Dr. Babasaheb Ambedkar Marathwada University

Aurangabad

Department of Computer Science & Information Technology

Reaccredited with 'A' Grade

CURRICULUM BOOK

M.TECH. COMPUTER SCIENCE & ENGINEERING

2016-2018

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

Syllabus Book of

M. Tech (Computer Science Engineering)

w.e.f. ACADEMIC YEAR JUNE, 2016-18

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Department of Computer Science and Information Technology

Choice Based Credit System

M. Tech (Computer Science Engineering)

(2016-2018)

SCHEME FOR CHOICE BASED CREDIT SYSTEM (CBCS)

w.e.f. JUNE, 2016 (ACADEMIC YEAR, 2016-18 Onwards)

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M.Tech (Computer Science Engineering) 2016-18

About the Revised Syllabus

- This version came into effect in June 2016. There have been many advancements in Computer Science and Information Technology and consequent changes in needs of society, industry in respect in which the syllabus was required to be updated.
- This document present the revised version of M. Tech. Computer Science and Engineering syllabus which becomes effective for teaching with immediate effect. It is designed to facilitate students in the development of concept based approach for problem solving using CSE as a tool. The self-learning approach is built in the syllabus thereby training the candidate to update themselves on the changing technologies in their area of work. The outstanding syllabus has been designed to produce junior programmers, EDP Assistants, web designers, etc. equipped with latest knowledge and skills.

About Admission Procedure:

Department of Computer Science and Information Technology adopted a credit- based system under the Academic Flexibility Program of the University from the academic year 2011-12.

It is a flexible, cafeteria- type learning system with an inbuilt horizontal mobility for students to all desire units of education in the Department/Departments with provision for even inter Departmental mobility for students. CBCS operates on modular pattern based on module/units called "credits", wherein 'credit' defines the quantum of contents/syllabus prepared for a course/paper and determines the minimum number of teaching- learning hours required

OBE & CBCS permits students to:

- Learn at their own pace,
- Choose electives from a wide range of elective courses offered by the department,
- Undergo additional/value added courses and acquire more than the required number of credits, depending upon the learner aptitude,
- Adopt an interdisciplinary approach in learning,
- Make best use of the expertise of faculty across the Department, beside the particular department faculty

- Acquire knowledge, skill and attitude of learning outcomes through participatory teaching and learning and continuous evaluation process

This provides the flexibility to make the system more responsive to the changing needs of our students, the professionals and society. The credit- based system also facilitates the transfer of credits.

Admission/ Promotion in M. Tech. Computer Science and Engineering

Program: M. Tech. Computer Science and Engineering

Duration: (Four Semesters means Two Academic Years)

Intake: 30

Eligibility: B.E/B. Tech. in Computer Science and Engineering/IT.

Program Outcomes: The overall objective of this course is to cater the need of computational field. The content of this course is according to the current trends of research in Computer Science and requirements of industry expectations. Some courses of this program are exclusively designed towards development of analytical, presentation and personality development skills among the students, through which the students get prepared and trend for building their carrier in computer science and its related applied technology, research and development.

In line with Outcome based education the program specific outcomes for M. Tech. Computer Science programs are as follows

- To be fundamentally strong at core subjects of computer science.
- An ability to apply programming and computational skills for industrial solutions.
- Realizes the importance of lifelong learning and continuous professional development.
- Broad understanding of latest technological trends.
- An ability to identify opportunities for establishing an enterprise for immediate Employment.
- Ability to understand and apply fundamental research concepts.
- An ability to use efficient soft skills for professional development.
- To be rational in professional ethics and attitude.
- Able to use current tools and technologies to cater multidisciplinary needs.
- An ability to indulge in lifelong learning for professional development.
- Ability to sustain in the areas of Data Science and Analytics.

Fees

Sr. No.	Fees Head	First Semester				Second Semester			
		Open	SC/ ST	OBC /VJ /NT /SBC	Sponsored	Open	SC/ST	OBC/VJ/NT /SBC	Sponsored
1	Admission Fees	50	50	50	50	50	50	50	50
2	Tuition Fees	18000	00	7500	18000	18000	00	7500	23000
3	Laboratory Fees	5000	00	5000	5000	5000	00	5000	5000
4	Other Fees	2000	00	2000	2000	2000	00	2000	2000
5	Eligibility Fees	100	100	100	00	00	00	00	00
		25150	150	14650	30150	25050	50	14550	30050

***Fees likely to be modified as per the university rule and regulation from time to time and will be applicable to the concern students**

Admission to the M. Tech. Computer Science course in the department will be done on the performance of GATE score and on their performance in the qualifying graduate level examination.

The student will apply on the application form of the University provided with the prospectus/e- prospectus. Once the student is admitted to the concern department/ course, he/she will be promoted to next semester with full carryon; subject to the registration of student in every consecutive semester. Dropout student will be allowed to register for respective semester as and

when the concerned courses are offered by the department, subject to the condition that his/her tenure should not exceed more than twice the duration of course from the date of first registration at parent department. The admission of concern student will be automatically get cancelled if he/she fails to complete the course in maximum period (Four years/Eight semesters).

Credits and Degrees

i. A candidate who has successfully completed all the core courses, Elective/ Specialized courses and, seminars and project prescribed and or optional service courses approved by the University for the Program with prescribed CGPA shall be eligible to receive the degree.

ii. One Credit shall mean one teaching period of one hour per week for one semester (of 15 weeks) for theory courses and two practical/laboratory/field/demonstration hours/ week for one semester.

iii. Every student will have to complete at least 100 credits to obtain the master's degree of M. Tech.

Computer Science M. Tech. (Post graduate degree) out of which 96 credits should be from this Department and four or eight credits of service courses from this or other Department. However the Department can design the curriculum of more credits and it will be compulsory for the students of this Department to complete the credits accordingly

Courses

i. Core Course: A core course is a course that a student admitted to M. Tech. Computer Science program must successfully completed to receive the degree. Normally no theory course shall have more than 4 credits.

ii. Elective Course: Means optional course from the basic subject or specialization. The elective course defined specialization that student want to perceive. The horizontal learning path is to be followed by the student for selection of elective course. Department may offer more than one specialization depending availability of resources.

iii. Attendance: Students must have 75% of attendance in each Core and Elective course for appearing the examination. However student having 65% attendance with medical certificate may apply to the H.O.D. for commendation of attendance.

Departmental Committee:

Every P.G. program of the University/College shall be monitored by a committee constituted for this purpose by the Department. The Committee shall consist of H.O.D. as a Chairman and some/all the teachers of the Department as its members.

Results Grievances Redressal Committee:

The department shall form a Grievance Redressal Committee for each course with the Course Teacher and the HOD. This Committee shall solve all grievances relating to the Assessment of the students.

