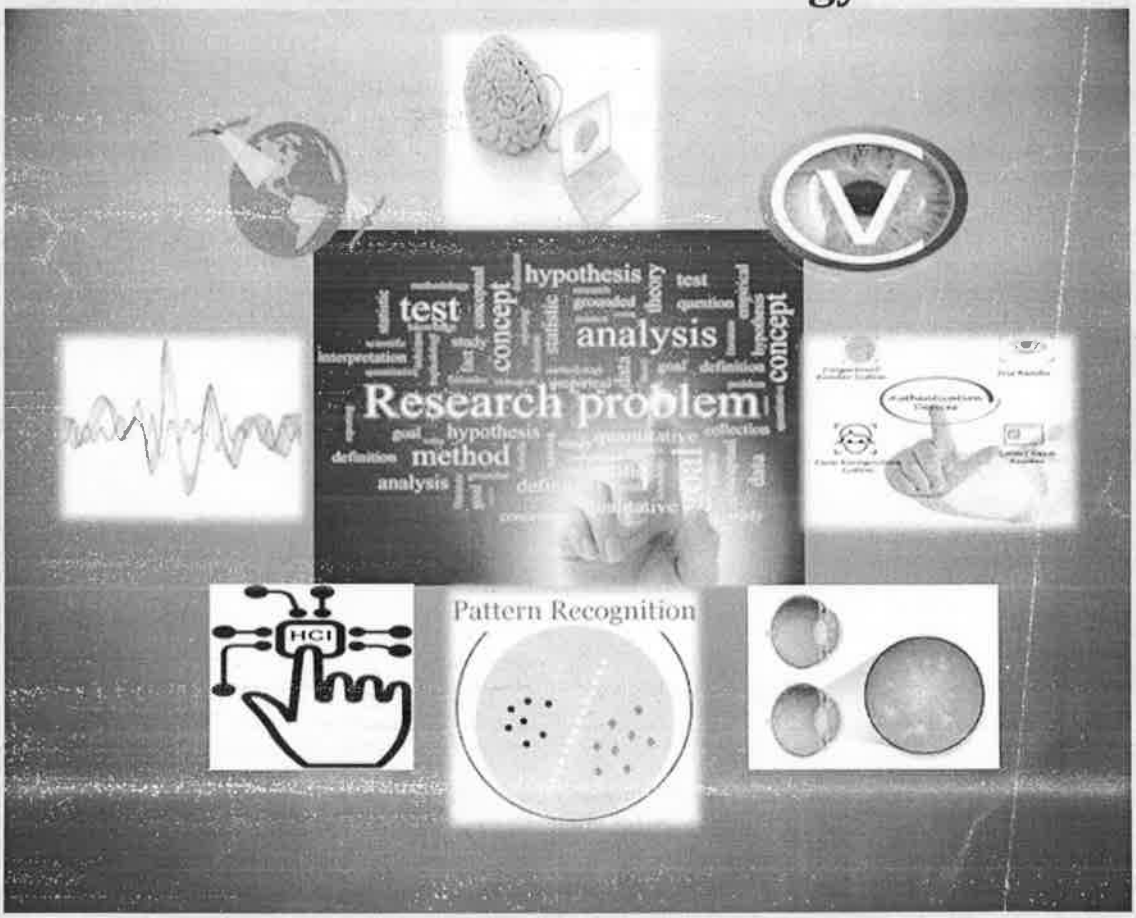
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Department of Computer Science & Information Technology



Department of Computer Science and Information Technology,

Dr.BAMUniversity, Aurangabad

M.Tech(Computer Science and Engineering)

Revised Outcome Based Education Course Structure

W.E.F.(Academic Year 2017-18)

M.Tech.(Computer Science & Engineering) Program

Department of Computer Science and Information Technology,

Dr.BAMUniversity, Aurangabad

Outcome Based Education Course Structure

PROGRAM OUTCOMES (POs/PSOs):

M. Tech. in Computer Science and Engineering Graduates will have the ability to:

1. **Domain Knowledge:** An ability to apply the knowledge of mathematics, engineering fundamentals to the solution of problems in Computer Science and engineering.

