
مولانا آزاد نیشنل اُردو یونیورسٹی
मौलाना आज़ाद नेशनल उर्दू यूनिवर्सिटी
Estd. 1998
MAULANA AZAD NATIONAL URDU UNIVERSITY

मौलाना आज़ाद नेशनल उर्दू यूनिवर्सिटी مولانا آزاد نیشنل اُردو یونیورسٹی

MAULANA AZAD NATIONAL URDU UNIVERSITY

(A Central University established by an Act of Parliament in 1998)

Accredited with 'A' grade by NAAC

PROGRAMME: MASTER OF TECHNOLOGY (COMPUTER SCIENCE)

DURATION: 2 YEARS

REGULATIONS, CURRICULUM & SYLLABUS

Department of CS & IT

School of Computer Science & Information Technology

Maulana Azad National Urdu University, Hyderabad (India)

1. **Definitions**

   a. **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.

   b. **Choice Based Credit System (CBCS):** The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).

   c. **Course:** Usually referred to, as 'papers' is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures, tutorials, laboratory work, field work, outreach activities, project work, vocational training, viva, seminars, term papers, assignments, presentations, self-study etc. or a combination of some of these.

   d. **Credit Based Semester System (CBSS):** Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.

   e. **Credit Point (CP):** The numerical value obtained by multiplying the grade point (GP) by the no. of credit(C) of the respective course i.e. CP= GP X C.

   f. **Credit(C):** A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week, i.e. a course with assigned L-T-P: 3-0-2 or 3-1-0 will be equivalent to 4 credits weightage course.

   g. **Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

   h. **Grade Point (GP):** It is a numerical weight allotted to each letter grade on a 10 point scale.

   i. **Letter Grade:** It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P and F.

   j. **Programme:** An educational programme leading to award of a degree, diploma or certificate.

   k. **Semester Grade point Average (SGPA):** It is a measure of performance of work done in a semester. It is ratio of total credit points (CPs) secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed upto two decimal places.

   l. **Semester:** Each semester will consist of 15-18 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be scheduled from July to December and even semester from January to June.

   m. **Transcript or Grade Card (GC) or Certificate:** Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester the grade certificate will display the course details (code, title, no. of credits, grades secured) along with SGPA of that semester and CGPA earned till date semester.

   n. **Sessional:** The internal assessments in theory papers conducted normally through two-tests, assignments, seminar / demonstrations and attendance with **15%, 5%, 5% and 5%** marks respectively. Sessional weightage shall be uniformly 30% and shall be normally performed by the

concerned teacher.

o. **Semester Examinations:** The comprehensive examinations conducted for summative evaluation of course. The duration of these examinations shall be 3 and 4 hours for theory and practical courses respectively; and the weightage shall be 70% for theory and 50% for practical uniformly for all the courses.

p. **L-T-P:** The prescribed hours/week during a semester for Lecture-Tutorial-Practical to a particular course, in accordance with curriculum prescriptions based on respective nature.

q. **Programme Span (PS):** The programme's maximum time for completion shall be additional two (2) years (4 semesters).

2. General

a. An academic year will consist of two semesters; namely odd and even semesters commencing normally from July and January respectively.

b. Promotion from odd-to-even semester shall be automatic for normal cases, otherwise shall be governed by Section 7 clauses.

c. All the calculations of SGPA and CGPA shall be rounded to two decimal places.

3. Attendance

Attendance requirement for appearing in examination of each of the semesters shall be 75%. Otherwise the student will be detained in semester examination. However, students having attendance from 65% to 75% may be allowed by a special permission from competent authority after showing the certified proofs with valid reasons for medical, sports, extra-curricular activities etc.

4. Performance Evaluation

a. **Sessional:** The laboratory course sessional evaluations shall be performed continuously based on practical performed by a student. Such evaluation may involve periodic assessment of documentation of the practical exercise/experiment, precision of experiment etc. In the case of Project /Dissertation the Internal Assessment may be based on periodical progress report.

b. **Semester Examination:** The Semester Examination shall commence during the first week of December/May for the Odd semester/Even semester courses, respectively.

c. **Appointment of Examiners:** Head of the department shall normally appoint the examiners for different courses, selecting at least two other than the concerned teachers, randomly for theory courses in each of the semesters. In case of Lab/Projects/Viva-Voce examinations there shall be one internal and one external examiner. A sizable panel of external examiners shall be approved by the BOS on annual basis to facilitate the appointment of external examiners.

d. **Moderation:** A committee duly constituted by BOS as follows, shall moderate the examination papers and shall have the right to improve / change the questions to a considerable extent:
   i. Dean (Chairman)
   ii. Head of the department (Convener)
   iii. Three Faculty Members nominated by the Dean

e. **Evaluation:** All the evaluations shall be performed in terms of marks, adding finally for each

course out of 100 marks. The marks obtained by each student in courses shall be converted to Letter-Grades / Grade-Points using Grading Assignment Table, described in Section 5.

5. Grading System:

The grades and their description, along with equivalent numerical grade points are listed in the Grading Assignment Table as follows:

Grade Assignment Table

Range of Marks	Description	Grade	Grade Point
85 – 100	Outstanding	O	10
75 – 84	Excellent	A+	9
65 – 74	Very Good	A	8
55 – 64	Good	B+	7
50 – 54	Above Average	B	6
45 – 49	Average	C	5
40 – 44	Pass	P	4
0 – 39	Fail	F	0
Otherwise	Absent	Ab	0

a. A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

b. For non credit courses **'Satisfactory' or 'Unsatisfactory'** shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

6. Computation of SGPA and CGPA

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

a. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

SGPA (Si) = ∑(Earned Credits Ci x Grade Point Gi)/∑Earned Credits Ci;

Where Ci is the number of credits of the ith course and Gi is the Grade Point Scored by the student in the ith course.

b. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

CGPA (Ci) = ∑(Earned Credits Ci x SGPA Si)/∑Ci);

Where Si is the SGPA of the ith semesters and Ci is the total number of credits in that semester.

c. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Illustration of the computation of SGPA and CGPA and Format for Transcripts

i. Computation of SGPA and CGPA

Illustration for SGPA

Course	Credits	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course 1	3	A	8	3 X 8 = 24
Course 2	4	B+	7	4 X 7 = 28
Course 3	3	B	6	3 X 6 = 18
Course 4	3	O	10	3 X 10 = 30
Course 5	3	C	5	3 X 5 = 15
Course 6	4	B	6	4 X 6 = 24
	20			139