Awards of Grades

Grade Scale As per regulation 1977 and 1978 for M.Tech. Examination

Sr. No.	Equivalent Percentile	Equivalent Percentile	Equivalent percentage	Grade points	Grade	Grade description	Passed Division
1	90.00- 100	45.00- 50.00	90.00- 100.00	9.00- 10	O	Outstanding	**Passed with Distinction**
2	80.00- 89.99	40..00- 44.99	80.00- 89.99	8.00- 8.99	A++	Excellent	
3	70.00- 79.99	35.00- 39.99	70.00- 79.99	7.00- 7.99	A+	Exceptional	
4	60.00- 69.99	30.00- 34.99	60.00-69.99	6.00- 6.99	A	Very good	**Passed with First Division**
5	55.00- 59.99	27.50- 29.99	55.00- 59.99	5.50- 5.99	B+	Good	**Passed with Second Division**
6	50.00- 54.99	27.00- 27.49	54.00- 54.99	5.00- 5.49	B	Fair	
7	45.00- 49.99	26.50- 26.99	52.50- 53.99	4.50- 4.99	C+	Average	
8	40.01- 44.99	25.01-26.49	50.01-52.50	4.01- 4.49	C	Below average	
9	40	25	50	4.00	D	Pass	
10	< 40	< 25	< 50	0.00	F	Fail	**Fail**

Computation of SGPA (Semester grade point average) &CGPA (Cumulative grade point average)

The computation of SGPA &CGPA, will be as below:

a) **Semester Grade Point Average (SGPA)** is the weighted average of points obtained by a student in a semester and will be computed as follows:

$$SGPA = \frac{Sum(CourseCredit * Number\ of\ Points\ in\ concern\ gained\ by\ student)}{Sum(CourseCredits)}$$

The Semester Grade Point Average (SGPA) for all the four semesters will be mentioned at the end of every semester.

b) **The Cumulative Grade Point Average (CGPA)** will be used to describe the overall performance of a student in all semesters of the course and will be computed as under:

$$CGPA = \frac{Sum(All\ \ Four\ \ Semester\ \ Credits\ \ gained\ \ by\ \ the\ student)}{Sum(Credits\ of\ All\ Semesters)}$$

The SGPA and CGPA shall be rounded off to the second place of decimal.

Evaluation method:

Each theory course will be of 100 Marks and be divided in to internal examination (Sessional) of 20 Marks and Semester end examination of 80 Marks. (20+80 = 100 Marks). Each Practical course will be of 50 marks. Research project / Internship / field projects if any, will be of 100 marks.

a) Internal Evaluation Method

There shall be two mid semester examinations, first based on 40 percent syllabus taught and second based on 60 percent syllabus taught. The setting of the question papers and the assessment will be done by the concerned teacher who has taught the syllabus. Average score obtained out of two mid semester examinations will be considered for the preparation of final sessional marks/grade.

b) Term end examination and evaluation

i. Semester end examination time table will be declared by the departmental committee and accordingly the concern course teacher will have to set question paper, conduct theory examination, practical examination with external expert, evaluate, satisfy the objection / query of the student (if any) and submit the result to DC.
ii. The semester end examination theory question paper will have two parts (20+60 = 80 Marks)
iii. Template of question paper is designed in light of Outcome based education method and determine the attainment level of students. The pattern of question paper is as

below

a) Q1 will be based on (fill in the blanks/ multiple choice questions/ match columns / state true or false / answer in one sentence) as compulsory questions and it should cover entire syllabus and carries 20 Marks.

b) Student will require to solve any five questions from Q2 to Q8 where Q2 of type comprehension, Q3 and Q4 are application oriented, Q5 based on analysis, Q6 will be on synthesis, Q7 checks evaluation ability of student, and Q8 on Comprehension ability.

iv. Semester end Practical examinations will be of 50 marks each and students will be examined by one external and one internal examiner. Seminar and Project work (if any) will be evaluated by the external examiners along with guide.

v. At the end of each semester the Committee of Department shall assign grade points and grades to the students.

vi. The Committee of Department shall prepare the copies of the result sheet in duplicate. Every student shall have the right to scrutinize answer scripts of Mid semester/Term end semester examinations and seek clarifications from the teacher regarding evaluation of the scripts immediately thereafter or within 3 days of receiving the evaluated scripts.

vii. The Head of the department shall display the grade points and grades for the notice of students. The head of the department shall send all records of evaluation for Safekeeping to the Controller of Examinations as soon as all the formalities are over.

Grade Card

The University shall issue at the beginning of each semester a grade card for the student, containing the Grades obtained by the student in the previous semester and his Semester Grade Point Average (SGPA).

The grade card shall list:

(a) The title of the courses along with code taken by the student

(b) The credits associated with the course,

(c) The grade and grade points secured by the student,

(d) The total credits earned by the student in that semester.

(e) The SGPA of the student,

(f) The total credits earned by the students till that semester and

(g) The CGPA of the student (At the end of the IVth Semester).

Cumulative Grade Card

At the end of the IVth semester, the University shall issue Cumulative Grade Card to the Students showing details of Grades obtained by the student in each subject in all semesters along with CG PA and total credits earned.

Annexure A

M. Tech. (Course Structure)

Semester I:

Sr. No.	Subject Code	Subjects	Teaching Scheme (Hours/Week)				Examination Scheme (Credits)				Min Marks	Max Marks
			L	T	P	Total	Th	TW	Practical	Total		
01	MTT401	Distributed Operating System: Advance OS	4	--	--	4	4	--	--	4	40	100
02	MTP101	Practical Based on MTT401	---	---	2	2	--	---	1	1	25	50
03	MTT402	Machine Learning	4	--	--	4	4	--	--	4	40	100
04	MTP102	Practical Based on MTT402	---	---	2	2	--	---	1	1	25	50
05	MTT403	Advanced Database Management Systems	4	--	--	4	4	--	--	4	40	100
06	MTP103	Practical Based on MTT403	---	---	2	2	--	---	1	1	25	50
07	MTT404	Advanced Computer Architecture	4	--	--	4	4	--	--	4	40	100
08	MTP104	Practical Based on MTT404	---	---	2	2	--	---	1	1	25	50
09		Elective –I	4	--	--	4	4	--	--	4	40	100
10		Practical Based on Elective-I	---	---	2	2	--	---	1	1	25	50
Total of First semester			**20**	--	**10**	**30**	**20**	**--**	**5**	**25**	**325**	**750**

Elective I:

Subject Code	Subjects	Min Marks	Max Marks	Subject Code	Subjects	Min Marks	Max Marks
MTT451	**Advance Compilers**	40	100	MTT453	**Multimedia Communication System**	40	**100**
MTP105	Practical Based on MTT451	20	50	MTP107	Practical Based on MTT453	25	**50**
MTT452	**Advance Software Engineering**	40	100	MTT454	**Remote Sensing**	40	**100**
MTP106	Practical Based on MTT452	20	50	MTP108	Practical Based on MTT454	25	**50**

Semester II:

Sr. No.	Subject Code	Subjects	Teaching Scheme (Hours/Week)				Examination Scheme (Credits)				Min Marks	Max Marks
			L	T	P	Total	Th	TW	Practical	Total		
11	MTT405	Data Mining	4	--	--	4	4	--	--	4	40	100
12	MTP109	Practical Based on MTT405	---	---	2	2	--	---	1	1	25	50
13	MTT406	Image Processing & Pattern Recognition	4	--	--	4	4	--	--	4	40	100
14	MTP110	Practical Based on MTT406	---	---	2	2	--	---	1	1	25	50
15	MTT407	Advance Algorithm	4	--	--	4	4	--	--	4	40	100
16	MTT408	Advanced Computer Networks	4	--	2	6	4	--	1	5	40	100
17	MTP111	Practical Based on MTT408	---	---	2	2	--	---	1	1	25	50
18		Elective –II	4	--	--	4	4	--	--	4	40	100
19		Practical Based on Elective-II	---	---	2	2	--	---	1	1	25	50
20	MTP111	Intellectual Property Rights	1	--	--	1	1	--	--	1	20	50
Total of Second semester			**21**	--	**8**	**29**	**21**	**--**	**4**	**25**	**320**	**750**

Elective II:

Subject Code	Subjects	Min Marks	Max Marks	Subject Code	Subjects	Min Marks	Max Marks
MTT455	**Object oriented system design**	**40**	100	MTT457	**Bio Informatics**	**40**	100
MTP112	Practical Based on MTT455	25	50	MTP114	Practical Based on MTT457	25	50
MTT456	**Embedded System**	**40**	100	MTT458	**Geospatial Technology**	**40**	100
MTP113	Practical Based on MTT456	**25**	50	MTP115	Practical Based on MTT458	**25**	50