2. **Problem Analysis:** An ability to apply identify, formulate, synthesize scholarly review research literature, and analyze complex Computing problems.

3. **Design/ Development of Solutions:** Capability to design Solutions for complex Computing problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct Investigations of Complex Problems:** To use research based knowledge and research methods including design and/or experiments, analysis and interpretation of data, and formulation of systematic information to provide valid conclusions.

5. **Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern technical and IT tools including prediction and modelling to complex Computing activities with clear understanding of limitations.

6. **Societal Responsibility:** Broad Understanding the impact of engineering in global, economic environment & social context. Apply reasoning informed by contextual knowledge to assess societal, health, safety legal and cultural issues and the consequent responsibilities relevant to professional Computer engineering practice.

7. **Environment and Sustainability:** Broad capability and understanding the impact of the professional Computer engineering solutions in environmental contexts, and apply knowledge of domain area for sustainable development.

8. **Ethics:** Ability to develop ethical principles and commit to professional ethics and responsibilities and norms of the Computer engineering practice.

9. **Individual and Team Work:** An ability to function effectively within multidisciplinary team and a team member of leader in diverse teams.

10. **Communication:** A fundamental capability in oral and written communication effectively on complex computer engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give/receive clear instructions.

11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and basic management principles and apply these to own work, as a member and leader in a team, to manage projects and multi-disciplinary environments.

12. **Life Long Learning:** Recognize the need for and have the ability to engage in independent and life-long learning in the broadest context of technological knowledge.

Course Structure M.Tech (Computer Sience and Engineering)
Academic Year (2013-14)

Semester I

Sr. No.	Subject Code	Subjects	Teaching Scheme (Hours/Week)				Examination Scheme (Credits)				Min Marks	Max Marks
			L	T	P	To	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	Tot	Th	TW	Practical	Tot		
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	Tot	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**

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

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

Detailed Syllabus

Semester –I

1.Advanced Database Management System

Course Code:	
Theory: MTT403	Practical: MTP103
Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs/Week	Theory Paper: 4 Credits
Practical's: 2 Hrs/Week	Practical /Term Work: 1 Credit

Objectives:

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

Prerequisites: Basic concepts o DBMS & RDBMS at B.E. level.

Contents:

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..

Grading Policy:

Tests: I- 10%, **II** – 10%

Assignments/Homework: 20%

Final Examination: 60%

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

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

2.Distributed Operating System

Course Code:	
Theory: MTT401	Practical: MTP101
Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs/week	Theory Paper: 4 Credits
Practical's: 2 Hrs/week	Practical/Term Work: 1 Credit

Objective:

- This course covers general issues of design and implementation of distributed operating systems.

- 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.
- The Course also focuses on case studies of MACH and DCE, with full coverage of the most recent advances in the field.

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.

Prerequisites: Basic course on Operating System at B.E. level

Syllabus

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.

Lecture (60 lectures) (15 weeks)

Lecture	Topic	Readings
1 -4	Introduction	Ch. 1
5-8	RPC, Remote object invocation, Sun RPC	Ch. 1
9-12	Clock synchronization, Physical clocks, Lamport time stamp, distributed	Ch. 2
13-16	Mutual exclusion algorithms, deadlock, election algorithm. **Test 1**	Ch. 2
17-22	Naming entities, locating mobile entities, removing unreferenced entities, naming and securities, Case study: DCE Directory service.	Ch. 3
23-26	Design and implementation issues, non-uniform memory access architecture, distributed shared memory, implementation of DSM systems.	Ch. 3
27-32	Desirable features of a good global scheduling algorithm, load - balancing approach, load - sharing approach, static process scheduling with communication.	Ch. 4
33-36	File models, file accessing models, file sharing semantics, file caching semantics, case study: Sun network file system. **Test 2**	Ch. 4
37-42	Characteristics of multimedia data, quality of service management	Ch. 5
43-46	Resource management, stream adaption.	Ch. 5
47-52	Case Study	Ch. 5
53-58	Mach	

59-60	DCE **Final Exam**	

Grading Policy:
Test 1 10%
Test 2 10%
Assignments/ home work: 20%
Final Exam 60%

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.

