Objective: To provide in-depth knowledge about embedded processor, its hardware and Software and To explain programming concepts and embedded programming in C and assembly language and To explain real time operating systems, inter-task communication and an Embedded software development tool.

Contents:

UNIT I **08 Hours**

Introduction: Applications, different type of real-time systems, reference models. Real-time Scheduling: Scheduling hierarchies commonly used scheduling approaches, Priority driven scheduling of periodic tasks.

UNIT II **08 Hours**

Scheduling of a periodic and sporadic tasks: Deferrable server, sporadic servers, constant utilization, total utilization and weighted fair queue servers, slack stealing approaches.

UNIT III **08 Hours**

Resource access control: priority inherited protocol, protocol priority ceiling protocol, slack based ceiling protocol, and multiprocessor priority ceiling protocol. Weakly hard real-time systems Imprecise computing and (M, K) Constraints systems.

UNIT IV **08 Hours**

Embedded System: introduction and applications, design constraints & challenges, Embedded system Architecture, Introduction to 8051 Microcontroller, block diagram, Addressing modes, I/O programming.

UNIT V **08 Hours**

8051 Counter / Timer programming, 8051 serial communications, Interfacing, 8051 Interrupts handling.

References

- Real-time systems by Jane W. S Liu, Pearson education.
- Foundation of real-time Computing: resource management, Edited by Andrew M.,Tilboge Gray from Kluwer academic Publisher London.
- The 8051 Microcontroller And Embedded Systems Using Assembly And C by Mazidi, Pearson education.
- Embedded System by Raj Kamal, TMH publication.

Outcomes:

- Describe and illustrate the concept of embedded systems, including their architecture, and review concepts associated with digital systems.
- Describe, appraise, devise and implement methods for how an embedded CPU gets, manages and stores data. This includes concepts such as the Cache and how the CPU interfaces with external devices.
- Examine, evaluate and implement task control and real-time scheduling algorithms required to perform multitasking.

Sarvesh Pankaj Vk Sulicity 1312 Tripathi

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology

MCS-252: AI Lab

L	T	P	Credit 2
0	0	4	

Objective:

- To understand basic principles of Artificial Intelligence
- To learn and design intelligent agents.
- To understand the basic areas of artificial intelligence including problem solving, knowledge representation, reasoning, decision making, planning, perception and action
- To master the fundamentals of machine learning, mathematical framework and learning algorithm.

Contents:

1. Write a program to implementation of DFS

2. Write a program to implement BFS

3. Write a program to implement Traveling Salesman Problem

4. Write a program to implement Simulated Annealing Algorithm

5. Write a program to implement 8 puzzle problems

6. Write a program to implement Tower of Hanoi problem

7. Write a program to implement A* Algorithm

8. Write a program to implement Hill Climbing Algorithm

9. To Study JESS expert system

10. To Study RVD expert system

Outcomes:

- Understand formal methods of knowledge representation, logic and reasoning
- Understand foundational principles, mathematical tools and program paradigms of artificial intelligence
- Understand the fundamental issues and challenges of machine learning: data, model selection, model complexity

- Analyze the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
- Apply intelligent agents for Artificial Intelligence programming techniques

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology
MCS-253: Distributed DBMS Lab

L	T	P	Credit 2
0	0	4	

Objective:

- To emphasize Integrity Constraints to keep the database consistent
- To facilitate normalization of tables to eliminate redundancies
- To inculcate storage strategies for easy retrieval of data through index.

Contents:

Each student is assigned with a problem. The student is to develop a logical and physical database design for the problem.

A. The logical design performs the following tasks:

1. Map the ER/EER diagrams to a relational schema. Be sure to underline all primary keys, include all necessary foreign keys and indicate referential integrity constraints.

2. Identify the functional dependencies in each relation

3. Normalize to the highest normal form possible

B. Perform physical design based above logical design using Oracle/MSSQL on Windows platform and My SQL/Postgre SQL on Linux platform

C: Perform DML and DDL using all possible SQL commands and with the help any one host languages like C, C++ and VB etc (ie embedded SQL)

D. Perform DML and DLL using PL/SQL and PL/pgSQL for the above problems

Ref: 1. Oracle PL/SQL Programming Steven Feuerstein O'Reilly Publishers

2. PL/pgSql, search internet for necessary documentation

Outcomes:

- Apply the concepts of transparency in Distributed databases
- Design a database to sustain distributed transactions
- Use of checkpoints to identify any inconsistency
- Apply the concepts of interoperability to the database

Third Semester

Departmental Elective-II

1.	Digital Forensic	MCS 030
2.	Image Processing and Pattern Recognition	MCS 031
3.	Enterprise Resource Planning	MCS 032
4.	Wireless Sensor Network	MCS 033
5.	Integrated Software Project Management	MCS 034
6.	Supply Chain Management	MCS 035
7.	Software Reliability Matrix	MCS 036
8.	Service Oriented Architecture and Web Security	MCS 037
9.	Software Quality Assurance	MCS 038
10.	Imaging and Multimedia System	MCS 039

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

Departmental Elective-II

MCS-030: Digital Forensic

L	T	P	Credit 4
3	1	0	

Objective: Digital Forensics program is designed to provide you with the skills you need for career success. You'll learn the process of computer forensics, including topics within digital forensics and computer crimes.

Contents:

UNIT I **08 Hours**

Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.

UNIT II **08 Hours**

Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

UNIT III **08 Hours**

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

UNIT IV **08 Hours**

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

UNIT V **08 Hours**

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail

investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

Text & Reference Books

- Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.
- Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and
- Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.

Outcomes:

- Conduct digital investigations that conform to accepted professional standards and are based on the investigative process: identification, preservation, examination, analysis and reporting.
- Identify and document potential security breaches of computer data that suggest violations of legal, ethical, moral, policy and/or societal standards.

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

MCS-031: Image Processing and pattern Recognition

L T P **Credit 4**

3 1 0

Objective: The goal of this subject is to teach skills used by professional engineers working at developing image processing and computer vision products, services and solutions. During the project students apply the knowledge they have gained to scope, solve, test and communicate a solution to a real-world image processing problem in a collaborative team-based environment..