Semester III:

Sr. No.	Subject Code	Subjects	Teaching Scheme (Hours/Week)				Examination Scheme (Credits)				Min Marks	Max Marks
			L	T	P	Total	Th	TW	Practical	Total		
23	MTD2000	Dissertation Part – II	0	0	40	40	0	10	10	20	250	500
Grand total (for all 4 semesters)										**90**	**1250***	**2500**

Semester IV:

No	Subject Code	Subjects	Teaching Scheme (Hours/Week)				Examination Scheme (Credits)				Min Marks	Max Marks
			L	T	P	Total	Th	TW	Practical	Total		
21	MTD1600	Dissertation Part –I	0	0	32	32	0	8	8	16	200	400
22	MTS409	Seminar	--		8	8		4	--	4	50	100
Total of Third semester			**0**	**0**	**40**	**40**	**0**	**12**	**8**	**20**	**250**	**500**

*** To obtain M.Tech. Degree candidate must secure at least 50% marks i.e. 1250 out of 2500.**

Detailed Syllabus

Semester – I

1. Distributed Operating System

Course Code	MTT401	Course Title	Distributed Operating System
Number of Credits	4 Credits (TH) 1 Credit(P)	Internal	Tests: I- 10%, II – 10% Assignments/Homework: 20%
Total Contact Hours	4 Hrs. (TH/Week) 2 Hrs. (TH/Week)	External	Final Examination: 60%
		(Semester/Term Exam)	

Prerequisites:

- Basic course on Operating System at B.E. level.

Course Objectives:

Following are the objectives of the course

1. This course covers general issues of design and implementation of distributed operating systems.
2. The focus of the course is on issues that are critical to the applications of distributed systems, which include communication, distributed processing, sharing and resource management and distributed multimedia system.
3. The Course also focuses on case studies of MACH and DCE, with full coverage of the most recent advances in the field.

Course Outline

1. **Introduction**

   Goals, Hardware concepts, Software concepts, What is Distributed operating system, Issues in designing a Distributed operating system, Introduction to Distributed computing environment (DCE). Communication: Remote procedure call, Remote object invocation, Message oriented communication, stream oriented communication, Case study: Sun RPC

2. **Synchronization**

   Clock synchronization, Physical clocks, Lamport time stamp, distributed mutual exclusion algorithms, deadlock, election algorithm.

3. **Naming**

   Naming entities, locating mobile entities, removing unreferenced entities, naming and securities, Case study: DCE Directory service.

   Distributed shared memory: design and implementation issues, non-uniform memory access architecture, distributed shared memory, implementation of DSM systems.

4. **Resource Management**

   Desirable features of a good global scheduling algorithm, task assignment approach, load-balancing approach, load-sharing approach, static process scheduling with communication.

   Distributed file system: desirable features of good distributed file system, file models, file accessing models, file sharing semantics, file caching semantics, case study: Sun network file system.

5. **Distributed Multimedia Systems**

   Characteristics of multimedia data, quality of service management, resource management, stream adaption.

   Case study: Mach and DCE

Text Book

1. Distributed Operating Systems, Pradeep K. Sinha, PHI
2. Distributed Systems, Andrew S. Tanenbaum, Maarten van Steen, Eastern Economy Edition
3. Distributed Operating Systems, Andrew S. Tanaenbaum, Pearson Education

Reference Books

1. Distributed Operating System and Algorithm Ananlysis, Randy Chow, Theodore Johnson, Addison Wesley.

2. Distributed Systems: Concepts and Design, George Coulouris, Jean Dollimore, 4th edition, Addison Wesley.

Some Links to be used in the course

ftp:ftp.cs.umanitoba.ca/pub/bibliographies/Distributed/Dcs-1.0.html

ftp:ftp.cs.umanitoba.ca/pub/bibliographies/Distributed/fault.tolerant.html

http:www-dsg.standford.edu/Publications.html

http:www.cse.ogi.edu/DSRG/osrg/osrg.html#Current Paper

http:www.dsg.cs.tcd.ie/dsgpublications/bibs

ftp:ftp.cs.umanitoba.ca/pub/bibliographies/Os/IMMD_IV.html

List of Practical Assignments

1. Inter-process communication using socket programming.
2. RPC using RMI.
3. Process Synchronization
4. Election algorithms.
5. Study of JINI
6. Study of CORBA
7. Distributed Multimedia Systems
8. Resource Management.

Course Outcomes:

- The student will explain various architectures used to design distributed systems, such as client-server and peer-to-peer.
  Evaluation: Examss
- The student will build distributed systems using various interprocess communication techniques, such as remote method invocation, remote events, and tuple spaces.
  Evaluation: Exams, programming projects.
- The student will build distributed systems using various techniques for tolerating partial failures, such as leasing and replication.
  Evaluation: Exams, programming projects

- The student will build distributed systems using various interprocess coordination techniques, such as distributed mutual exclusion, distributed monitors, and tuple spaces.
  Evaluation: Exams, programming projects
- The student will explain various distributed algorithms, such as logical clocks and leader election.
  Evaluation: Exams
- The student will analyze and explain current distributed systems research literature.
  Evaluation: Written research report, oral presentations

2. Machine Learning

Course Code	MTT402	Course Title	Machine Learning
Number of Credits	4 Credits (TH), 1 Credits (PR)	Internal	Tests: I-10%,II–10% Assignments/Homework: 20%
Total Contact Hours	4 Hrs. (TH/Week) 2 Hrs. (PR/Week)	External	Final Examination: 60%
		(Semester/Term Exam)	

Prerequisite:

An upper-level undergraduate course(s) in algorithms and data structures, a basic course on probability and statistics, basic understanding of linear algebra and basic of neural networks

Course Objective:

1. After completion of this course student can learn how to design a Learning system, Learning Process, Learning methods, Forms of learning, learning with complex data, learning with Hidden variables.

Course Outline:

Unit 1: Introduction

Introduction to Machine Learning Supervised and unsupervised learning, Learning task, instances, features, labels, reward/loss, training, testing , Overview of classification: setup, training, test, validation dataset, over fitting. Classification families: linear discriminative, non-linear discriminative

Unit 2: Decision tree

Decision trees, probabilistic (conditional and generative), nearest neighbor, Classification, Purity, Gini index, entropy ,Algorithms for constructing a decision tree ,Pruning methods to avoid over-fitting ,Regression trees

Unit 3: Clustering

Mixture Densities, K-means Clustering, Expectation –Maximization Algorithm, Mixture of Latent Variable Models, Hierarchical Clustering, Non-parametric Methods: Nonparametric Density Estimation, Nonparametric Classification, Nonparametric Regression

Unit 4: Support vector machines

Application of SVM, Kernel Methods and Evolution of SVM, Vapnik-Chervonenkis dimension, probably approximately correct learning, Noise, Linear and Nonlinear SVM and Kernel Trick, SMO

Unit 5: Genetic Algorithm

Genetic Programming, Hidden Markov Models, Discrete Markov Processes, Reinforcement Learning: Q Learning, Nondeterministic Rewards and Actions, Model based learning, Temporal Difference Learning, Analytical Learning.

Text Book

1. Tom Mitchell, Machine Learning, McGraw-Hill, 1997
2. Ethem Alpaydin, Introduction to Machine Learning, PHI, 2005

References

1. K.P. Soman, R. Longonathan and V. Vijay, Machine Learning with SVM and Other Kernel Methods, PHI-2009
2. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer 2006
3. R.O. Duda, P.E. Hart, D.G. Stork. Pattern Classification, John Wiley and Sons, Second edition 2000
4. Data Mining: Concepts and Techniques by Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers
5. A. K. Jain and R. C. Dubes. *Algorithms for Clustering Data*. Prentice Hall, 1988.