3. MACHINE LEARNING

Course Code:	
Theory: MTT402	Practical: MTP102
Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs/Week	Theory Paper: 4 Credits
Practicals: 2 Hrs/Week	Practical/Term Work: 1 Credit

Objective

- 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.

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.

Prerequisites

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 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.

Lecture (60 lectures) (15 weeks)

lecture	Topic	Readings
1 -10	Introduction	(Mitshell Ch.01) (Ethem Ch.01),
11-21	Decision tree	(Ethem Ch.09)
22	**Test 1**	Unit 1,2
23-33	Clustering	(Ethem Ch.07), A. K. Jain
34-44	Support vector machines	(Bis Ch.07)
45	**Test 2**	Unit 3, 4
45-55	Genetic Algorithm	(Ethem Ch.15)
59-60	**Final Exam**	Unit 1-5

Grading Policy:

Test 1 10%
Test 2 10%
Assignments/ home work: 20%
Final Exam 60%

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***.

4. Advanced Computer Systems Architecture

Term and Course Credit: First semester 2012, 5 credit hours

Objective

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.

Text Book

J. L. Hennessy and D. A. Patterson, Computer Architecture: A Quantitative Approach, 4th Edition, Morgan Kaufmann Publishing Co., Menlo Park, CA. 2006. ISBN: 978-0-12-370490-0, ISBN10:0-12-370490-1

http://textbooks.elsevier.com/0123704901

References

o 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.

o Dezso Sima, Terence Fountain, Peter Kacsuk, Advanced Computer Architectures: A Design Space Approach,
Addison-Wesley, 1998. ISBN: 0-201-42291-3

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

Syllabus

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)

Lecture (60 lectures) (15 weeks)

lecture	Topic	Readings
1 -4	Introduction	Ch. 1;
5-8	Performance, Benchmarks, Measurements	Ch. 1
9-12	pipelining	Appeendix A; Read Appendix B;
13-16	Problems **Test 1**	
17-22	Instruction Set Design	Appendix A; Appendix B; ~docs/ (SimpleScalar)
23-26	Caches	Chapter 5
27-32	Memory	Chapter 5
33-36	ILP Dynamic **Test 2**	Chapter 2
37-42	Branch Predictors	Chapter 2
43-46	ILP, Static	
47-52	Simultaneous multithreading	Pentium 4
53-58	Vector processing	
59-60	Multiprocessors **Final Exam**	

Grading Policy:

Test 1 10%
Test 2 10%
Assignments/ home work : 20%
Test 3 60%

One project work using tools available in open source.
Some Links to be used in the course

- LaCASA: http://www.ece.uah.edu/~lacasa
- WWW Computer Architecture Home Page: http://www.cs.wisc.edu/~arch/www
  - Simulators, Benchmarks, Tools: http://www.cs.wisc.edu/arch/www/tools.html
- SimpleScalar resources:
  - Web page: http://www.simplescalar.com/
  - SimpleScalar Version 4.0 Test Releases: http://www.simplescalar.com/v4test.html
- Benchmarks:
  - MiBench Embedded Benchmark Suite: http://www.eecs.umich.edu/mibench/
  - SPEC http://www.spec.org/
- Tools for Performance Evaluation
  - Intel VTune Performance Analyzers (Windows, Linux): http://www.intel.com/software/products/vtune/
  - AMD Code Analyst Performance Analyzer (Windows, Linux): http://developer.amd.com/cawin.jsp
  - Performance Application Programming Interface: http://icl.cs.utk.edu/projects/papi/
  - Performance Inspector (Linux): http://perfinsp.sourceforge.net/
  - Perfmon2 - hardware-based performance monitoring interface for Linux: http://perfmon2.sourceforge.net/
  - Pin - A Dynamic Binary Instrumentation Tool: http://rogue.colorado.edu/Wikipin/index.php/Main_Page
  - ns2 - the network simulator: http://www.isi.edu/nsnam/ns/
- Other Intel Museum: http://www.intel.com/museum/