Thus, **SGPA = 139/20 = 6.95**

Illustration for CGPA

Semester 1	**Semester 2**	**Semester 3**	**Semester 4**
Credit : 20 SGPA : 6.9	Credit : 22 SGPA : 7.8	Credit : 25 SGPA : 5.6	Credit : 26 SGPA : 60
Semester 5	**Semester 6**		
Credit : 26 SGPA : 6.3	Credit : 25 SGPA : 8.0		

Thus, **CGPA** = $\frac{20 \times 6.9 + 22 \times 7.8 + 25 \times 5.6 + 26 \times 6.0 + 26 \times 6.3 + 25 \times 8.0}{144} = 6.73$

ii. **Transcripts (Format):**

Based on the above recommendations on Letter grades, grade points, SGPA and CGPA, the Higher Education Institutions may issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

7. Programme Continuation / Discontinuation:

The continuation / discontinuation and Exit with Degree shall be governed as follows:

a) A candidate shall be allowed to continue the programme provided he/she maintains a CGPA of 5.0 both in all theory and lab courses at the end of the even semesters (e.g. 2nd, 4th and 6th for the academic programmes). Otherwise, the candidate shall remain in the same year till he/she pass the back paper with minimum credits required to attain the CGPA as 5.0.

b) A candidate shall have to re-appear in semester examination of the courses with Fail/Absent grade (as per Grade Assignment Table in section 5 clause), when the same course is offered next time in the department during the programme span. Such students shall retain their sessional marks.

8. Division and Position:

Division shall be awarded in the following manner, to the candidates on the basis of their respective CGPA:

CGPA ≥ 8	1st Division with Distinction
6.5 ≤ CGPA < 8	1st Division
Otherwise	2nd Division

However, First, Second or Third position shall be awarded to the candidates, provided they meet the following conditions:

a) Rank shall be solely decided on the final CGPA, on completion of degree credit requirement.

b) The candidate has completed all the prescribed requirements, in the prescribed programme duration.

c) The candidate has passed / secured valid grades in all the prescribed courses, in the first attempt.

d) No disciplinary action is pending or has ever been lodged against him/her.

e) In case of an exceptional tie, both candidates shall be awarded the same rank.

9. Review and Re-evaluation:

Review and re-evaluation of the answer sheets shall be as per the university rules.

10. Grade Card:

At the end of each semester, a student will be given a 'Grade Card' which will contain Course Code, Title, Credits, Grades Awarded, Earned Credits and Earned Point secured by him/her in each course, together with his/her SGPA in that semester. On the completion of the programme, a Final Grade Card will be issued to the student, giving full semester-wise details about the absolute marks and grades obtained by him/her in each course together with his/her SGPA and also the CGPA and Division awarded to him/her.

11. Equivalence:

Percentage (P) equivalent to CGPA earned by a candidate may be calculated using the following formula:

$$\mathbf{P = 9.5 \times CGPA}$$

12. Conduct of Teaching

a. **Course Co-ordinator**

Every course will be taught by one or more teachers. The Head of the department with consultation of Dean will allocate the teaching load to the teacher(s) and will also designate a course co-ordinator for each course. If more than one department is involved in the teaching of the course, the course co-ordinator will be from the coordinating department. The course co-ordinator will coordinate all the work related to attendance, course work, examination and evaluation. It is necessary that the students are informed about the course co-ordinator so that they may contact him/her about any problems regarding the course.

b. **Display of Attendance, Marks etc.**

It is essential that the attendance should be displayed to the students twice in a semester, once in the middle and then at the end of a semester by the teacher(s) concerned. The sessional marks should be displayed to students normally within 15 days of the examination. The total Sessional marks should be displayed to the students before the beginning of the end-semester examinations. The course co-ordinator will ensure that the teachers associated with the course make such displays.

c. **Offering Courses**

Courses will be offered by the department concerned as per the schedule given in the relevant Curriculum. More choices in elective courses will be offered depending on the availability of the staff

and other facilities and therefore any particular elective course may not be offered even though it may exist in the list of possible elective courses. Department may also offer a course in both the semesters even though it may be shown in particular semesters.

d. **Syllabus**

Each course syllabus which will be distributed to the students. The teacher(s) concerned should ensure that some portion, beyond the syllabus, should also be covered in the class.

13. Correction of Errors

In case of any error is detected in the marks recorded on the award list, the examiner(s) concerned shall make a request to correct the mistake to the Dean, School of CS & IT through the Head of the department, and shall attach relevant documentary evidence. A committee consisting of the following members shall take suitable remedial measures depending upon the merit of the case.

a. Dean (Chairman)
b. Head of the department.
c. Two Faculty Member nominated by the Dean

14. Examinations

e. **Sessional Examination**

Sessional examination(s) of each course is one hour duration and shall be conducted as per norms and schedule notified by the office of the Head of department in each semester.

f. **End-Semester Examination**

End-semester examination(s) of each theory course shall be of three hours duration and will be conducted as per norms and schedule notified by the Controller of Examination. The end semester examinations of laboratory/practical courses, and other courses such as seminar, colloquium, field work, project, dissertation etc. shall be conducted as notified by the HOD.

15. Degree Requirement

A student who earns total specified credits according to the curriculum and fulfills such other conditions as may be mentioned in the curriculum of the programme, shall be awarded the degree. He/she must also pay all University dues as per rules. Moreover, there should be no case of indiscipline pending against him/her.

CURRICULUM AND SYLLABUS OF M.TECH (CS) PROGRAMME

1. Programme Title:

Master of Technology (M.Tech) in Computer Science.

2. Duration and Mode:

Duration of programme for a student shall be two (2) years with four consecutive semesters after admission. The mode of the programme is Regular (semester system).

3. Objective:

The objective of this programme is to train the manpower required

a. to meet the industry needs of the country,
b. to pursue research in specialized areas, and
c. to meet the growing needs of engineering colleges for trained faculty in Computer Science.

4. Eligibility Criteria:

A candidate will be eligible for admission in to M. Tech. (Computer Science) program if he/she has obtained the Bachelor of Technology degree in Computer Science/Information Technology/Electronics & Communication Engineering or Master of Computer Application or Master of Science in Computer Science/Information Sciences/Electronics degree from recognized University with not less than 55% marks in the aggregate or its equivalent CGPA. The knowledge of Urdu for the candidate is essential.