Contents:

UNIT I **08 Hours**

Introduction

Digital Image processing, Origins of DIP, Examples, Fundamental steps in DIP, Components of DIP Elements of visual perception, Light and the electromagnetic spectrum, Image Sensing and acquisition, Image sampling and quantization, basic relationships between pixels

UNIT II **08 Hours**

Image Enhancement

Background, some basic gray level transformation, Histogram processing, enhancement using arithmetic /Logic operation, Basics of Spatial filtering, smoothing spatial filters, sharpening spatial filters Image enhancement Background , Introduction to the Fourier transform and the frequency domain, smoothing frequency- domain filters, sharpening frequency domain filters, homomorphic filters & implementation

UNIT III **08 Hours**

Image restoration

Noise models, restoration in the presence of noise only – spatial filtering, Periodic noise reduction by frequency domain filtering. Inverse filtering

UNIT IV **08 Hours**

Image compression

Fundamentals. Image compression models, error free compression, lossy compression

UNIT V **08 Hours**

Pattern Recognition

Introduction, Probability, Statistical decision making, nonparametric decision making, Clustering, Processing of waveforms, Image analysis.

Text & Reference Books:

- Digital Image Processing, Woods & Gangzlez
- Pattern Recognition, Pau & Gonzalez.

Outcomes:

- Use foundational techniques of image processing and analysis such as filtering, segmentation and local features to solve image processing problems of real world application
- Build a statistical classifier and know how to use other classifiers
- Use image processing and pattern recognition techniques to detect objects and activities in images and video
- Collaborate with team members to successfully complete a project

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

MCS-032: Enterprise Resource Planning

L	T	P	Credit 4
3	1	0	

Objective: t increases the quality of services, shortens delivery times and enhances the performance rate offered by companies. Error controlling is another core objective behind ERP implementation in an organization. It helps in better planning and coordination of business resources so as to achieve maximum profit.

Contents:

UNIT I

INTRODUCTION TO ERP **08 Hours**

Overview – Benefits of ERP – ERP and Related Technologies – Business Process Reengineering – Data Warehousing – Data Mining – On–line Analytical Processing – Supply Chain Management.

UNIT II

ERP IMPLEMENTATION **08 Hours**

Implementation Life Cycle – Implementation Methodology – Hidden Costs – Organizing Implementation – Vendors, Consultants and Users – Contracts – Project Management and Monitoring.

UNIT III

BUSINESS MODULES **08 Hours**

Business Modules in an ERP Package – Finance – Manufacturing – Human Resource – Plant Maintenance – Materials Management – Quality Management – Sales and Distribution.

UNIT IV

ERP MARKET **08 Hours**

ERP Market Place – SAP AG – PeopleSoft – Baan Company – JD Edwards World Solutions Company – Oracle Corporation – QAD – System Software Associates.

UNIT V

ERP – PRESENT AND FUTURE **08 Hours**

Turbo Charge the ERP System – EIA – ERP and E–Commerce – ERP and Internet – Future Directions in ERP.

References

- Alexis Leon, "ERP Demystified", Tata McGraw Hill, 1999.
- Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, "Concepts in Enterprise Resource Planning" , Thomson Learning, 2001.
- Vinod Kumar Garg and N.K .Venkata Krishnan, "Enterprise Resource Planning – concepts and Planning", Prentice Hall, 1998.
- Jose Antonio Fernandz, "The SAP R /3 Hand book", Tata McGraw Hill

Outcomes:

- Improve the decision-making process
- Planning realistic future scenarios
- The minimum duplication
- Greater control and traceability
- Improved Internal Communication

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology
MCS-033: Wireless Sensor Network

L	T	P	Credit 4
3	1	0	

Objective: This course deals with the comprehensive knowledge about wireless sensor networks. It provides an Enabling Technologies for Wireless Sensor Network.

Contents:

UNIT I **08 Hours**

Introduction: Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet.

UNIT II **08 Hours**

Introduction to adhoc/sensor networks: Key definitions of adhoc/ sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering.

UNIT III **08 Hours**

MAC Protocols : Issues in designing MAC protocols for adhoc wireless networks, design goals, classification of MAC protocols, MAC protocols for sensor network, location discovery, quality, other issues, S-MAC, IEEE 802.15.4.

UNIT IV **08 Hours**

Routing Protocols: Issues in designing a routing protocol, classification of routing protocols, table-driven, on-demand, hybrid, flooding, hierarchical, and power aware routing protocols.

UNIT V **08 Hours**

QoS and Energy Management : Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy

management, classification, battery, transmission power, and system power management schemes.

Text Book

- C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education -2008.

Reference Book

- Feng Zhao and Leonides Guibas, "Wireless sensor networks ", Elsevier publication 2004.
- Jochen Schiller, "Mobile Communications", Pearson Education, 2Nd Edition, 2003.
- William Stallings, "Wireless Communications and Networks ", Pearson Education – 2004

Outcomes:

- Wireless Sensor Networks (WSN) is a promising technology for monitoring the wireless network environment.

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Faculty of Engineering & Technology

MCS-034: Integrated Software Project Management

L	T	P	Credit 4
3	1	0	

Objective: Understand the fundamental principles of Software Project management & will also have a good knowledge of responsibilities of project manager and how to handle these. Be familiar with the different methods and techniques used for project management.

Contents:

UNIT I Project Management Concepts **08 Hours**

Evolution of Software Economics – Software Management Process Framework (Phases, Artifacts, Workflows, Checkpoints) – Software Management Disciplines (Planning / Project Organization and Responsibilities / Automation / Project Control) – Modern Project Profiles

UNIT II Software Estimation & Costing **08 Hours**

Problems in Software Estimation – Algorithmic Cost Estimation Process, Function Points, SLIM (Software LIfe cycle Management), COCOMO II (COnstructive COst MOdel) – Estimating Web Application Development – Concepts of Finance, Activity Based Costing and Economic Value Added (EVA) – Balanced Score Card.

UNIT III Risk Management **08 Hours**

Risk Definition – Risk Categories – Risk Assessment (Identification / Analysis / Prioritization) – Risk Control (Planning / Resolution / Monitoring) – Failure Mode and Effects Analysis (FMEA)

UNIT IV Metrics **08 Hours**

Need for Software Metrics – Classification of Software Metrics: Product Metrics (Size Metrics, Complexity Metrics, Halstead's Product Metrics, Quality Metrics), and Process metrics (Empirical Models, Statistical Models, Theory-based Models, Composite Models, and Reliability Models).