5. Remote Sensing

Course Code: T5MTT405	
Course Credit	
Theory : 4 Credits	Practical : 1 Credit
Total 5 Credits	

Course Description
Introducing technical issues behind the remotely sensed image acquisition and utilization 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.

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. Schow engerdt, 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.

Attendance

We believe that the attendance is the responsibility of the individual student. However, as rules and regulation stated by the university authority, Students are expected to attend class and to complete all assignments and lab practical's in

time. It has been my experience that failure to attend class, especially labs, is a major cause of poor performance in the class.

Learning 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 Content

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.

Semester –II

1.Advanced Algorithms

Course Code:	
Theory: MTT407	
Teaching Scheme:	**Examination Scheme:**
Lectures: 4 hrs/week	Theory Paper: 4 Credit

Course Outcomes:
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.

Prerequisites
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 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.

Lecture (60 lectures) (15 weeks)

lecture	Topic	Readings
1 -10	Unit1	Thomas H. Cormen
11-21	Unit2	Mark de Berg
22	**Test 1**	Unit 1,2
23-33	Unit3	Eric Bach
34-44	Unit 4	C. Xavier
45	**Test 2**	Unit 3, 4
45-55	Unit 5	Thomas H. Cormen
59-60	**Final Exam**	Unit 1-5

Grading Policy:

Test 1 10%
Test 2 10%
Assignments/ home work: 20%
Final Exam 60%

Text Book

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

References

6. Michael T. Goodrich and Roberto Tamassia, Algorithm Design Foundations, Analysis, and Internet Examples, John Wiley & Sons, Inc., 2nd Edition, 2009.
7. Gilles Brassard and Paul Bratley, Fundamentals of Algorithmics, Prentice Hall, 1996.
8. Parag Himanshu Dave, Himanshu Bhalchandra Dave, Design and Analysis of Algorithms, Pearson Education, 2008.
9. Computational Geometry: Algorithms and Applications,Third Edition (March 2008) Mark de Berg, TU Eindhoven (the Netherlands) ,Otfried Cheong, KAIST (Korea),Marc van Kreveld, Mark Overmars, Utrecht University (the Netherlands)

10. Algorithmic Number Theory, Volume 1,Efficient Algorithms By Eric Bach and Jeffrey Shallit,MIT Press
11. Introduction to Parallel Algorithms,C. Xavier, S. S. Iyengar,Wiley Press

Journal References:

3) ***International* Journal *of* Advanced Algorithms *and Complexity***
4) **Journal *of Discrete* Algorithms - *Elsevier***
5) **Journal of Mathematical Modeling and Algorithms**

2. Advanced Computer Networks

Course Code:	
Theory: MTT408	Practical: MTP111
Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs/Week	Theory Paper: 4 Credits
Practical's: 2 Hrs/Week	Practical /Term Work: 1 Credit

Objectives:

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.

Prerequisites: Basic concepts of Data Communication and Networking

Contents:

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

Grading Policy:

Tests: I- 10%, **II** – 10%

Assignments/Homework: 20%

Final Examination: 60%

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.

3. Data Mining

Theory Paper Code: MTT405 **Practical Code: MTP109**

Course Outcomes:

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.

Prerequisite:

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

Unit I **(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

Class Test I **(1 Hr)**

Unit II **(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 III **(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.