Journal References:

1) ***Journals on Machine Learning, Neural Computation, Neural Networks, Journal of the American Statistical Association,*** and the
2) ***IEEE Transactions on Pattern Analysis and Machine Intelligence***.

Lab Exercise:

There should be minimum 10 lab assignment on the topics discussed in the course.

Course Outcomes:

Students will be able to:

- Gain knowledge about basic concepts of Machine Learning
- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Apply Dimensionality reduction techniques.
- Design application using machine learning techniques.

3. Advanced Database Management System

Course Code	MTT403	Course Title	Advance Database Management System
Number of Credits	4 Credits (TH) 1 Credit(P)	Internal	Tests: I- 10%, II – 10% Assignments/Homework: 20%
Total Contact Hours	4 Hrs. (TH/Week) 2 Hrs. (TH/Week)	External	Final Examination: 60%
		(Semester/Term Exam)	

Prerequisites:

- Basic concepts o DBMS & RDBMS at B.E. level.

Course Objectives

1. To cover advanced concepts of Database Management System.
2. It focuses on topics like Object-Oriented Databases, Distributed Databases, and Data Models for advanced Database applications.
3. Study of various database architectures, applications and administration issues.
4. To reinforce students' ability to apply modern database management concepts to real problems.

Course Outline:

Unit 1: Relational Database Management Issues and Data storage and querying (12 hrs)

Transaction Processing: Serial and Serializable Schedules, Conflict-Serializability, Enforcing Serializability by Locks (Two-Phase Locking), Locking Systems With Several Lock Mode, Concurrency Control by Timestamps, Serializability and Recoverability, The Dirty-Data Problem, Cascading Rollback, Recoverable Schedules, Managing Rollbacks Using Locking, Logical Logging, Recovery From Logical Logs, Concurrency, Recovery, Security and Integrity, Storage and file structure, Indexing and hashing, Query processing and optimization.

Unit 2: Database System Architecture and Object Oriented Database (12 hrs)

Centralized client server architecture, Server system architecture, Parallel system and distributed

system.

Object Oriented Concepts: Data Object Models, Object Based Databases, Object Oriented Databases, Object Oriented Relational Databases, Object Definition Languages, Object Query Languages,SQL3 - Concurrency in OODBs, Storage and Access.

Unit 3: Data Warehousing (12 hrs)

Heterogeneous information; the integration problem; the Warehouse Architecture; Data Warehousing; Warehouse DBMS, Data Warehouse Models and OLAP operations. ETL, materialized views, Dashboards, BI.Advanced Transaction Processing: E-commerce, MMDB, Real time transaction system, long duration transaction, Transaction management in multi databases.

Unit 4: Advanced application development and Enhanced Data Models for Advanced Applications (12 hrs)

Performance Tuning, Performance bench mark, Standardization. Enhanced Data Models for Advanced Applications: Active database concepts, Temporal Database concepts, spatial databases, Deductive databases, Mobile databases, Geographic information systems, Multimedia Data bases.

Unit 5: Case Studies (12 hrs)

Hadoop Distributed File System: Study of Hadoop Distributed File System. HadoopP is a distributed file system that provides high-throughput access to application data; HIVE - Data warehousing application built on top of Hadoop; MapReduce - It is a patented software framework introduced by Google in 2004 to support distributed computing on large data sets on clusters of computers; Dynamo – It is a highly available, proprietary key-value structured storage system or a distributed data store; Eventual Consistency Model for Distributed Systems..

Reference Books:

1. Korth, Silberchatz, Sudarshan, **Database System Concepts**, McGraw-Hill.
2. Elmasri and Navathe, **Fundamentals of Database Systems** [4e], Pearson Education.
3. Peter Rob and Coronel, **Database Systems, Design, Implementation and Management** Thomson Learning.

4. Raghu Ramakrishnan, Johannes Gehrke, **Database Management Systems** [3e], McGraw-Hill.
5. C. J. Date, Longman, **Introduction To Database Systems**, Pearson Education.
6. http://hadoop.apache.org
7. J. D. Ullman, **Principles of Database Systems**, Galgotia Publication, 2nd Edition, 1999.
8. Rajesh Narang, **Object Oriented Interfaces & Databases**, Prentice Hall Of India, 2002.
9. **Oracle 9i Data Warehousing Guide** Relese 2 (9.2) Part Number A96520-01by Oracle Press
10. William Inmon, Building the **Data Warehouse Lifecycle Toolkit**, John Wiley & Sons, 1998

Lab Exercise:

There should be minimum 10 lab assignment on the topics discussed in the course.

Term Work:

The term work shall consist of a record of at least 5 programs/assignments or mini project. The experiments shall be evenly spread over the syllabus.

Course Outcome:

Upon completion of this course, students should be able to:

- Explain in detail DBMS architecture.
- Explain in detail query processing and techniques involved in query optimization.
- Explain the principles of concurrency control.
- Explain the principles of recovery management.
- Know recent developments and active research topics in database.

4. Advanced Computer Architecture:

Course Code	MTT404	Course Title	Advance Computer Architecture
Number of Credits	4 Credits (TH) 1 Credit(P)	Internal	Tests: I- 10%, II – 10% Assignments/Homework: 20%
Total Contact Hours	4 Hrs. (TH/Week) 2 Hrs. (TH/Week)	External	Final Examination: 60%
		(Semester/Term Exam)	

Prerequisites:

Basic courses on 8085, 8086 processor at B.E. level

Course Objectives

This course surveys architecture and organization of modern computing systems including: CPU design, instruction sets, memory hierarchy, pipelined machines, and multiprocessors. The emphasis is on the major component subsystems of high performance computers: pipelining, instruction level parallelism, thread-level parallelism, memory hierarchies, input/output, and network-oriented interconnections. The course introduces techniques and tools for quantitative analysis and evaluation of modern computing systems and their components.

Course Outline:

Part I:

1. Fundamentals of Computer Design (Chapter 1)

2.Pipelining Basic and Intermediate Concepts (Chapter 2)

Part II

3. Memory Hierarchy (Appendix C, Chapter 5)

4. Inside Processors

Part III

5.Instruction Set Principles (Appendix B)

6. Instruction Level Parallelism and Its Exploitation (Chapter 2)

Part IV

7. Limits on Instruction-Level Parallelism (Chapter 3)
8. Multiprocessors and Thread-Level Parallelism (Chapter 4)

Part V

9. Storage (Chapter 6)

10. Interconnection Network and Clusters (Chapter 8)

Reference Books:

1. Joseph A. Fisher, Paolo Faraboschi, Cliff Young, Embedded Computing A VLIW Approach to Architecture, Compilers and Tools, Morgan Kaufmann Publishing Co., Menlo Park, CA. 2004. ISBN: 978-1-55860-766-8, ISBN10: 1-55860-766-8.
2. Dezso Sima, Terence Fountain, Peter Kacsuk, Advanced Computer Architectures: A Design Space Approach, Addison-Wesley, 1998. ISBN: 0-201-42291-3

Lab Exercise:

There should be minimum 10 lab assignment on the topics discussed in the course.

Term Work:

The term work shall consist of a record of at least 5 programs/assignments or mini project. The experiments shall be evenly spread over the syllabus.