UNIT V People Management **08 Hours**

Team Management – Client Relationship Management.

Text & Reference Books:

- McConnell, S. "Software Project: Survival Guide", Microsoft Press, 1998. Royce, W. "Software Project management: A Unified Framework", Addison- Wesley, 1998.
- Cooper, R., "The Rise of Activity-Based Costing- PartOne: What is an Activity-Based Cost System?" Journal of Cost Management, Vol.2, No.2 (Summer 1988), pp.45 – 54.
- Grant, J.L. "Foundations of Economic Value Added", John Wiley & Sons, 1997.
- Kaplan, R.S., Norton, D.P. "The Balanced Scorecard: Translating Strategy into Action", Harvard Business School Press, 1996.
- Boehm, B. W. "Software Risk Management: Principles and Practices" in IEEE Software, January 1991, pp32-41.

Outcomes:

- Responsiveness to Clients and the Environment
- Ability to make Timely Trade-off Decisions
- Central Locus of Decisions to insure overall Project Optimality
- Better control, better customer relations,Shorter development time, lower costs,Higher quality and reliability, higher profit margins, better co-ordination, higher morale

Sarvesh Pankaj Vijay Lalita Tripathi

Rama University Uttar Pradesh, Kanpur
Faculty of Engineering & Technology
MCS-035: Supply Chain Management

L	T	P	Credit 4
3	1	0	

Objective: A supply chain is the connected network of individuals, organizations, resources, activities and technologies involved in the manufacture and sale of a product or service. The end result is getting a better product or service to the consumer more efficiently.

Contents:

UNIT I

Fundamentals of Supply Chain Management **08 Hours**

Supply chain networks, integrated supply chain planning, Decision phases in s supply chain, process view of a supply chain, supply chain flows, Overview of supply chain models and modeling systems, Supply chain planning: Strategic, operational and tactical, Understanding supply chain through process mapping and process flow chart.

UNIT II

SCM Strategies, Performance **08 Hours**

Supply chain strategies, achieving strategic fit, value chain, Supply chain drivers and obstacles, Strategic Alliances and Outsourcing, purchasing aspects of supply chain, Supply chain performance measurement: The balanced score card approach, Performance Metrics. Planning demand and supply: Demand forecasting in supply chain, Aggregate planning in supply chain, Predictable variability.

UNIT III

Planning and Managing Inventories **08 Hours**

Introduction to Supply Chain Inventory Management. Inventory theory models: Economic Order Quantity Models, Reorder Point Models and Multiechelon Inventory Systems, Relevant deterministic and stochastic inventory models and Vendor managed inventory models.

UNIT IV Distribution Management **08 Hours**

Role of transportation in a supply chain - direct shipment, warehousing, cross-docking; push vs. pull systems; transportation decisions (mode selection, fleet size), market channel structure, vehicle routing problem. Facilities decisions in a supply chain. Mathematical foundations of distribution management, Supply chain facility layout and capacity planning,

UNIT V Strategic Cost Management in Supply Chain **08 Hours**

The financial impacts, Volume leveraging and cross docking, global logistics and material positioning, global supplier development, target pricing, cost management enablers, Measuring service levels in supply chains, Customer Satisfaction/Value/Profitability/Differential Advantage.

Text & Reference Books:

- David Simchi-Levi, Philip Kaminsky, and Edith Simchi-Levi Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies, Second Edition, , McGraw-Hill/Irwin, New York, 2003. 31
- Sunil Chopra and Peter Meindel. Supply Chain Management: Strategy, Planning, and Operation, Prentice Hall of India, 2002.
- Sunil Chopra & Peter Meindl, Supply Chain Management , Prentice Hall Publisher, 2001
- Robert Handfield & Ernest Nichols, Introduction to Supply Chain Management, Prentice hall Publishers, 1999.

Outcomes:

- Analyze the manufacturing operations of a firm
- Apply sales and operations planning, MRP and lean manufacturing concepts
- Apply logistics and purchasing concepts to improve supply chain operations
- Apply quality management tools for process improvement

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Faculty of Engineering & Technology

MCS-036: Software Reliability Matrix

L	T	P	Credit 4
3	1	0	

Objective: Software metric is a measure of software characteristics which are quantifiable or countable. Software metrics are important for many reasons, including measuring software performance, planning work items, measuring productivity, and many other uses.

Contents:

UNIT I

Introduction to Software Reliability **08 Hours**

Basic Concepts – Failure and Faults – Environment – Availability –Modeling –uses.

UNIT II

Software Reliability Modeling **08 Hours**

Concepts – General Model Characteristic – Historical Development of models – Model Classification scheme – Markova models – General concepts – General Poisson Type Models – Binomial Type Models – Poisson Type models – Fault reduction factor for Poisson Type models.

UNIT III

Comparison of Software Reliability Models **08 Hours**

Comparison Criteria – Failure Data – Comparison of Predictive Validity of Model Groups – Recommended Models – Comparison of Time Domains – Calendar Time Modeling – Limiting Resource Concept – Resource Usage model – Resource Utilization – Calendar Time Estimation and confidence Intervals.

UNIT IV

Fundamentals of Measurement **08 Hours**

Measurements in Software Engineering – Scope of Software metrics – Measurements theory – Goal based Framework – Software Measurement Validation.

UNIT V

Product Metrics **08 Hours**

Measurement of Internet Product Attributes – Size and Structure – External Product Attributes – Measurement of Quality –Reliability Growth Model – Model Evaluation

References

- John D. Musa, Anthony Iannino, Kazuhira Okumoto, "Software Reliability – Measurement, Prediction, Application, Series in Software Engineering and Technology", McGraw Hill, 1987.
- John D. Musa, "Software Reliability Engineering", Tata McGraw Hill, 1999.
- Norman E. Fenton, Shari Lawrence Pfleeger, "Software metrics", Second Edition, International Student Edition, 2003.

Outcomes:

- Increase return on investment (ROI) Software development
- Identify areas of improvement
- Manage workloads
- Reduce overtime
- Reduce costs

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MCS-037: Service Oriented Architecture and Web Security

L T P **Credit 4**

3 1 0

Objective: Service-oriented architecture (SOA) is a software development model for distributed application components that incorporates discovery, access control, data mapping and security features.