5. Intake:

The number of seats for the program is eighteen (18).

6. Admission:

a. The admission to the M. Tech programme is based on the rank secured by the candidate in a written test conducted by the University. Minimum qualifying marks shall be 30% in Entrance Test. The written test will be of 100 marks.

b. GATE qualified candidates are exempted from the entrance exam.

c. The 60% seats are reserved for candidates qualified in entrance exam and 40% seats are reserved for GATE qualified candidates. For GATE qualified candidates the preference will be given according to the rank in GATE exam. However if suitable number of GATE qualified candidates have not applied, the said seats may be filled through the entrance qualified candidates and vice-versa.

7. Syllabus: Each theory or lab courses shall have prescribed syllabus approved by BOS from time to time, as per following prescriptions:

a. **Theory Courses:** Five (5) units largely based on ONE standard textbook and two Reference Books prescribed by the concerned teacher.

b. **Lab Courses:** At least TEN (10) individual generic assignments and ONE Mini-Project, to be prescribed by the concerned teacher and approved by HoD.

8. Evaluation of Dissertation:

Every candidate shall be required to submit Dissertation as per the following details:-

i. **A Departmental Research Committee (DRC)** shall be constituted with Head of the Department as chair person and at-least two other faculty members.

ii. **Registration of Dissertation:** A candidate is permitted to register for the Dissertation after satisfying the attendance requirement of all the subjects (theory and practical subjects).

iii. After satisfying clause 8.(ii), a candidate has to submit, in consultation with his Dissertation supervisor, the title, objective and plan of action of his project work to the DRC for its approval. Only after obtaining the approval of DRC the student can initiate the Dissertation.

iv. A candidate shall submit status report (in a spiral binding) in two stages at least with a gap of 3 months between them.

v. The work on the dissertation shall be initiated in the beginning of the second year and the duration of the dissertation is for two semesters. A candidate is permitted to submit thesis only after successful completion of theory and practical courses with the approval of DRC not earlier than 40 weeks from the date of registration of the dissertation. For the approval of DRC the candidate shall submit the draft copy of thesis to the Head of the Department and shall make an oral presentation before the DRC.

vi. Three copies of the thesis certified by the supervisor shall be submitted to the Department.

vii. The thesis shall be examined by one examiner selected by the University. For this, Head of the Department shall submit a panel of 3 examiners, who are eminent in that field with the help of the concerned guide.

viii. If the report of the examiner is not favorable, the candidate shall revise and resubmit the thesis, in the time frame as described by DRC. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected.

ix. If the report of the examiner is favorable, viva-voce examination shall be conducted by a board consisting of the supervisor, Head of the Department and the examiner. The Board shall jointly report candidates work as:

1. Excellent
2. Good
3. Satisfactory
4. Unsatisfactory

Head of the Department shall coordinate and make arrangements for the conduct of viva-voce examination.

x. If the report of the viva-voce is unsatisfactory, the candidate will retake the viva-voce examination within three months.

Course No.	Course Title	Contact periods per week			Credits	Internal Marks	External Marks	Total Marks
		Lecture L	Tutorial T	Practical P				
	Semester - 1							
MT111	Network and Computer Security	3	1	0	4	30	70	100
MT112	Advanced Computer Architecture	3	1	0	4	30	70	100
MT113	Neural Networks	3	1	0	4	30	70	100
MT114	Distributed Databases	3	1	0	4	30	70	100
	Elective-I	3	1	0	4	30	70	100
MTL11	Distributed Databases Lab	0	0	4	2	50	50	100
MTL12	Seminar	0	0	4	2	50	50	100
	Total	15	5	8	24	250	450	700
	Semester - 2							
MT121	Advanced Operating Systems	3	1	0	4	30	70	100
MT122	Data Structure and Algorithm Design	3	1	0	4	30	70	100
MT123	Distributed Systems	3	1	0	4	30	70	100
	Elective-II	3	1	0	4	30	70	100
	Open Elective	3	1	0	4	30	70	100
MTL21	Data Structure and Algorithm Design Lab	0	0	4	2	50	50	100
MTL22	Comprehensive Viva	-	-	-	2	50	50	100
	Total	15	5	4	24	250	450	700
	Semester - 3							
MTR31	Dissertation Part - I	-	-	-	12	200	400	600
	Total	-	-	-	12	200	400	600
	Semester - 4							
MTR41	Dissertation Part - II	-	-	-	20	200	400	600
	Total	-	-	-	20	200	400	600
	Grand Total				80	900	1700	2600

List of electives

Course No.	Course Title	Contact periods per week			Credits
		Lecture L	Tutorial T	Practical P	
	Elective-I				
MTE11	Parallel Algorithm	3	1	0	4
MTE12	Pattern Recognition	3	1	0	4
MTE13	Wireless Mobile Network	3	1	0	4
MTE14	Wireless & Mobile Communication	3	1	0	4
MTE15	Machine Learning	3	1	0	4
MTE16	Fuzzy Systems	3	1	0	4
	Elective-II				
MTE21	Real Time System	3	1	0	4
MTE22	Software Metrics	3	1	0	4
MTE23	Software Quality Engineering	3	1	0	4
MTE24	Cluster and Grid Computing	3	1	0	4
MTE25	Natural Language Processing	3	1	0	4
MTE26	Applied Cryptography	3	1	0	4
	Open Elective				
MTO21	Human Computer Interaction	3	1	0	4
MTO22	Bioinformatics	3	1	0	4
MTO23	Information Security and Cyber Laws	3	1	0	4

MT111: NETWORK AND COMPUTER SECURITY **L T P C**
3 1 0 4

UNIT 1

Introduction: History and Overview of Cryptography, Historical Ciphers and Their Cryptanalysis, Definition of Perfect Secrecy, Shannon's Theorem, Basic Principles of Modern Cryptography Private Key Cryptography: Private Key Encryption, Computational Approach to Cryptography, Pseudo Randomness, Constructing Secure Encryption Schemes, Chosen Plaintext Attacks, CPA Secure Encryption Schemes, Chosen Cipher Text Attacks, Security Against CCA, Limitations of Private Key Cryptography

UNIT 2

Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN.