Elective I:

Remote sensing

Course Code	MTT454	Course Title Remote sensing	
Number of Credits	4 Credits (TH) 1 Credits (PR)	Internal	Tests: I- 10%, II – 10% Assignments/Homework: 20%
Total Contact Hours	3 Hrs. (TH/Week) 4 Hrs. (PR/Week)	External (Semester/Term Exam)	Final Examination: 60%

Prerequisite:

Introducing technical issues behind the remotely sensed image acquisition andutilization with airborne and satellite images. Analyzing and studying various formats and interpretation of images with software tools. Understanding thoroughly the techniques which help in experimentation of remote sensed images for studying environmental monitoring, biological, geological, hydrological and oceanographic as well as human activities are emphasized

Course Objective:

This course is so designed by keeping in mind that the student will get thorough knowledge and practical experience in studying the burning issue i.e. Remote Sensing. The alignment of course content and learning objective is focused according latest books reviews and online material. It also meets various dimensions of RS objective according to international syllabus. Precaution has been taken not overwhelm student. The overall objective can be summarized as follows:

1. Students will be able to articulate the basics of how electromagnetic energy enables remote sensing and be able to describe why different wavelength regions of the electromagnetic spectrum are useful for different types of remote sensing as well as why various portions of the electromagnetic spectrum cannot be used for remote sensing.
2. Students will be able to explain the concepts of spatial, spectral, radiometric and temporal resolution and how they impact the selection of the most appropriate data source(s) for a particular analytical task. Students will also be able to compare and contrast current common sensors on the basis of these properties and explain if a sensor is useful for particular tasks.

3. Students will be able to describe spectral signatures and use this knowledge to explain how different wavelengths can successfully be used to differentiate between different land surface types.
4. Students will be able to explain and perform fundamental digital image processing tasks including: radiometric preprocessing, and supervised and unsupervised image classification.
5. Students will be able to integrate remote sensing results with other geographic variables to obtain a more comprehensive view of particular area of interest.
6. Students will be able to perform Remote Sensed Image analysis and classification using ENVI/MatLab on different data sets.

Course Outline:

Unit-I Basics of Remote Sensing

Principles of Remote sensing, History of Remote sensing, Remote sensing in India,

- Electromagnetic Radiation and Electromagnetic Spectrum, EMR quantities: Nomenclature and Units
- Thermal Emission of Radiation, Radiation Principles (Plank's Law, Stephen Boltezman law) Interaction of EMR with the Earth Surface (Wien's Displacement law, Kirchoffs Law)
- Spectral signature, Reflectance characteristics of Earths cover types, Remote sensing systems.

Unit-II Platforms and Sensors

- Platforms, Types of sensors, resolutions sensor, Passive and Active Sensors, Optical sensors, Classification of RS, Selection of Sensor Parameter, Spatial Resolution, Spectral Resolution, Radiometric Resolution, Temporal Resolution.
- Satellite missions: Landsat series, SPOT series, IRS, Metrological satellites

Unit-III Microwave Region & Multispectral, Thermal, and Hyperspectral Sensing

- Characteristics of EM radiation in microwave region, passive and active Microwave sensors.
- Introduction - Electromagnetic spectrum in thermal inferred.
- Across-Track & Along-Track Scanning.
- Operating Principles: Across-Track Multispectral Scanners, Across-Track Thermal Scanning.

- Thermal Radiation Principles, Interpreting Thermal Scanner Imagery.
- Geometric Characteristics of Across-Track & Along-Track Scanner Imagery.
- Radiometric Calibration of Thermal Scanners.
- Temperature Mapping with Thermal Scanner Data, FLIR Systems, Hyperspectral Sensing
- Thermal properties of vegetation, soils, water and snow in thermal domain.

Unit-IV Interpretation of Remote Sensing Images.

- Types of interpretation, Interpretation Phase.
- Visual Interpretation, Criteria for visual interpretation, Elements for visual analysis.
- Digital image processing enhancement and correction: Structure, Media and data organization, Equipments, visual enhancement, image correction, Radiometric and Geometric corrections.
- Digital Image Classification

Unit-V Remote Sensing and GIS

- GIS Introduction
- Need for GIS, Data Model, Data Entry, Data Analysis, GPS, and Remote Sensing as input for GIS.
- Integration of Satellite Images and GIS.
- Spatial Data Infrastructure.

Lecture Text Books

- Fundamentals of Satellite Remote Sensing, Emilio Chuvieco, Alfredo Huete (2010), CRC Press, Taylor & Francis Group.
- Remote Sensing and Image Interpretation. 6th ed. Lillesand, T.M., Kiefer, R.W. and Chipman.J.W. 2008. New York: John Wiley & Sons.
- Fundamentals of Remote Sensing, George Joseph (2004), Universities Press (India) Private Limited.
- Remote Sensing Models and Methods for Image Processing, 3rd ed, Robert A. Schowengerdt, Academic Press is an imprint of Elsevier, 2007.

Reference Books

- Remote Sensing of the Environment - an Earth Resource Perspective 2nd ed. Jensen, J.R. 2007. Upper Saddle River, NJ, Prentice Hall.

- Remote Sensing Principles and Interpretation, Floyd, F. Sabins, Jr: Freeman and Co., San Franscisco, 1978.
- Manual of Remote Sensing Vol. I&II, 2nd Edition, American Society of Photogrammetry.
- Remote Sensing: The quantitative approach, P.H. Swain and S.M. Davis, McGraw Hill.
- Introductory Digital Image Processing: A remote sensing perspective, John R. Jensen, Prentice Hall.
- Imaging Radar for Resource Survey: Remote Sensing Applications, 3, W Travelt, Chapman & Hall.
- Remote sensing Notes –Edited by Japan Associates of Remote sensing- JARS 1999
- Introduction to Remote Sensing, Campbell James, Taylor & Francis London.
- Photogrammetry and Remote Sensing (2000), Lecture notes, Module I, IIRS
- Remote Sensing, Agarwal C.S. and Garg, P. K. (2000): A. H. Wheeler and Co. Ltd., New Delhi.

Web Resources

- www.esriindia.com
- http://www.exelisvis.com/ProductsServices/ENVI.aspx
- http://rst.gsfc.nasa.gov/start.html
- http://www.isro.org/

Journals

- IEEE Transactions on Geo-science and Remote sensing.
- International Journal of Remote Sensing.
- Canadian Journal of Remote Sensing.
- GeoCarto International.
- ITC Journal.
- ISPRS Journal of Photogrammetry and advances in space research.

Lab Course

ENVI 4.4/ MatLab 2011a

Software Guides

ENVI 4.4/MatLab: User’s Guide.

ENVI 4.4/MatLab: Tutorials.

Semester – II

1. Data Mining

Course Code	MTT405	Course Title	Data Maning
Number of Credits	4 Credits (TH) 1 Credit(P)	Internal	Tests: I- 10%, II – 10% Assignments/Homework: 20%
Total Contact Hours	4 Hrs. (TH/Week) 2 Hrs. (TH/Week)	External	Final Examination: 60%

Prerequisite:

- Fundamental Concept of Database Management System and Relational Database Management System.

Course Objective:

- To develop an understanding of the strengths and limitations of popular data mining techniques and to be able to identify promising business applications of data mining. Students will be able to actively manage and participate in data mining projects executed by consultants or specialists in data mining. A useful take away from the course will be the ability to perform powerful data analysis.

Course Outline:

Unit 1 **(14 Hrs)**

Introduction to Data Mining:

Why Mine Data? Commercial Viewpoint, Scientific Viewpoint Motivation, Definitions, Origins of Data Mining, Data Mining Tasks, Classification, Clustering, Association Rule Discovery, Sequential Pattern Discovery, Regression, Challenges of Data Mining.

Data Mining: Data

What is Data? Attribute Values, Measurement of Length, Types and Properties of Attributes, Discrete and Continuous Attributes, Types of data sets, Data Quality, Data Preprocessing, Aggregation, Sampling, Dimensionality Reduction, Feature subset selection, Feature creation, Discretization and Binarization, Attribute Transformation, Density.