Contents:

UNIT I

XML Technology **08 Hours**

XML – XML and Web - Name Spaces – XML Document Structure - Structuring with Schemas and DTD - Modeling Databases in XML – X Query

UNIT II

SOA Basics **08 Hours**

Service Oriented Architecture (SOA) – Comparing SOA with Client-Server and Distributed architectures- Characteristics of SOA – Benefits of SOA -- Principles of Service orientation – Service layers -Business Process management

UNIT III

Web Services (WS) **08 Hours**

SOA and Web Services – Web Services Protocol Stack – Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI. Service- Level Interaction patterns – XML and Web Services -Enterprise Service Bus - .NET and J2EE Interoperability.

UNIT IV

WS Technologies and Standards **08 Hours**

Web Services Technologies - JAX-RPC, JAX-WS. Web Service Standards – WS-RM, WS-Addressing,

WS-Policy. Service Orchestration and Choreography – Composition Standards – BPEL Service Oriented Analysis and Design.

UNIT V

XML and WS Security **08 Hours**

XML Security Overview – Canonicalization – XML Security Framework – XML Encryption – XML Signature – XKMS Structure. Web Services Security - XACML - WS-Security.

Text & Reference Books:

- Ron Schmelzer et al. "XML and Web Services", Pearson Education, 2008. (UNIT 1 and 3)
- Thomas Erl, " Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005 (UNIT 2, 3, 4, and 5)
- Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002 (UNIT5)

Outcomes:

- Improved information flow
- Ability to expose internal functionality
- Lower software development and management costs

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MCS-038: Software Quality Assurance

L T P **Credit 4**

3 1 0

Objective: Understand quality management processes and Distinguish between the various activities of quality assurance, quality planning and quality control. Understand the importance of standards in the quality management process and their impact on the final product.

Contents:

UNIT I **08 Hours**

Introduction to software quality - challenges – objectives – quality factors – components of SQA – contract review – development and quality plans – SQA components in project life cycle – SQA defect removal policies – Reviews

UNIT II **08 Hours**

Basics of software testing – test generation from requirements – finite state models – combinatorial designs - test selection, minimization and prioritization for regression testing – test adequacy, assessment and enhancement

UNIT III **08 Hours**

Testing strategies – white box and black box approach – integration testing – system and acceptance testing – performance testing – regression testing - internationalization testing – ad-hoc testing – website testing – usability testing – accessibility testing Test plan – management – execution and reporting – software test automation – automated testing tools

UNIT IV **08 Hours**

Hierarchical models of software quality – software quality metrics –function points Software product quality – software maintenance quality – effect of case tools – software quality infrastructure – procedures – certifications – configuration management – documentation control.

UNIT V **08 Hours**

Project progress control – costs – quality management standards – project process standards – management and its role in SQA – SQA unit

Text & Reference Books:

- Daniel Galin, Software quality assurance – from theory to implementation, Pearson education, 2009.
- Aditya Mathur, Foundations of software testing, Pearson Education, 2008
- Srinivasan Desikan and Gopalaswamy Ramesh, Software testing – principles and practices , Pearson education, 2006

Outcomes:

- Software & Quality
- Verification & Validation (V&V)
- Dependent Software and Software Integrity Levels
- SQA Planning
- Quality Metrics and Measurements

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Faculty of Engineering & Technology

MCS-039: Imaging and Multimedia System

L	T	P	Credit 4
3	1	0	

Objective: Multimedia is the field related to computer controlled integration of texts, (still or moving images) graphics, drawings, audio and animations.

Contents:

UNIT I

Introduction **08 Hours**

Introduction to Image Processing: Steps in Image Processing Systems –Image Acquisition – Sampling and Quantization – Pixel Relationships – Color Fundamentals and Models.

Introduction to Multimedia: Multimedia Elements – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

UNIT II

Compression and File Formats **08 Hours**

Compression and Decompression: Need for Data Compression – Types of Compression – Binary Image Compression Schemes – Image Compression – Video Compression – Audio Compression.

Data and File Format Standards: Rich Text Format – TIFF File Format – Resource Interface File Format – MIDI File Format - JPEG DIB File Format – AVI Indeo File Format – MPEG Standards –TWAIN.

UNIT III

Image Computing and Security **08 Hours**

Image computing: The basics of processing 2D images- Thresholding -Convolution-Edge detection-Mathematical Morphology and Shape Descriptors-Noise Reduction- Image Fusion. Image Security: Image Forensics - Steganography -Image Cryptography Techniques-Chaos based and Non-Chaos based methods.

UNIT IV

I/O Technologies **08 Hours**

Input and Output Technologies: Multimedia I/O Technologies: Image Scanners – Digital Voice and Audio – Digital Camera – Video Images and Animation – Full Motion Video - Video Motion Analysis.

UNIT V

Application Design **08 Hours**

Multimedia Application Classes – Types of Multimedia Systems – Virtual Reality – Components of Multimedia Systems -Multimedia Authoring Systems – Multimedia Authoring Tools – User Interface Design- Mobile Messaging – Hypermedia Message Components -Hypermedia Linking and embedding.

Text & Reference Books:

- Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing – Pearson Education, 2011.
- Ralf Steinmetz, Klara Steinmetz, "Multimedia Computing, Communications & Applications", Pearson education, 2009.
- A.K. Jain, Fundamentals of Digital Image Processing, PHI, New Delhi, 2001.
- William K Pratt, Digital Image Processing, John Willey, 2012.
- Prabat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", Prentice Hall India, 2007, New Delhi.
- Tay Vaughan, "Multimedia Making It Work", McGraw Hill, 2011.
- Parekh R "Principles of Multimedia" Tata McGraw-Hill, 2006.

Outcomes:

- Describe different realisations of multimedia tools and the way in which they are used
- Analyse the structure of the tools in the light of low-level constraints imposed by the adoption of various QoS schemes (ie bottom up approach)
- Analyse the effects of scale and use on both presentation and lowerlevel requirements (ie top down approach)

Departmental Elective-III

1.	Data Manning and Data Ware Housing	MCS 040
2.	Cluster and Grid Computing	MCS 041
3.	Artificial intelligence & Neural Network	MCS 042
4.	Research Methodology	MCS 043
5.	Open Source Software	MCS 044
6.	Natural Language Processing	MCS 045
7.	Machine Vision	MCS 046
8.	Information Retrieval	MCS 047
9.	Analysis & Design of Real-Time Systems	MCS 048
10.	Dedicated System Design	MCS 049

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Departmental Elective-III

MCS-040: Data Mining and Data Ware Housing

L	T	P	Credit 4
3	1	0	

Objective: Data mining is a process of extracting information and patterns, which are previously unknown, from large quantities of data using various techniques ranging from machine learning to statistical methods. Data could have been stored in files, Relational or OO databases, or data warehouses.