UNIT 3

Reconnaissance: Information Gathering Methodology, Locate the Network Range, Active and Passive reconnaissance. Scanning: Scanning, Elaboration phase, active scanning, DNS Zone transfer. Detecting live systems on the target network, Discovering services running /listening on target systems, Understanding port scanning techniques, Identifying TCP and UDP services running on the target network, Understanding active and passive fingerprinting.

UNIT 4

Trojans and Backdoors: Effect on Business, Trojan, Overt and Covert Channels, Working of Trojans, Different Types of Trojans, Different ways a Trojan can get into a system, Indications of a Trojan Attack. Sniffers: Definition of sniffing, Sniffer working, Passive Sniffing, Active Sniffing, Ethreal tool, Man-in-the-Middle Attacks, Spoofing and Sniffing Attacks, ARP Poisoning and countermeasures.
Denial of Service: Goal of DoS (Denial of Service), Impact and Modes of Attack.

UNIT 5

Understanding Session Hijacking, Spoofing vs Hijacking, Steps in Session Hijacking, Types of Session Hijacking, TCP Concepts 3 Way and shake, Sequence numbers. ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing. Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Securing Wireless Networks.

TEXT BOOKS:

1. Cryptography and Network Security, W. Stallings , Prentice Hall, 5th Edition, 20102.
2. Network Security Essentials, William Stallings ,Prentice Hall, 5th Edition, 2013

REFERNCE BOOKS:-

1. Firewalls and Internet Security, William R. Cheswick and Steven M. Bellovin, Addison-Wesley Professional, 2ndEdition, 2003.
2. Hackers Beware, Eric Core, EC-Council Press, 2003

MT112: ADVANCED COMPUTER ARCHITECTURE **L T P C**
3 1 0 4

UNIT 1

Introduction: Overview of IAS computer function and Modern computer function- Instruction sets, Instruction Set Architecture, Instruction formats, Instruction set categories, addressing modes.

UNIT 2

Processor Design: Data path implementation, Register Transfer Notation (RTN), Abstract RTN, Concrete RTN, Control sequence for Simple RISC computer (SRC); Control Module Design, Hardwired control Module Design and Micro programmed control Module Design using control Sequences; Characteristic of CISC and RISC processors, Performance metrics, Execution time, MIPS, MFLOPS.

UNIT 3

Memory Design: Characteristics, Performance parameters, Operations & Timing Diagrams, Main Memory, Byte Storage methods, Six transistor static RAM cell- Timing diagrams, DRAM- Timing diagrams, Conceptual view of memory cell, 1-D,2-D memory design, Typical RAM, ROM chip layouts, Memory address map, Memory connections to CPU, Cache memory- Cache memory management techniques, Types of cache's : Look through, look aside, unified Vs Split, multilevel, performance issues: Mean memory access time, Execution time.

UNIT 4

High Performance Processors: Pipelining: Two stages, Multi stage pipelining, Basic performance issues in pipelining: Hazards, Methods to prevent/ resolve hazards and their drawbacks-Approaches to deal with branches; Flynn's Classification, Shared Memory Multiprocessors: Cache Coherence Protocols, Snoopy, MSI, MESI, and MOESI.

UNIT 5

Multi-Core Architectures: Introduction to multi-core architectures, Moore's Law, hyper threading, multi threading for single core and Multi-core, Issues involved into writing code for multi-core architectures, development of programs for these architectures using OpenMP and Pthreading.

Text Books:-

1. Kai Hwang, Faye A. Briggs, "Computer Architecture and Parallel Processing" McGraw-Hill international Edition
2. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill

References:

1. V.Rajaraman, L Sivaram Murthy, "Parallel Computers", PHI.
2. William Stallings, "Computer Organization and Architecture, Designing for performance" Prentice Hall, Sixth edition.
3. Kai Hwang, Scalable Parallel Computing.

MT113: NEURAL NETWORK

L	T	P	C
3	1	0	4

UNIT 1

Introduction to Neural Networks, Biological Neural Networks, Characteristics of Neural Networks, Models of Neuron, Basic data structures: mapping of vector spaces, clusters, principal components. Basic Learning Rules, Recent advances in Neural Networks.

UNIT 2

The Perceptron and its learning law. Classification of linearly separable patterns. Adaptive networks, Supervised Learning Neural Networks, Single layer and multi layer perceptrons, Radial basis function networks, Modular neural networks, Adaline and madaline.

UNIT 3

Stochastic Processes and Neural Networks and Stimulated Annealing, Analysis of pattern storage Networks, Analysis of linear auto adaptive feed forward networks, Boltzman machine.

UNIT 4

Analysis of linear auto adaptive feed forward networks, Feedback Neural Networks, Analysis of linear auto adaptive feed forward networks, Stochastic Networks & Stimulated Annealing, Boltzman machine Multilayer Perceptrons, Analysis of pattern storage Networks

UNIT 5

Unsupervised Learning, Adaptive Resonance Theory, Unsupervised Learning Networks Competitive learning, learning vector quantization, Principal component analysis of Hebbian Learning, Adaptive Resonance Theory, Kohonen self-organizing maps.

Text Books:-

1. B. Yegnanarayana, ―Artificial Neural Networks‖, PHI
2. Jacek M. Zurada, Introduction to artificial neural systems, Jaico Publ. House, 1994.

Reference Books:-

1. Haykin, ―Neural Network a comprehensive Foundation‖, PHI
2. Anderson, ―An introduction to Artificial Neural Networks‖, Prentice Hall
3. James A Freeman, David M Skapura, ―Neural Networks-Algorithms, Applications and Programming Techniques,‖ Person Education.

MT114: DISTRIBUTED DATABASES

L	T	P	C
3	1	0	4

UNIT 1

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

UNIT 2

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler.

UNIT 3

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT 4

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT 5

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.

Text Books:-

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill

Reference Books:-

1. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
2. Ceei and Pelagatti,'Distributed Database', TMH
3. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

MT121: ADVANCED OPERATING SYSTEMS

L	T	P	C
3	1	0	4

UNIT 1

Introduction: Operating system concept - processes and threads, process model, process creation, process termination, process hierarchies, and process states, Implementation of processes, Threads- Thread model, thread usage, Implementation of threads in user space and kernel, Hybrid implementations.

UNIT 2

Inter Process Communication: Race conditions, critical regions, Mutual Exclusion with busy waiting, sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing; Scheduling- scheduling in batch systems, Interactive systems, Real time systems, Thread scheduling.