Data Mining: Exploring Data:

Data Exploration Techniques, Summary Statistics, Frequency and Mode, Percentiles, Measures of Location: Mean and Median, Measures of Spread: Range and Variance, Visualization, Representation, Arrangement, Selection, Visualization Techniques: Histograms, Box Plots, Scatter Plots, Contour Plots, Matrix Plots, Parallel Coordinates, Other Visualization Techniques, OLAP : OLAP Operations

Unit 2 **(12 Hrs)**

Data Mining Classification: Basic Concepts, Decision Trees, and Model Evaluation

Classification: Definition, Classification Techniques, Tree Induction, Measures of Node Impurity, Practical Issues of Classification, ROC curve, Confidence Interval for Accuracy, Comparing Performance of Two Models, Comparing Performance of Two Algorithms.

Data Mining Classification: Alternative Techniques

Rule-Based Classifier, Rule Ordering Schemes, Building Classification Rules, Instance-Based Classifiers, Nearest Neighbor Classifiers, Bayes Classifier, Naive Bayes Classifier, Artificial Neural Networks (ANN), Support Vector Machines.

Unit 3 **(10 Hrs)**

Data Mining Association Analysis: Basic Concepts and Algorithms

Association Rule Mining, Frequent Itemset Generation, Association Rule Discovery : Hash tree, Factors Affecting Complexity, Maximal Frequent Horible Closed Item set, Alternative Methods for Frequent Item set Generation, FP-growth Algorithm, Tree Projection, Rule Generation, Pattern Evaluation, Statistical Independence, Properties of A Good Measure, Support-based Pruning, Subjective Interestingness Measure.

Unit 4 **(10 Hrs)**

Data Mining Cluster Analysis: Basic Concepts and Algorithms

Applications of Cluster Analysis, Types of Clusters, Clustering Algorithms:

K-means and its variants, Hierarchical clustering, Density-based clustering. Graph-Based Clustering, Limitations of Current Merging Schemes, Characteristics of Spatial Data Sets, Shared Near Neighbor Approach, ROCK (Robust Clustering using links), Jarvis-Patrick Clustering, SNN Clustering Algorithm.

Data Mining Anomaly Detection

Anomaly/Outlier Detection, Importance, Anomaly Detection Schemes, Density-based: LOF approach.

Unit 5: Case Study **(12 Hrs)**

WEKA (Waikato Environment for Knowledge Analysis): is a well-known suite of machine learning software that supports several typical data mining tasks, particularly data preprocessing, clustering, classification, regression, visualization, and feature selection.

Orange is a component-based data mining and machine learning software suite that features friendly yet powerful, fast and versatile visual programming front-end for explorative data analysis and visualization, and Python bindings and libraries for scripting. It contains complete set of components for data preprocessing, feature scoring and filtering, modeling, model evaluation, and exploration techniques.

RapidMiner: Formerly called YALE (Yet another Learning Environment), is an environment for machine learning and data mining experiments that is utilized for both research and real-world data mining tasks.

JHepWork: Designed for scientists, engineers and students, jHepWork is a free and open-source data-analysis framework that is created as an attempt to make a data-analysis environment using open-source packages with a comprehensible user interface and to create a tool competitive to commercial programs.

KNIME: (Konstanz Information Miner) is a user friendly, intelligible and comprehensive open-source data integration, processing, analysis, and exploration platform. It gives users the ability to visually create data flows or pipelines, selectively execute some or all analysis steps, and later study the results, models, and interactive views.

FEBRL: (Freely extensible biomedical record linkage) is prototype software which undertakes data standardization, which is an essential pre-processing phase for most record linkage projects, and which implements the "classical" approach to probabilistic record linkage model as described by Fellegi and Sunter and subsequently extended by others.

SPSS: SPSS Statistics is a software package used for statistical analysis. PSS is among the most widely used programs for statistical analysis in social science. It is used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations and others.

REFERENCES:

1. Introduction to Data Mining by Tan, Steinbach, Kumar.
2. Data Mining: Concepts and Techniques by Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers.
3. Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten and Eibe Frank, Morgan Kaufmann, 2nd Edition (2005).
4. Principles of Data Mining: David Hand, Heikki Mannila & Padhraic Smyth, PHP Publication.

5. http://www.cs.waikato.ac.nz/ml/weka/
6. http://orange.biolab.si/
7. http://rapid-i.com/content/view/181/190/
8. http://jwork.org/jhepwork/
9. http://www.knime.org
10. http://datamining.anu.edu.au/projects/linkage.html
11. http://www.spss.co.in/

Lab Exercise:

There should be minimum 10 lab assignment on the topics discussed in the course.

Course Outcomes:

- Be able to approach data mining as a process, by demonstrating competency in the use of CRISP-DM, the Cross-Industry Standard Process f or Data Mining, including the business understanding phase, the data understanding phase, the expl or at or y data analysis phase, the modeling phase, the evaluation phase, and the deployment phase.

2. Image Processing and Pattern Recognition

Course Code	MTT406	Course Title	Image Processing and Pattern Recognition
Number of Credits	4 Credits (TH)	Internal	Tests: I- 10%, II – 10% Assignments/Homework: 20%
Total Contact Hours	4 Hrs. (TH/Week)	External	Final Examination: 60%
		(Semester/Term Exam)	

Prerequisite:

Computer Science students should have completed the fundamentals of image processing.
Students should have completed the undergraduate calculus sequence

Course Objectives:

- The course will provide an introduction to methodologies for digital image processing and pattern recognition.
- This course will give students hands-on experiences on using tools such as Matlab to process digital images and analyze the images.

Course Outline:

Unit1:

Image Transforms: Introduction, Need for transform, Image transforms, Fourier transform, 2D Discrete Fourier transform, Walsh transform, Hadamard transform, Haar transform, Discrete Cosine transform, KL transform, Singular value decomposition, Comparison of different transforms.

Wavelet-based Image Processing: Background, Multiresolution expansions, wavelet transform in one dimension, the fast wavelet transform, examples of wavelets, wavelet based image compression, wavelet transform in two dimensions, wavelet packets , JPEG2000 compression standard, mulitwavelets, ridgelet, curvelet, contourlet tarnsform

Unit2:

Segmentation in Video Data: Video Acquisition, Detecting Changes in the Video, The Algorithm, Background Subtraction, Defining the Threshold Value, Image Differencing, Learning Parameters in Video and Image Processing: training and initialization

Unit3:

Introduction to Pattern Recognition: Pattern recognition systems, the design cycle, learning and adaption, Pattern recognition applications, relationship of pattern recognition to other fields, Statistical

Decision Theory, Image processing and Analysis

Unit4:

Bayesian Decision Theory: Introduction, Bayesian decision theory-continuous features, minimum error rate classification, Classifiers, discriminant functions, and decision surfaces, Bayes decision theory-discrete features, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation: Gaussian case, Components analysis and discriminants

Unit5:

Recognition of 2D and 3D objects: Introduction, Need for object recognition system, automated object recognition system, relationship between image processing and object recognition, Approaches to object recognition, applications of object recognition, Structural methods: Matching shape numbers, String matching, Object Recognition from Large Structural Libraries, Acquisition of 2-D Shape Models from Scenes with Overlapping Objects Using String Matching, A Taxonomy of Occlusion in View Signature II Representations: A Regular Language for the Representation of 3-D Rigid Solid Objects

References

1. S. Jayaraman, S. Essakkirajan, T. Veerakumar, Digital Image Processing, McGraw Hill Publication,
2. Rafel C. Gonzalez, Richard E. Woods, Digital Image Processing, PHI
3. Moeslund Th.B., Introduction to Video and Image Processing Building Real Systems and Applications, Springer, ISBN 978-1-4471-2502-0
4. R.O. Duda, P.E. Hart, D.G. Stork. Pattern Classification, John Wiley and Sons, Second edition 2000
5. Robert Schalkoff, Pattern Recognition Statistical, Structural and Neural Approaches, Wiley
6. Earl Gose, Richard Johnsonbaugh, Steve Jost, Pattern Recognition and Image Analysis, PHI

Journal References:

1) IEEE Transaction on Image Processing
2) IEEE Transactions on Pattern Analysis and Machine Intelligence.