Contents:

UNIT I **08 Hours**

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

UNIT II **08 Hours**

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems.

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT III **08 Hours**

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines –

Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT IV **08 Hours**

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods –Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis –Outlier Analysis.

UNIT V **08 Hours**

Mining Object, Spatial, Multimedia, Text and Web Data:Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining –Multimedia Data Mining – Text Mining – Mining the World Wide Web.

Text Book

- Jiawei Han, Micheline Kamber and Jian Pei"Data Mining Concepts and Techniques", Third Edition, Elsevier, 2011.

Reference Books

- Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw –Hill Edition, Tenth Reprint 2007.
- K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", EasterEconomy Edition, Prentice Hall of India, 2006.
- G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, PrenticeHall of India, 2006.

Outcomes: Upon Completion of the course, the students will be able to Store voluminous data for online processing Preprocess the data for mining applications. Apply the association rules for mining the data.

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MCS-041: Cluster and Grid Computing

L	T	P	Credit 4
3	1	0	

Objective: Rapid developments in the capabilities of computing, storage, and networking components and their manufacturing techniques in the last two decades have enabled commoditization of high performance computing. Grids to enable distributed high-performance computing for scientific research and business applications.

Contents:

UNIT I **08 Hours**

Introduction: High Performance Computing (HPC), Grand Challenge Problems Computational and communication intensive, Parallel Architectures Classifications SMP,MPP, NUMA, Clusters and Components of a Parallel Machine, Conventional Supercomputers and it's limitations, Multi processor and Multi Computer based Distributed Systems.

UNIT II **08 Hours**

Cluster and Grids: Cluster Components Processor/machine, High Speed Interconnections goals, topology, latency, bandwidth, Example Interconnect: Myrinet, Inifiniband, QsNet, Fast Ethernet, Gigabit Ethernet, Light weight Messaging system/Light weight communication Protocols, Cluster Middleware Job/Resource Management System, Load balancing, Scheduling of parallel processes, Enforcing policies, GUI,

UNIT III **08 Hours**

Introduction to programming tools such as PVM, MPI, Cluster Operating Systems Examples: Linux, MOSIX, CONDOR, Characteristics of Grid, Computational services, Computational Grids, Data grids/Storage grids, management and applications, Different components of Grid Grid fabric, Grid middleware, Grid applications and portal, Globus toolkit Ver.2.4, web services, MDS,GRAM, Grid Security –Cryptography,

UNIT IV **08 Hours**

Authentication: Integrity, Digital Signature, Digital Certificates, Certificate Authority, MD 5, RSA, GSI,GSSAPI, Directory Service, LDAP,GRID FTP,GASS

UNIT V **08 Hours**

Fault Tolerance: Fault detection and diagnosis of Clusters and Grids. Recent advances in cluster and grid computing.

Text & Reference Books:

- D. Janakiram, Grid Computing, Tata Mcgraw Hill.
- R. K. Buyya, High Performance Cluster Computing: Programming and Applications, Vol- 2, PHI, NJ, USA.
- P. Jalote, Fault Tolerance in Distributed Systems, Prentice Hall.
- J. J. Jos & R. K. Buyya, High Performance Cluster Computing: Architecture and Systems, Vol 1, PHI, NJ, USA.
- R. K. Buyya & C. Szyperski, Cluster Computing, Nova Science, New York, USA.

Outcomes:

Owing to this diversity, ensuring that all students have a good understanding of the foundations of network and concurrent programming is important to focus on core topics in cluster and Grid computing.

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Faculty of Engineering & Technology
MCS-042: Artificial intelligence & Neural Network

L	T	P	Credit 4
3	1	0	

Objective: Detect fraud as soon as possible in a dataset of millions of cards. Alternative approach: neural networks: Large collection of frauds for training a forward neural network with 3 layers i.e. apply actions of credit card users at the input of the first layer of neurons.

Contents:

UNIT I **08 Hours**

Overview of Artificial intelligence

Problems of AI, AI technique, Tic – Tac – Toe problem. Problems, Problem Space & search. Heuristic Search Techniques, Knowledge representation issues. Representing knowledge using rules. Symbolic reasoning under uncertainty. Statistical reasoning.
Learning – induction & explanation based learning.

UNIT II **08 Hours**

Basic concepts of neurocomputing

Artificial Neural Networks (ANN) and their biological roots and motivations. ANNs as numerical data/signal/image processing devices. Encoding (training phase) and decoding (active phase). Taxonomy of neural networks: feedforward and recurrent networks with supervised and unsupervised learning laws.
Static and dynamic processing systems. Basic data structures: mapping of vector spaces, clusters, principal components.

UNIT III **08 Hours**

Basic terminology related to an artificial neuron

A summing dendrite, synapses and their weights, pre- and post-synaptic signals, activation potential and activation function. Excitatory and inhibitory synapses. The biasing input. Types of activating functions.

The Perceptron

The Perceptron and its learning law. Classification of linearly separable patterns.

Linear Networks.

Adaline --- the adaptive linear element. Linear regression. The Wiener-Hopf equation. The Least-Mean-Square (Widrow-Hoff) learning algorithm. Method of steepest descent. Adaline as a linear adaptive filter. A sequential regression algorithm.

UNIT IV **08 Hours**

Multi-Layer Feedforward Neural Networks: AKA Multi-Layer Perceptrons. Supervised Learning. Approximation and interpolation of functions. Radial-Basis functions. Back-Propagation Learning law. Fast training algorithms. Applications of multilayer perceptrons: Image coding, Paint-quality inspection, Nettalk.

Self-Organising systems: Unsupervised Learning. Local learning laws. Generalised Hebbian Algorithm. The Oja's and Sanger's rules. Principal component analysis --- Karhunen-Loeve transform.

UNIT V **08 Hours**

Competitive Learning: MinNet and MaxNet networks. Clustering. Learning Vector Quantisation. Codebooks. Application in data compression.

Self-Organizing Feature Maps: Kohonen networks.