UNIT 3

Deadlocks: Introduction, Deadlock Detection and Recovery – Deadlock Detection with one resource of each type, with multiple resource of each type, recovery from deadlock; Deadlock Avoidance, Deadlock Prevention

UNIT 4

Memory and Device Management: Introduction, Swapping, Paging, Virtual memory – Demand paging, page replacement Algorithms; File System Management- Organization of File System, File Permissions, MS DOS and UNIX file system case studies, NTFS; Device Management- I/O Channels, Interrupts and Interrupt Handling, Types of device allocation.

UNIT 5

Distributed Operating Systems: Distributed operating system concept – Architectures of Distributed Systems, Distributed Mutual Exclusion, Distributed Deadlock detection, Agreement protocols, Threads, processor Allocation, Allocation algorithms , Distributed File system design; Real Time Operating Systems: Introduction to Real Time Operating Systems, Concepts of scheduling , Real time Memory Management

Text Books:-

1. Mukesh Singhal and Niranjan, “Advanced Concepts in Operating Systems”, TMH, 1st Edition, 2001
2. Andrew S. Tanenbaum, “Modern Operating Systems”, Pearson Education, 2nd Edition, 2006

Reference Books:-

3. Andrew S. Tanenbaum, “Distributed Operating Systems”, Pearson Education, 2nd Edition, 2001
4. Pradeep K. Sinha, “Distributed Operating Systems and concepts”, PHI, First Edition, 2002

MT122: DATA STRUCTURE AND ALGORITHM DESIGN **L T P C**
3 1 0 4

UNIT 1

Introduction: Algorithms, analysis of algorithms, Growth of Functions, Master's Theorem, Designing of Algorithms. Sorting and order Statistics: Heap sort, Quick sort, Sorting in Linear time, Medians and Order Statistics.

UNIT 2

Advanced Data Structure: Red-Black Trees, Augmenting Data Structure. B-Trees, Binomial Heaps, Fibonacci Heaps, Data Structure for Disjoint Sets.

UNIT 3

Decrease and Conquer: Insertion Sort, Depth First Search and Breadth First Search, Topological Sorting, algorithms for Generating Combinatorial Objects.
Greedy Method: minimum-cost spanning trees: Prim's and Kruskal's algorithms – Single source shortest paths: Dijkstra's algorithm and Bellman Ford algorithms.

UNIT 4

Dynamic Programming: Concepts**,** Dynamic programming v/s. divide and conquer, Applications-Matrix chain multiplication, Optimal binary search trees, All pairs shortest path problem-Warshal's and Floyd's algorithms, Longest Common sequence(LCS).

UNIT 5

Decision Trees, P, NP, NP-complete problems, NP-hard problem. Randomized Algorithms, String Matching, Approximation Algorithms.

Text Books:-

1. **C**ormen, **L**eiserson, **R**ivest and Stein, "Introduction to Algorithms", 2nd Edition, by, McGraw-Hill, 2000.
2. E. Horowitz, and S. Sahni, "Fundamentals of Computer Algorithms", Computer Science Press (1978).

Reference Books:-

1. Basse, "Computer Algorithms: Introduction to Design & Analysis", Addision Wesley.

MT123: DISTRIBUTED SYSTEM **L T P C**
3 1 0 4

UNIT 1

System Models: Architectural models, Fundamental Models
Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection.
Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

UNIT 2

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.
Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem,

UNIT 3

Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study.
Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System, Recent advances.

UNIT 4

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT 5

Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.
Distributed Algorithms: Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, Election algorithm.
CORBA Case Study: CORBA RMI, CORBA services.

Books:

1. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, Tata McGraw-Hill Edition.
2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed.

Reference books:

1. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
2. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.

MTE11: PARALLEL ALGORITHM

L	T	P	C
3	1	0	4

Unit 1

Parallel Algorithm Design **:** Boundary Value Problem, Finding the Maximum, Complexity measure for parallel algorithms.

Unit 2

Parallel Combinatorial Algorithms: Permutations with and without repetitions, combinations, derangements.

Unit 3

Parallel Searching Algorithms: Maximum/ minimum, median, k^{th} largest/smallest element, Parallel sorting algorithms.

Unit 4

Parallel Graph Algorithms: Parallel graph search and tree traversal algorithms, parallel algorithms for connectivity problems, parallel algorithms for path problems.

Unit 5

Programming for Parallel Algorithms: Shared-Memory Programming with OpenMP, Message-Passing Programming, Performance Analysis.

Text Books:

1. Pattern Classification, R.O.Duda, P.E.Hart and D.G.Stork, John Wiley.
2. Pattern Recognition principles: Julus T. Tou and Rafel C. Gonzalez, Addision –Wesley.

Reference Books:

1. A probabilistic theory of pattern recognition, Luc Devroye, László Györfi, Gábor Lugosi, Springer, 1996.
2. Pattern classification, Richard O. Duda, Peter E. Hart and David G. Stork, Wiley, 2001.
3. Pattern recognition and machine learning, Christopher M. Bishop, Springer 2006.

MTE12: PATTERN RECOGNITION

L	T	P	C
3	1	0	4

Unit 1

Pattern recognition fundamentals: Basic concepts of pattern recognition, fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model.

Unit 2

Bayesian decision theory: Minimum-error-rate classification, Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, Discrete features, Missing and noisy features, Bayesian networks (Graphical models) and inferencing.

Unit 3

Maximum-likelihood and Bayesian parameter estimation: Maximum-Likelihood estimation: Gaussian case, Maximum a Posteriori estimation, Bayesian estimation: Gaussian case, Problems of dimensionality, Dimensionality reduction: Fisher discriminant analysis, PCA Expectation-Maximization method: Missing features

Unit 4

Sequential Models: State Space, Hidden Markov models, Dynamic Bayesian, Non-parametric techniques for density estimation: Parzen-window method, K-Nearest Neighbour method
Linear discriminant functions: Gradient descent procedures, Perceptron criterion function, Minimum-squared-error procedures, Ho-Kashyap procedures, Support vector machines

Unit 5

Unsupervised learning and clustering: Unsupervised maximum-likelihood estimates, Unsupervised Bayesian learning, Criterion functions for clustering, Algorithms for clustering: K-means, Hierarchical and other methods, Cluster validation, Low-dimensional representation and multidimensional scaling (MDS).