Lab Exercise:

There should be minimum 10 lab assignment on the topics discussed in the course.

3.Advance Algorithm

Course Code	MTT407	Course Title	Advance Algorithm
Number of Credits	4 Credits (TH)	Internal	Tests: I- 10%, II – 10% Assignments/Homework: 20%
Total Contact Hours	4 Hrs. (TH/Week)	External	Final Examination: 60%
		(Semester/Term Exam)	

Prerequisite:

Basic course in Algorithms and a good background in Discrete Mathematics (sets, graphs, relations, combinatorics, logic) and Probability (random variables, expected values, conditional probability, etc.). Knowledge of rigorous mathematical analysis and proofs, and be familiar with: Time complexity and O-notation.

- Greedy algorithms and dynamic programming.
- Recurrences and divide-and-conquer.
- Some fundamental data structures and graph algorithms.

Course Objectives:

- After completion of this course student can learn how to design a Learning system, Learning Process, Learning methods, Forms of learning, learning with complex data, learning with Hidden variables.

Course Outline:

Unit 1:

Probabilistic Analysis and Randomized Algorithms: The Hiring Problem, Indicator Random Variables, Randomized Algorithms, Network Flow and Matching: Flows and Cuts, maximum Flow, Maximum Bipartite Matching, Minimum-Cost Flow, Efficiency Analysis

Unit 2:

Text Processing: String and pattern matching algorithms, tries, text compression, text similarity testing, performance analysis, Computational Geometry Algorithms: Range trees, Priority Search trees, Quadtrees and k-D trees, Plan Sweep Technique, Convex Hulls

Unit 3:

Number Theory Algorithms: Elementary Number Theory algorithms like Euclid's GCD algorithm, modular arithmetic algorithms, primality testing, Multiplying Big Integers.

Unit 4:

Parallel Algorithms: Model for parallel computation, basic techniques, parallel evaluation of expressions, parallel sorting networks, parallel sorting

Unit 5:

NP-Completeness and Approximation Algorithms: Polynomial time, Polynomial time verification, NP-completeness and reducibility, NP-completeness examples, Vertex Cover problem, Travelling Salesman Problem, Set Covering Problem.

Text Book

Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, MIT Press, 3rd Edition, 2009.

References

1. Michael T. Goodrich and Roberto Tamassia, Algorithm Design Foundations, Analysis, and Internet Examples, John Wiley & Sons, Inc., 2nd Edition, 2009.
2. Gilles Brassard and Paul Bratley, Fundamentals of Algorithmics, Prentice Hall, 1996.
3. Parag Himanshu Dave, Himanshu Bhalchandra Dave, Design and Analysis of Algorithms, Pearson Education, 2008.
4. Computational Geometry: Algorithms and Applications,Third Edition (March 2008)
5. Mark de Berg, TU Eindhoven (the Netherlands) ,Otfried Cheong, KAIST (Korea),Marc van Kreveld, Mark Overmars, Utrecht University (the Netherlands)
6. Algorithmic Number Theory, Volume 1,Efficient Algorithms By Eric Bach and Jeffrey Shallit,MIT Press.
7. Introduction to Parallel Algorithms,C. Xavier, S. S. Iyengar,Wiley Press

Journal References:

1. *International* Journal *of* Advanced Algorithms *and Complexity*
2. Journal *of Discrete* Algorithms - *Elsevier*
3. Journal of Mathematical Modeling and Algorithms

Lab Exercise:

There should be minimum 10 lab assignment on the topics discussed in the course.

Course Outcomes:

- Describe analysis techniques for algorithms.
- Identify appropriate data structure and design techniques for different problems
- Identify appropriate algorithm to be applied for the various application like geometric modeling, robotics, networking, etc.
- Appreciate the role of probability and randomization in the analysis of algorithm
- Analyze various algorithms.
- Differentiate polynomial and non-deterministic polynomial algorithms.

4. Advance Computer Networks

Course Code	MTT408	Course Title	Advance Computer Network
Number of Credits	4 Credits (TH), 1 Credits (PR)	Internal	Tests: I- 10%, II – 10% Assignments/Homework: 20%
Total Contact Hours	4 Hrs. (TH/Week) 2 Hrs. (PR/Week)	External (Semester/Term Exam)	Final Examination: 60%

Prerequisite:

- Basic concepts of Data Communication and Networking.

Course Objective:

1. To understand the state-of-the-art in network protocols, architectures and applications.
2. To elaborates TCP/IP protocol suit and Wireless Network
3. To cover advanced concepts of Computer Networks
4. To investigate novel ideas in the area for research projects.

Course Outline:

Unit 1: Network System: (12 hrs)

Introduction: Network Core, The OSI Model and the TCP/IP Protocol Suite. ISPs and Internet Backbone, Delay and Loss in Packet Switched Networks, Protocol Layers and their service models. Link Layer: Framing, Error detection, Error Recovery and Shared Media Access [MIT-OCW L0singlelink.pdf], Link Virtualization.

Unit 2: Internetworking and Routing (12 hrs)

Network Service Models. Virtual Circuits and Datagram Subnets. Internet Protocol: Forwarding and Addressing in the Internet. Internetworking Problems[MIT-OCW L2Internetworking.pdf], Scaling IP for Size and Speed[MIT-OCW L3ScalingIP.pdf] Routing Algorithms, Routing in the Internet , Unicast Internet Routing: Intra- and Inter-Domain Routing [MIT-OCW L4UnicastRtg.pdf]

Unit 3: Transport Layer (12 hrs)

Transport Layer Services, Principles of Reliable Data Transport, Connectionless (UDP), Connection Oriented (TCP) Data Transport and SCTP. Resource Management : Principles of Congestion Control, End to End Congestion Control[MIT-OCW L8e2ecc.pdf], Router-Assisted Congestion Control: Active Queue Management[MIT-OCW L9routercc.pdf],Scheduling for Fairness[MIT-OCW L10fq.pdf]

Unit 4: Application Layer and Multimedia Networking (12 hrs)

Principles of Network Applications. Protocols: DNS, HTTP, FTP and Electronic Mail in Internet. Multimedia Networking Applications, Streaming Stored Audio and Video, Protocols for Real-Time Interactive Applications and scheduling- policing Mechanisms. Distributing Multimedia: Content Distribution Networks

Unit 5: Wireless and Mobile Networks: (12 hrs)

Wireless Links and Network Characteristics, Wi-FI:802.11 Wireless LANs, Cellular Internet Access. Mobility Management Principles, Mobile IP, Mobility Management in Cellular Networks Mobile TCP, WAP

Reference Books:

1. James F. Kurose and Keith W. Ross, **Computer Networking**- A Top-Down Approach, Pearson
2. BehrouzA. Forouzan, **Data Communications and Networking**, Tata McGraw Hill
3. AndrewS. Tanenbaum, **Computer Networks**, Prentice Hall
4. Jochen Schiller, **Mobile Communications**, Pearson Education
5. Douglas Comer, **Network Systems Design using Network Processor**, Pearson Education
6. William Stallings, **High-Speed Networks and Internets**, Pearson Education
7. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-829-computer-networks-fall-2002/lecture-notes
8. Y-Bing Lin and Imrich Chlamtac, **Wireless and Mobile Network Architecture**, Wiley

Term Work: The term work shall consist of a record of at least 5 programs/assignments or mini project. The experiments shall be evenly spread over the syllabus.