Text & Reference Books:

- Simon Haykin, Neural Networks -- a Comprehensive Foundation, Prentice Hall, 2nd ed., 1999, ISBN 0-13-273350-1
- H. Demuth, M. Beale, For use with MATLAB. User's Guide The MathWorks Inc, (Huge file!)
- For use with MATLAB. User's Guide The MathWorks Inc, (Huge file!)

Outcomes:

- Feedback system is the essential part of any well-organized system.
- The continuous uninterrupted feedback results can be used as learning matrix.
- Neural network relearning from updated matrix helps to make decisions using new experience of exceptional cases, thus improving decision-making.

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MCS-043: Research Methodology

L	T	P	Credit 4
3	1	0	

Objective: Formulating research aim and objectives in an appropriate manner is one of the most important aspects of your research.

Contents:

UNIT I **08 Hours**

Introduction to Educational Research

Concept, types-basic, applied and action, Need for educational research

Reviewing Literature

Need, Sources-Primary and Secondary, Purposes of Review, Scope of Review, Steps in conducting review

UNIT II **08 Hours**

Identifying and defining research problem

Locating. Analyzing stating and evaluating problem, Generating different types of hypotheses and evaluating them.

Method of Research

Descriptive research design-survey, case study, content analysis, Ex-post Facto Research, Correlational and Experimental Research

UNIT III **08 Hours**

Sampling Techniques

Concept of population and sample' sampling techniques-simple random sampling, stratified random sampling, systematic sampling and cluster sampling, snow ball sampling, purposive sampling, quota sampling techniques determining size of sample

UNIT IV **08 Hours**

Design and development of measuring instruments, Tests, questionnaires, checklists, observation schedules, evaluating research instruments, selecting a standardized test.

Procedure of data collection

Aspects of data collection, coding data for analysis

UNIT V **08 Hours**

Statistical Methods of Analysis

Descriptive statistics: Meaning, graphical representations, mean, range and standard deviation, characteristics and uses of normal curve.

Inferential statistics: t-test. Chi-square tests. Correlation (rank difference and product moment), ANOVA (one Way)

Text & Reference Books:

- Borg, W and Gall, M. Educational Research: An Introduction, New York, Longman, 2003
- Cohen, L. Educational Research in class rooms and schools! A Manual of Materials and Methods NY: Harper and Row Publishers,2000
- CPSC: Developing Skills in Technican Education Research Modules 1 to 11 Singapore, Colombo Plan Staff College for Technician Education
- Garrett, HE and Woodworth, RS Statistics in Psychology and Education, Educational Research, Bombay: Vakils Fetter and Simons Ltd. 2003
- Gay, LR, Educational Research, Ohio: Charles E. Merril Publishing Company 2000
- Wiersma William Research Methods in Education- An Introduction London, Allyn and Bacon, Inc. 2000

Outcomes:

- Understand some basic concepts of research and its methodologies
- Identify appropriate research topics
- Select and define appropriate research problem and parameters
- Prepare a project proposal (to undertake a project)
- Organize and conduct research (advanced project) in a more appropriate manner
- write a research report and thesis and write a research proposal.

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MCS-044: Open Source Software

L T P **Credit 4**

3 1 0

Objective: Ability to install and run **open-source** operating systems. Ability to gather information about Free and **Open Source Software** projects from **software** releases and from sites on the internet. Ability to build and modify one or more Free and **Open Source Software** packages.

Contents:

UNIT I - Introduction **08 Hours**

Introduction to open source programming languages, advantages and drawbacks of open source programming, threats and vulnerabilities in open source languages, Operating System – Ubuntu Linux – Introduction to shell programming.

UNIT II – PHP **08 Hours**

PHP Language Basics, Functions - calling a function, variable function, and anonymous function, Strings - cleaning, encoding and escaping, and comparing strings, Arrays – storing data in arrays, extracting multiple values, traversing, and sorting arrays, Objects – creation, introspection, and serialization, Web Techniques – processing forms and maintaining state.

UNIT III – Web Database Applications **08 Hours**

Three-tier architecture, Introduction to Object oriented programming with PHP 5, Database basics, MYSQL - querying web databases, writing to web databases, validation with Javascript, Form based authentication, protecting data on the web.

UNIT IV – Perl, Tcl, and Python **08 Hours**

Numbers and Strings, Control Statements, Lists and Arrays, Files, Pattern matching, Hashes, Functions. Introduction to TCL/TK, Introduction to Python.

UNIT V – Security In Web Applications **08 Hours**

Recognizing web application security threats, Code Grinder, Building functional and secure web applications, Security problems with Javascript, vulnerable GCI scripts, Code Auditing and Reverse Engineering, types of security used in applications.

Text Book

- Kevin Tatroe, Peter MacIntyre, Rasmus Lerdorf, "Programming PHP", O'Reilly Media, 2012.
- Michael Cross, "Developer's Guide to Web Application Security", Syngress Publishers, 2007.
- Hugh E. Williams, David Lane, "Web Database applications with PHP and MYSQL", Second Edition, O'Reilly Media, 2004.

References

- Tom Christiansen, Brian D Foy, Larry Wall, Jon Orwant, "Programming Perl", Fourth Edition, O'Reilly Media, 2012.
- Mark Lutz, "Programming Python", Fourth Edition, O'Reilly Media, 2010.
- Online Tutorials and Recent IEEE/ACM Journal Papers

Outcomes:

- Ability to use a version control system and to interface with version control systems used by development communities.
- Ability to contribute software to and interact with Free and Open Source Software development projects.

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MCS-045: Natural Language Processing

L T P **Credit 4**

3 1 0

Objective:

This course introduces the fundamental concepts and techniques of natural language processing (NLP). Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information. The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.

Contents:

UNIT I **08 Hours**

Introduction to NLP: Introduction and Survey of applications, Levels of linguistic processing: morphology, syntax, semantics

Language processors and Understanding: recognizers, transducers, parsers, generators, Language as a rule-based system, Language understanding as an inferential activity.

UNIT II **08 Hours**

Resources for NLP: Introduction to lexicons and knowledge bases.

Computational morphology: lemmatization, Part-of-Speech Tagging, Finite-State Analysis.

UNIT III **08 Hours**

Syntactic Processing: Basic parsing: Top Down and Bottom Up parsing, Chart parsing, Deterministic parsing, Statistical parsing, Grammars with features, Unification Grammars, The Lexicon.