Text Books:

1. Pattern Recognition principles: Julus T. Tou and Rafel C. Gonzalez, Addision –Wesley.
2. Pattern recognition and machine learning, Christopher M. Bishop, Springer 2006.

Reference Books:

1. A probabilistic theory of pattern recognition, Luc Devroye, László Györfi, Gábor Lugosi, Springer, 1996.
2. Pattern classification, Richard O. Duda, Peter E. Hart and David G. Stork, Wiley, 2001.
3. Pattern Classification, R.O.Duda, P.E.Hart and D.G.Stork, John Wiley.

MTE13: WIRELESS MOBILE NETWORKS

L	T	P	C
3	1	0	4

UNIT 1

Fundamental of Wireless Communication Technology, Wireless Network, Wireless Characteristics, Channels, Propagation. Types of wireless systems and their parameters, Satellite System, Cellular System, GSM, Wireless LAN, PAN, MAN and WANs, IEEE 802.11 Standards.

UNIT 2

Infrastructure and Infrastructure less Network, Mobile Ad hoc Network (MANET), Wireless Sensor Network, Properties of MANET, MANET Applications, MAC (Hidden and Exposed terminal problems), MAC Protocol for MANET.

UNIT 3

Security Definition, Services, Mechanisms, Spread spectrum, Frequency hopping, Encryption, Integrity check-sums, Assessment issues specifically related to wireless, Jamming, Interception, Spoofing, Fraud, Satellite Jamming, Theft of service – entertainment services on downlink, Hidden signals

UNIT 4

Routing Protocols for Ad Hoc Wireless Networks Issues in Designing a Routing Protocol for Ad hoc Wireless Networks, Classifications of Routing Protocols. Transport Layer for Ad Hoc Wireless Networks Issues in Designing a Transport layer protocol for Ad hoc Wireless Networks, Design goal s of a Transport layer protocol for Ad hoc Wireless Networks, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks.

UNIT 5

Basics of Wireless, Sensors and Applications: The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors, Applications
Data Retrieval in Sensor Networks: Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

Text Books:-

1. Ad Hoc Wireless Networks, Architecture and Protocols by C. Siva Ram Murthy
2. Wireless security handbook by Aron E. Earle.

Reference Books:-

1. Handbook of research on wireless security by Yan zhang jun zheng miao ma.

MTE14: WIRELESS & MOBILE COMMUNICATION

L	T	P	C
3	1	0	4

Unit 1

Introduction: Network Technologies and Cellular Communications, Discussion on Bluetooth &GSM. Introduction to Mobile Computing: novel applications, limitations, and architecture.
(Wireless) Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

Unit 2

Mobile Architecture: Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

Unit 3

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time out freezing, Selective retransmission, Transaction oriented TCP.

Unit 4

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

Unit 5

Protocols and Tools: Wireless Application Protocol WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME, Latest Technologies.

Text Books:

1. Mobile and Personal communication System and Services- Raj Pandya
2. Wireless Communication and Networks- William Stallings.

Reference Books:

1. Fundamentals of Wireless Communication, David Tse and Pramod Viswanath, Cambridge University Press, 2005
2. Wireless and Personal Communications Systems, Vijay Garg, Joseph Wilkes, Prentice-Hall, Englewood Cliffs, NJ, 1996.

MTE15: MACHINE LEARNING **L T P C**
3 1 0 4

UNIT 1

INTRODUCTION - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

UNIT 2

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Evaluation Hypotheses – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

UNIT 3

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Naïve Bayes classifier.

Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

UNIT 4

Learning Sets of Rules – Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution

Analytical Learning - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

UNIT 5

Combining Inductive and Analytical Learning – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators,

Reinforcement Learning – Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

TEXT BOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)

REFERENCE BOOKS:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995

MTE16: FUZZY SYSTEMS

L	T	P	C
3	1	0	4

UNIT I

Introduction, Basic Types, Basic Concepts, Representations of Fuzzy Sets, Extension Principle for Fuzzy Sets, Types of Operations. Fuzzy Complements, Fuzzy Intersections: t- Norms., Fuzzy Unions: t-Conorms, Combinations of Operations. Aggregation Operations. Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals, Arithmetic Operations on Fuzzy Numbers, Fuzzy Equations

UNIT 2

Crisp versus Fuzzy Relations, Projections and Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on a Single Set. Fuzzy Equivalence Relations, Fuzzy Compatibility Relations. Fuzzy Ordering Relations, Fuzzy Morphisms, Sup-i Compositions of Fuzzy Relations., InfCompositions of Fuzzy Relations.

UNIT 3

Fuzzy Measures, Fuzzy Sets and Possibility Theory, Classical Logic: An Overview. Multivalued Logics. Fuzzy Propositions. Fuzzy Quantifiers. Linguistic Hedges. Inference from Conditional Fuzzy Propositions. Inference from Conditional and Qualified Propositions. Inference from Quantified Propositions, Information and Uncertainty, Nonspecificity of Fuzzy Sets. Fuzziness of Fuzzy Sets. Principles of Uncertainty

UNIT 4

Fuzzy Expert Systems: An Overview. Fuzzy Implications. Selection of Fuzzy Implications. Multiconditional Approximate Reasoning. The Role of Fuzzy Relation Equations, Fuzzy Controllers: Overview, Fuzzy Neural Networks. Fuzzy Automata. Fuzzy Dynamic Systems.

UNIT 5

Fuzzy Databases. Fuzzy Information Retrieval, Individual Decision Making, Multiperson Decision Making, Multicriteria Decision Making, Multistage Decision Making, Fuzzy Systems and Genetic Algorithms.

Text Books:-

1. George J. Klir, Bo Yuan, "Fuzzy Sets and Fuzzy Logic", PHI
2. Witold Pedrvcz and Femando Gomide. "An Introduction to Fuzzy Sets", PHI

MTE21: REAL TIME SYSTEMS

L	T	P	C
3	1	0	4

Unit 1

Real-time systems: Real-time systems models, Types of real-time systems, internal structure of real-time systems, Performance measures, Examples of real-time systems and real-world applications, Modeling & Designing real-time systems

Unit 2

Real-Time Process Management: Task scheduling for Uniprocessor systems, handling priorities with critical section, interrupts, task allocation & scheduling for multiprocessor systems, adaptive scheduling.