Lab Exercise:

There should be minimum 10 lab assignment on the topics discussed in the course.

Course Outcomes:

- Demonstrate the understanding of advance data communication technologies.
- Demonstrate the understanding of WAN Technology typically ATM
- Demonstrate the understanding of packet switching protocols such as X.25, X.75.
- Explore the issues of advance internet routing protocols and also QoS based protocols.
- Analyze issues of traffic requirements and perform capacity planning.
- Demonstrate the understanding of protocol used for management of network.

5. Intellectual Property Rights

Course Code	MTT111	Course Title	Intellectual Property Rights
Number of Credits	1 Credits (TH)	Internal	Tests: I- 10%, II – 10% Assignments/Homework: 20%
Total Contact Hours	1 Hrs. (TH/Week)	External	Final Examination: 60%

Prerequisite

- Basic concepts of Indian law and American law

Course Objective:

1. To meet the needs of generalists as well as those who intend to specialize.
2. To consider both the basic components of IP: (1) the use of copyright, patents and related laws to prevent others from copying and (2) the use of trademarks and related laws to prevent others from making source and other harmful misrepresentation.
3. To consider IP law from two basic perspectives – both proactively and reactively. First, parties need to know whether and how they can stop others from engaging in certain activities. Also, parties need to know when they can ignore others' objections, e.g., to copying.

Course Outline:

Unit 1: Introduction: I-Basic Principles and Acquisition of Intellectual Property Rights

Philosophical Aspects of Intellectual Property Laws, Basic Principles of Patent Law, Patent Application procedure, Drafting of a Patent Specification, Understanding Copyright Law, Basic Principles of Trade Mark, Basic Principles of Design Rights.

Unit 2: Indian Constitutional Law: The New Challenges

"State": Need for Widening the Definition in the Wake of Liberalization, Right to Equality: Privatization and Its Impact on Affirmative Action, Freedom of Press and Challenges of New Scientific Development,

Freedom of speech and right to broadcast and telecast , Access to information , Right to strikes, hartal and bandh

Unit 3: Emerging Regime of New Rights and Remedies

Reading Directive Principles and Fundamental Duties into Fundamental Rights, Compensation jurisprudence, Right to education, Commercialization of education and its impact, Brain-drain by foreign education market.

Unit 4: Separation of Powers: Stresses and Strain

Judicial activism and judicial restraint, PIL: implementation , Judicial independence , Appointment, transfer and removal of judges, Accountability: executive and judiciary Tribunals.

Reference Books:

1. H. M. Sheervai, Indian Constitution of Law (three Volumes)
2. M. P. Jain, Constitution Law of India (2008), Tripathi, Bombay
3. D. D. Baus Commentaries of Indian Constitution
4. Latest Judgments of Supreme Court

Term Work: The term work shall consist of a record of at least 5 assignments. The assignments shall be evenly spread over the syllabus.

Lab Exercise:

There should be minimum 10 lab assignment on the topics discussed in the course.

Course Outcomes:

- The students once they complete their academic projects, they get awareness of acquiring the patent and copyright for their innovative works. They also get the knowledge of plagiarism in their innovations which can be questioned legally.

Elective II:

Geospatial Technology

Course Code	MTT458	Course Title	Geospatial technology
Number of Credits	4 Credits (TH) 1 Credit(P)	Internal	Tests: I- 10%, II – 10% Assignments/Homework: 20%
Total Contact Hours	4 Hrs. (TH/Week) 2 Hrs. (TH/Week)	External	Final Examination: 60%

Prerequisites:

Geographic information science (GIS), remote sensing, and global navigation satellite systems are used in wide-ranging applications such as environmental management, engineering, planning, transport/logistics, public utilities, business, public health and social sciences.

Course Objective:

1. Introduce Geospatial technology & its Concepts & components.
2. Improve the skills for handling, processing & analysis of geospatial data related to various applications through GIS tools.

Course Outline:

Unit 1 Remote sensing models & Methods for image processing:

Data models, Spectral transform spatial transform, correction & calibration, Registration & fusion.

Unit2 Introduction to Geospatial Technology:

Introduction, Coordinate system, Global positioning system, Georelational vector Data model, Object based vector Data model, Raster Data model.

Unit 3 Data input, transformation, editing & Cartography:

Data input, Geometric transformation, Spatial Data Editing Attribute Data input & Management, surveying & mapping, Data display & Cartography.

Unit 4 Data Exploration & Analysis:

Data Exploration, Vector Data Analysis, Raster Data Analysis, Terrin Mapping & analysis, DEM,TIN.

Unit 5 Spatial interpolation, Geocoding & Modeling:

View sheds & Watersheds, spatial interpolation, Geocoding & Dynamic segmentation, Path analysis & Network Application, GIS model & modeling.

Text Books:

- Remote sensing models & methods for image processing, third edition, Robert's A.Schowengerdt
- Geographic Information System, Kang-tsung Chang, fourth edition
  Tata McGraw-Hill.
- An Introduction to Geographic Information Technology, Sujit Choudhary, Deepankar Chakrabarty, Suchandra Choudhary,IK international.

Reference Books:

- Digital Analysis of Remotely sensed Imagery, Jay Gao,McGraw Hill
- Remote sensing Digital image Analysis An Introduction, John A. Richards, Xiuping Jia
- Fundamentals of Satellite Remote Sensing, Emilio Chuvieco, and Alfredo Huete
- An introduction to geographical information systems, Ian Heywood, Sarah Cornelius, Steve Carver

Web Resources:

- http://www.gis.com/whatisgis/index.html
- http://www.gis.nic.in
- http://www.esriindia.com
- http://www.qgis.org
- http://www.exelisvis.com/ProductsServices/ENVI.aspx
- http://rst.gsfc.nasa.gov/start.html
- http://www.isro.org
- http://www.usgs.gov

Journals:

- IEEE Transactions on Geo-science and Remote sensing.
- GeoCarto International.
- ITC Journal.

- International journal of Geoinformatics
- ISPRS Journal of Photogrammetry and advances in space research

Lab Exercise: Geospatial technology

Practical: (code-MTP115)

Illustration & Demonstration of Geospatial data through GIS tools (ENVI & ArcGIS) on the basis of Unit 1 to 5

Course Outcomes:

Students will acquire the basics of GIS and will use GIS to:

- Explore mapped data
- Relate GIS with remote sensing technologies
- Analyze spatial data, using GIS analysis tools
- Develop and manage geodatabases.
- Apply Python as a GIS computer language
- Create maps, images and apps to communicate spatial data in a meaningful way to others

Students practice competencies from the Geospatial Technology Competency Model (GTCM) throughout each program.

- Personal effectiveness and workplace competencies are practiced through engagement in discussion boards, following course guidelines, and interactions with the instructor and other students in the class
- Workplace competencies are strengthened as students apply the analytical and evaluative tools to GIS mapping and apps
- The industry-wide and industry-sector technical competencies are a focal point in the lab activities provided by instructors in the courses.

Semester – III

1. Dissertation-I

Course Code	Course Title	
MTDR1200	Dissertation-I Industrial Project	1) Mid Term Review : 100 Marks (4 Credits) 2) Final Review : 200 Marks (8 Credits)

Semester – IV

1. Dissertation-II

Course Code	Course Title	
MTDR2000	Dissertation-II	1) Mid Term Review : 100 Marks (4 Credits) 2) Final Review : 400 Marks (16 Credits)

IQAC Cell

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

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