UNIT IV **08 Hours**

Semantic Interpretation: Lexical semantics, Semantics and logical form, Resolving ambiguities: Word Sense Disambiguation, Linking syntax and semantics, Linking syntax and semantics in restricted domains

UNIT V **08 Hours**

Context and World Knowledge: Discourse: linguistic context, Ellipsis; World knowledge, Discourse structure Conversation and co-operation, Implementing "co-operative responses", Information Retrieval and Information Extraction

Text Book:

- Allen, J. Natural language understanding, 2ndEdition, Redwood City, CA: 1994. Benjamin/ Cummings.

References:

- Covington, M.A : Natural Language Processing for Prolog . Programmers, (1994), Prentice Hall
- Jurafsky, D. and Martin: Speech and Language Processing, (2000), Prentice Hall
- Gazdar, G. & Mellish, C: Natural Language Processing in Prolog: An Introduction to Computational Linguistics,(1989), Addison Wesley

Outcomes:

By the end of the course, students should have a broad understanding of the eld of natural language processing. They should also understand the theoretical underpinnings of natural language processing in linguistics and formal language theory.

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MCS-046: Machine Vision

L	T	P	Credit 4
3	1	0	

Objective: Machine vision is the automatic extraction of information from digital images for process or quality control. Most manufacturers use automated machine vision instead of human inspectors because it is better suited to repetitive inspection tasks. It is faster, more objective, and works continuously.

Contents:

UNIT I **08 Hours**

Introduction:

Camera Models, & Views, basics of image processing, introductions to image segmentation and representation.

Early Vision:

Vision goals, Linear Filters , Edge Detection, Texture, The Geometry of Multiple Views, Stereopsis, Affine Structure from Motion, Projective Structure from Motion

UNIT II **08 Hours**

Mid Level Vision:

Segmentation By Clustering, Segmentation By Fitting a Model, Segmentation and Fitting Using Probabilistic Methods, Tracking with Linear Dynamic Models.

UNIT III **08 Hours**

High-level Vision: Geometric Methods

Model-Based Vision, Smooth Surfaces and their Outlines, Aspect Graphs, Range Data

UNIT IV **08 Hours**

High-level Vision: Probabilistic and Inferential Methods:

Finding Templates using Classifiers, Recognition by Relations between Templates, geometric Templates from Spatial Relations

UNIT V **08 Hours**

Applications

Digital Libraries, Image Rendering, Medical applications, Human activity recognition, Face Recognition

Text Book

- Forsyth and Ponce : Computer Vision A Modern Approach Pearson Education Latest Edition References
- Trucco & Verri : Introductory Techniques for 3-D Computer Vision, Prentice Hall, Latest Edition
- Low: Introductory Computer Vision and Image Processing, McGraw-Hill 1991, ISBN 0-07-707403-3
- Jain, Kasturi and Schunk : Machine Vision, McGraw-HiII. 1995 ISBN 0070320187.

Outcomes:

- Measurement, counting, location, and decoding are some of the most common applications for machine vision in manufacturing today.
- By reducing defects, increasing yield, facilitating compliance with regulations and tracking parts with machine vision, manufacturers can save money and increase profitability.

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

MCS-047: Information Retrieval

L T P **Credit 4**

3 1 0

Objective: The main objective of this course is to present the basic concepts in information retrieval and more advance techniques of multimodal based information systems.

Contents:

UNIT I Introduction **08 Hours**

Basic Concepts – Retrieval Process – Modeling – Classic Information Retrieval – Set Theoretic, Algebraic and Probabilistic Models – Structured Text Retrieval Models – Retrieval Evaluation –Word Sense Disambiguation

UNIT II Querying **08 Hours**

Languages – Key Word based Querying – Pattern Matching – Structural Queries – Query Operations – User Relevance Feedback – Local and Global Analysis – Text and Multimedia languages

UNIT III Text Operations And User Interface **08 Hours**

Document Preprocessing – Clustering – Text Compression - Indexing and Searching – Inverted files – Boolean Queries – Sequential searching – Pattern matching – User Interface and Visualization – Human Computer Interaction – Access Process – Starting Points –Query Specification - Context – User relevance Judgment – Interface for Search

UNIT IV Multimedia Information Retrieval **08 Hours**

Data Models – Query Languages – Spatial Access Models – Generic Approach – One Dimensional Time Series – Two Dimensional Color Images – Feature Extraction

UNIT V Applications **08 Hours**

Searching the Web – Challenges – Characterizing the Web – Search Engines – Browsing – Meta-searchers – Online IR systems – Online Public Access Catalogs – Digital

Libraries – Architectural Issues – Document Models, Representations and Access – Prototypes and Standards

References:

- Ricardo Baeza-Yate, Berthier Ribeiro-Neto, "Modern Information Retrieval", Pearson Education Asia, 2005.
- G.G. Chowdhury, "Introduction to Modern Information Retrieval", Neal- Schuman Publishers; 2nd edition, 2003.
- 3. Daniel Jurafsky and James H. Martin, "Speech and Language Processing", Pearson Education, 2000
- David A. Grossman, Ophir Frieder, " Information Retrieval: Algorithms, and
- Heuristics", Academic Press, 2000
- Charles T. Meadow, Bert R. Boyce, Donald H. Kraft, "Text Information Retrieval Systems", Academic Press, 2000

Outcomes:

- Understand the underlined problems related to IR and
- Acquired the necessary experience to design, and implement real applications using information Retrieval systems.

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

MCS-048: Analysis & Design of Real-Time Systems

L T P **Credit 4**

3 1 0

Objective: Formal specification and verification of timing constraints and properties design methods for real-time systems. Development and implementation of new techniques to advance the state-of-the-art real-time systems research.