Unit 3

Programming Environment: In depth Knowledge of RTOS programming languages, tools & techniques.

Unit 4

Real-Time System Design: Design techniques for Reliability, Fault Tolerance & other application specific quality considerations.

Unit 5

Trends in Real-Time System Design & Development in fields such as Robotics. Introduction to research topics.

Text Books:

1. A.C. Shaw, Real-Time Systems and Software, Wiley.
2. J.E. Cooling, Real-Time Software Systems, International Thompson Computer Press.

Reference Books:

1. Real-Time Systems Design and Analysis, P.H. Laplante, IEEE Press.
2. Real-Time Systems, J. Liu, Prentice-Hall, 2000.
3. Real-Time Computer Control, R. Bennett, Prentice-Hall.
4. Real-Time Systems, C.M. Krishna and K.G. Shin, McGraw-Hill.

MTE22: SOFTWARE METRICS

L	T	P	C
3	1	0	4

Unit 1

Software Quality Assurance Framework: What is Quality? Software Quality Assurance, Components of Software Quality Assurance, Software Quality Assurance Plan. Steps to develop and implement a Software Quality Assurance Plan

Unit 2

Quality Standards: ISO 9000 and Comparison ISO Standards, CMM, CMMI, PCMM, 3 Sigma, 6 Sigma, Software Quality Models.

Unit 3

Measurement basics: What is Software Metrics?, Application Areas of Metrics, Categories of Metrics, Measurement Scale, Axiomatic Evaluation of Metrics on Weyuker's Properties. Analyzing the Metric Data: Summary statistics for preexamining data, Metric Data Distribution, Outlier Analysis, Correlation Analysis, Exploring Analysis.

Unit 4:

Measuring Structure and Size: Size Estimation, Halstead Software Science Metrics, Information flow Metrics, Measuring Quality, Software Quality metrics based on Defects, Usability Metrics, Testing Metrics, Reliability Models.

Unit 5

Object Oriented Metrics: Coupling Metrics, Cohesion Metrics, Inheritance Metrics, Size Metrics, Reuse Metrics,
Empirical software engineering, research in software quality.

Text Books:

1. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education (Singapore) Pvt. Ltd., 2002.
2. Norman E. Fenton and Shari Lawrence, "Software Metrics", PfleegerThomson, 2003.

Reference Books:

1. D. Galin, "Software Quality Assurance: From Theory to Implementation", Addison Wesley.
2. Allan C. Gillies, "Software Quality: Theory and Management", Thomson Learning, 2003
3. Mike Konrad and Sandy Shrum, CMMI, Mary Beth Chrissis, Pearson Education (Singapore) Pvt Ltd, 2003.
4. Mordechai Ben Menachem/Garry S. Marliss, "Software Quality", Thomson Learning.

MTE23: SOFTWARE QUALITY ENGINEERING

L	T	P	C
3	1	0	4

UNIT 1:

Introduction
Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT 2:

Software Quality Metrics
Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT 3:

Software Quality Management and Models
Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT 4:

Software Quality Assurance
Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT 5:

Software Verification, Validation & Testing:
Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

Text Books:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley-Interscience, 2005; ISBN 0-471-71345-7.
2. Metrics and Models in Software Quality Engineering, Stephen H. Kan, Addison- Wesley (2002), ISBN: 0201729156

MTE24: CLUSTER AND GRID COMPUTING

L	T	P	C
3	1	0	4

Unit 1

Cluster Computing: Introduction to concepts in Cluster based distributed computing Hardware technologies for cluster computing and software for cluster computing, and different Software Architecture for Cluster Computing.

Unit 2

Resource management and scheduling: Managing, cluster resources: single system images, system level middleware, distributed task scheduling, monitoring and administering system resources Parallel I/O and Parallel Virtual File System. Scheduling: Condor, Maui Scheduler, Portable Batch System (PBS)

Unit 3

Grid Computing: Grids and Grid Technologies, Programming models and Parallelization Techniques, Grid Security Infrastructure, Setting up Grid, deployment of Grid software and tools, and application execution.

Unit 4

Standard application development tools and paradigms: Performance evaluation tools, HINT, netperf, netpipe, ttcp, Iperf.message

Unit 5

Data Management: Application Case Study: Molecular Modeling for Drug Design and Brain Activity Analysis, Resource management and scheduling.

Text Books:

1. William Gropp, Ewing Lusk, Thomas Sterling, Beowulf Cluster Computing with Linux, 2nd edition, MIT Press.
2. Bart Jacob, Michael Brown, Introduction to grid computing

Reference Books:

1. MPI The Complete Reference - 2nd Ed by Marc Snir, et. al., The MIT Press, 1998.
2. Parallel Programming with MPI by Peter Pacheco, Morgan Kaufmann, 1998.
3. Gregory F. Pfister, In Search of Clusters: The ongoing battle in lowly parallel computing, Second Edition, Prentice Hall Publishing Company, 1998.

MTE25: NATURAL LANGUAGE PROCESSING

L	T	P	C
3	1	0	4

Unit 1

Introduction: Introduction to the Morphology, Syntax, Semantics by linking the "linguistics view" (computational linguistics) with the "artificial intelligence view" (natural language processing).

Unit 2

Morphology: Analysis and generation of language on word level: e.g. problems with compounding and idiomatic phrases, homophonous strings as well as loan words and their processing using e.g. finite state automata as well as semantic networks. Ambiguities in words like "pen" and "pipe", but will also discuss some complex strings.

Unit 3

Syntax: Analysis and generation of language on phrasal and sentence level: e.g. applications such as machine translation and grammar checking and the processing using phase structure grammars as well as unification based formalisms and relating those formalisms to recursive transition networks (RTNs) as well as augmented transition networks (ATNs).

Unit 4

Semantics: Language ambiguities on the level of "meaning": represented by case structures and conceptual dependency structures. We will look at famous utterances such as: Colourless green ideas sleep furiously. And will discuss why the machine runs into problems during analysis, and how these problems can be overcome.

Unit 5

Applications of NLP: Machine Translation, Grammar Checkers Dictation, Automatic Document Generation, NL Interfaces.

Text Books:

1. Daniel Jurafsky, James H. Martin "Speech and Language Processing" Second Edition, Prentice Hall, 2008.
2. Chris Manning and Hinrich Schütze, "*Foundations of Statistical Natural Language Processing"*, MIT Press. Cambridge, MA: May 1999.

Reference Books:

1. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
2. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.

MTE26: APPLIED CRYPTOGRAPHY

L	T	P	C
3	1	0	4

UNIT 1

Basic Encryption and Decryption: introduction to Ciphers, Monoalphabetic Substitutions such as the Caesar Cipher, Cryptanalysis of Monoalphabetic Ciphers, Polyalphabetic Ciphers such as Vigenere Tableaux, Cryptanalysis of Polyalphabetic Ciphers, Perfect Substitution Cipher such as the Vernam Cipher, Stream and Block Ciphers.

UNIT 2

Encryption; authentication; symmetric cryptography, asymmetric cryptography: public-key cryptosystems; digital signatures, message authentication codes. Steganography, One-way functions; pseudo-randomness and random number generators.

UNIT 3

Remote user authentication, notions of security; zero knowledge/ interactive proofs, multi-party cryptographic protocols, key exchange and applications.

UNIT 4

Cryptanalysis of cryptographic primitives and protocols, such as by side-channel attacks, differential cryptanalysis, or replay attacks; and cryptanalytic techniques on deployed systems.

UNIT 5

Advanced Topics - ECC, DNA cryptography, quantum cryptography, Digital Watermarking.
Digital signatures: Definitions and applications, Lamport and Merkle schemes. overview of signatures based on discrete-log. certificates and trust management. , SSL/TLS and IPsec, Privacy mechanisms.

Text Books:

1. Handbook of Applied Cryptography by A. Menezes, P. Van Oorschot, S. Vanstone.
2. Cryptography by Behrouz A. Forouzan,TMH

Reference Books:

1. Cryptography and Network Security by Stalling, PHI
2. Cryptography & security services , Mechanism & application By Mogollon , Manuel , Cyber tech. Pub.
3. Cryptography and hardware security By Stalling, W PHI
4. Introduction to Modern Cryptography by J. Katz and Y. Lindell.
5. Kahate, Atul, "Cryptography and Network Security." Tata McGraw Hill, 2007.
6. Delfs, Hans, "Introduction to cryptography." Springer, 2004.

MTO21: HUMAN COMPUTER INTERACTION **L T P C**
3 1 0 4

UNIT 1

Introduction: Importance of user Interface –Characteristics of graphical and web user interfaces, importance of good design. Benefits of good design, Principles of good Screen design.

UNIT 2

System menus and navigation schemes, kinds of windows, device based controls, screen based controls, test and messages.

UNIT 3

Feedback, guidance and assistance, Internationalization and Accessibility, graphics, icons and images, colors, layout windows and pages

UNIT 4

Interaction design - introduction, goals, usability. Conceptualizing interaction problem space, conceptual models, interface metaphors, interaction paradigms, cognition, conceptual framework for cognition, collaboration, communication, social mechanisms conceptual frame work

UNIT 5

Affective aspects, Expressive interface, user frustration agents process of interaction design, activities, characteristics, practical issues, life cycle models, design , prototyping and conceptual design, physical design, evaluation, framework, testing modeling users-kinds of tests, doing user testing, experiments, predictive model.

Text Books:-

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
   Designing the user interface. 3rd Edition Ben Sheidermann, Pearson Education Asia.
2. Preece, Rogers, Sharp, “interaction design”, John Wiley 2002

Reference Books:-

1. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education
2. Sheiderman B Desiging the user interface, “Strategies for Effective Human Computer Interaction” , 2nd ed. Addison Wesley , 1992
3. Sudifte AG , “Human Computer Interface Design” , 2nd ed, Macmillan ,1995

MTO22: BIOINFORMATICS

L	T	P	C
3	1	0	4

Unit 1

Introduction: biology, physics: Biological hierarchy, Information stages, Physical processes,
Methods of gene sequencing: Detailed discussion on Sequences searching methods.

Unit 2

Gene expression: Current and prospective methods of gene profiling. Data acquisition. Data standardization. Linear approximations of data; DNA chips, Protein targeting, Data normalization, Linear view.

Unit 3

Statistics approaches: Probabilistic notions, Multivariate issues, Clustering, Information handling, Experimental and computational methods of structure determination for proteins and nucleic acids.

Unit 4

Ontology: Annotation of genes, their products and functions. System biology, evolution, hierarchy, Medical informatics, Software support: Software availability, Software targets, Text parsing, BioPerl. Statistics, R-system

Unit 5

Recent Advances & Applications of Bio-Informatics: Recent trends in Computing with bio-systems.

Suggested Readings:

Text Books:

1. David W. Mount, "Bioinformatics, Sequence and Genome Analysis", Cold Spring Harbor Laboratory Press
2. Andreas D. Baxevanis, "Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins", Second Edition.

Reference Books:

1. D.E. Krane and M.L. Raymer, "Fundamental Concepts of Bioinformatics", Pearson Education, 2003.
2. B. Bergeron, "Bioinformatics Computing", Prentice –Hall, 2003.
3. Richard Durbin, Sean R. Eddy, Anders Krogh, Graeme Mitchison, "Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids", Cambridge University Press.

MTO23: INFORMATION SECURITY AND CYBER LAWS

L	T	P	C
3	1	0	4

UNIT 1

Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages 18 Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Principles of Information Security: Confidentiality, Integrity Availability and other terms in Information Security.

UNIT 2

Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards. Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems.

UNIT 3

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls: Design and Implementation Issues, Policies.

UNIT 4

IT Act; The rights the various parties have with respect to creating, modifying, using distribution. Computer Software and Intellectual Property-Objective, Copyright Protection, Reproducing, Defenses, Patent Protection. Database and Data Protection-Objective.

UNIT 5

Introduction to Trade mark – Trade mark Registration Process – Post registration Procedures – Trade mark maintenance. Introduction to Copyrights – Principles of Copyright Principles -The subjects Matter of Copy right – The Rights Afforded by Copyright Law – Copy right Ownership. Introduction to Trade Secret – Maintaining Trade Secret.

Text Books:-

1. Godbole," Information Systems Security", Willey
2. Merkov, Breithaupt," Information Security", Pearson Education

Reference Books:-

1. Sood,"Cyber Laws Simplified", Mc Graw Hill
2. Furnell, "Computer Insecurity", Springer
3. 4. Schou, Shoemaker, " Information Assurance for the Enterprise", Tata McGraw Hill
4. IT Act 2000