Contents:

UNIT I Basic Concepts **08 Hours**

IEEE Definition of Real-Time Systems, Characterization of Real-Time Systems, Process, IEEE POSIX.1c Threads, Tasks and Priorities, Pre-emptive and Non-Preemptive Tasks, Soft and Hard Real-Time Systems

UNIT II Scheduling **08 Hours**

Scheduling Paradigms: Priority Driven, Time Driven, and Share Driven, Priority Driven Scheduling of Periodic, Aperiodic and Sporadic tasks

Static Priority Scheduling: Rate Monotonic Scheduling Algorithm and its exact analysis using Response Time Test

Dynamic Priority Scheduling: Analysis of EDF and LLF Algorithms and their open issues

UNIT III Specification and Verification **08Hours**

Modeling Real-Time System, Requirement Specification, Assumptions, Design, Basic Duration Calculus, Specification of Scheduling Policies, Probabilistic Duration Calculus, Applications of Duration Calculus

UNIT IV RTOS **08 Hours**

Introduction, Requirement of Real-Time Guarantees in industrial applications, Soft and Hard RTOS, Commercial RTOS Examples

IEEE POSIX.1b: Priority Scheduling, Real-Time Signals, Timers, Binary Semaphores, Counting Semaphores, MUTEX operations and usage, Message Passing, Message Queues

operations and usage, Shared Memory, Synchronous and Asynchronous I/O, Memory Locking

RTOS Services, Case Studies of Real Time Capabilities of Linux Kernel 2.6, RTLinux and VxWorks

UNIT IV Applications **08 Hours**

Real-Time Application Design, Real-Time Application Interface (RTAI), Real-Time Java, Real-Time Communications and Networking

Text & Reference Books:

- JWS Liu, "Real-Time Systems", Pearson
- Mathai Joseph, "Real-Time Systems: Specification, Verification and Synthesis", Prentice-Hall
- Qing Li, "Real-Time Concepts for Embedded Systems", CMP Books
- Krishna, Shin, "Real-Time Systems", TMH

Outcomes:

- An ability to understand advanced concepts in theory of computer science.
- An ability to understand advanced concepts in analysis & design of algorithms.
- An ability to apply knowledge of advanced computer science to formulate the analyze problems in computing and solve them.

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

MCS-049: Dedicated System Design

L	T	P	Credit 4
3	1	0	

Objective: An ability to function effectively on teams to accomplish a common goal. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

Contents:

UNIT-I Review of Digital Computer & Digital Arithmetic **8 Hours**

Algorithm and Algorithmic Notation, Timing, Synchronization_and Memory, Fixed and Floating point Arithmetic operations, Arithmetic primitives, Sequential and Distributed Arithmetic.

UNIT-II Hardware Elements and Hardware Design using VHDL **8 Hours**

Gates, Flip-Flops, Registers, Synchronization Signals, Power Consumption and related design rules, Pulse generation and Interfacing, Chip Technology: Semiconductor Memories, Processors and Configurable Logic, Chip Level and Board Level Design Considerations Hardware Design Languages, Simulation of Hardware Elements using VHDL, Timing Behavior and Simulation, Test Benches, Synthetic Aspects

UNIT III Sequential Control Circuits and Processors **8 Hours**

Mealy and Moore Automaton, Designing the Control Automaton, Implementing Control Flow and Synchronization Designing for ALU efficiency, Memory Subsystems, Simple Programmable Processor Design, Interrupt Processing and Context Switching, Interfacing Techniques, Standard Processor Architectures

UNIT IV System Level Design **8 Hours**

Aspects of System Design, Scalable System Architecture, Regular Processors, Network Architecture, Integrated Processor Networks, Static Application Mapping and Dynamic Resource Allocation, Resource Allocation on Crossbar Networks and FPGA Chips,

Communication Data and Control Information, Π(Pi)-nets Language for Heterogeneous Programmable Systems

UNIT IV Digital Signal Processors **8 Hours**

DSP Elements and Algorithms, Integrated DSP Chips, Floating Point Processors, DSPs on FPGA, Typical Applications

Text & Reference Books:

- Mayer, Lindenberg, "Dedicated Digital Processors", Wiley
- R Gupta, "Co-Synthesis of Hardware and Software for Embedded Systems", Kluwer
- "Digital Signal Processing", IEEE Press

Outcomes:

- An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
- An ability to design, implements, and evaluate a computer-based system, process, component, or program to meet desired needs.
- An ability to function effectively on teams to accomplish a common goal.

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

MCS 301: Dissertation-I

L	T	P	Credit 12
0	0	16	

Course Contents:

Research and development projects based on problems of practical and theoretical interest. Problem definition, background research, development of overall project plan. Evaluation will be based on student seminars, written reports, and evaluation of the developed system and/or theories

Students have to perform a dissertation work related to their respective stream in M. Tech. The dissertation work may be software or hardware based. It may be extendable to major dissertation.

Rama University Uttar Pradesh, Kanpur

Faculty of Engineering & Technology

MCS 401: Dissertation-II

L	T	P	Credit 20
0	0	24	

The module aims to develop an understanding of the processes and skills required to undertake a supervised research project at master's level of study, and to write this up as your dissertation. The dissertation is the assessment for this module.

The module objectives are:

- Develop research skills commensurate with the accomplishment of a master's degree
- Develop skills in independent inquiry
- Produce a coherent and logically argued piece of writing that demonstrates competence in research and the ability to operate independently
- Address issues of research design, methodology, ethics and theoretical arguments, and apply these to your own research
- A student has to make a latest technology based work in their respective stream. It may be hardware or software based.

Outcomes: Having successfully completed this module you will be able to:

- Identify key research questions within the field of Demography on which you will carry out independent research.
- Manage your time effectively whilst working on your independent research.
- Demonstrate appropriate referencing and develop skills in other aspects of academic writing.
- Demonstrate knowledge and understanding of report writing.
- Apply the demographic/statistical research training acquired in the taught element of the programme by designing an appropriate research strategy and research methodology to carry out your research.
- Use and develop written and oral presentation skills.
- Identify, summaries and critically evaluate relevant literature and write a literature review of the relevant field.

- Identify, analyses and interpret suitable data to enable the research question to be answered.
- Understand and apply theoretical frameworks to the chosen area of study.
- Show evidence of clarity of argument, understanding of the chosen topic area, and presentation of technical information.
- Describe the process of carrying out independent research in written format and report your results and conclusions with reference to existing literature.
- Analyze and synthesize research findings.

Chairperson

Signature: .....

Name: Dr. Vivek Srivastava

Date:

Internal Members

Signature:

1..... 2.....

Name: Mr. Sarvesh Kumar Mr. Somendra Tripathi

Date:

Signature: 3.....

Name: Ms. Lalita Mishra

Date:

External Members

Signature:

1..... 2.....

Name: Dr. Bipin Kumar Tripathi Mr. Pankaj Singh Patel

Date:

Date :