Class Test II **(1 Hr)**

Unit IV **(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 V: 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.

PROGRAM OUTCOMES (POs/PSOs):

M. Tech. in Computer Science and Engineering Graduates will have the ability to:

1. **Domain Knowledge:** An ability to apply the knowledge of mathematics, engineering fundamentals to the solution of problems in Computer Science and engineering.

2. **Problem Analysis:** An ability to apply identify, formulate, synthesize scholarly review research literature, and analyze complex Computing problems.

3. **Design/ Development of Solutions:** Capability to design Solutions for complex Computing problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct Investigations of Complex Problems:** To use research based knowledge and research methods including design and/or experiments, analysis and interpretation of data, and formulation of systematic information to provide valid conclusions.

5. **Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern technical and IT tools including prediction and modelling to complex Computing activities with clear understanding of limitations.

6. **Societal Responsibility:** Broad Understanding the impact of engineering in global, economic environment & social context. Apply reasoning informed by contextual knowledge to assess societal, health, safety legal and cultural issues and the consequent responsibilities relevant to professional Computer engineering practice.

7. **Environment and Sustainability:** Broad capability and understanding the impact of the professional Computer engineering solutions in environmental contexts, and apply knowledge of domain area for sustainable development.

8. **Ethics:** Ability to develop ethical principles and commit to professional ethics and responsibilities and norms of the Computer engineering practice.

9. **Individual and Team Work:** An ability to function effectively within multidisciplinary team and a team member of leader in diverse teams.

10. **Communication:** A fundamental capability in oral and written communication effectively on complex computer engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give/receive clear instructions.

11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and basic management principles and apply these to own work, as a member and leader in a team, to manage projects and multi-disciplinary environments.

12. **Life Long Learning:** Recognize the need for and have the ability to engage in independent and life-long learning in the broadest context of technological knowledge.

Grading Policy:

Tests: I- 10%, **II** – 10%
Assignments/Homework: 20%
Final Examination: 60%

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/

4. Geospatial technology

Course Code: MTT458 (Theory)	
Course Credit:	
Theory : 4 Credits	Practical : 1 Credit
Total 5 Credits	

Course Outcomes:

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

Course Contents (Theory)

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.

Geospatial technology

Practical: (code-MTP115)

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

Grading Policy:

Test 1 : ***10%***
Test 2 : ***10%***
Term Work : ***20%***
End Term : ***60%***

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.

Attendance:

We believe that the attendance is the responsibility of the individual student. However, as rules and regulation stated by the university authority, Students are expected to attend class and to complete all assignments and lab practical's in time. It has been my experience that failure to attend class, labs, is a major cause of poor performance in the class.

5.Image Processing and Pattern Recognition

Course Code:	
Theory: MTT406	**Practical:** MTP110
Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs/Week	Theory Paper: 4 Credits
Practicals: 2 Hrs/Week	Practical/Term Work: 1 Credit

Course Outcomes

- 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.

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

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

Reference books:

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

Lecture (60 lectures) (15 weeks)

lecture	Topic	Readings
1 -10	Unit1: Image Transform	(Essakrajan)
11-21	Wavelet based image processing	(Essakrajan, Gonzalez)
22	**Test 1**	Unit 1
23-33	Unit2: Segmentation in Video Data	(Moeslund Th.B)
34-40	Unit3: Introduction to Pattern Recognition	(Duda Hart)
41	**Test 2**	Unit 2,3
42-50	Unit4: Bayesian Decision Theory	(Duda Hart)
51-59	Unit5: Recognition of 2D & 3D objects	(Essakrajan)
50-60	**Final Exam**	Unit 1-5

Grading Policy:

Tests: I- 10%, **II** – 10%
Assignments/Homework: 20%
Final Examination: 60%

Journal References:

6) ***IEEE Transaction on Image Processing***
7) ***IEEE Transactions on Pattern Analysis and Machine Intelligence***.

6. Intellectual property Rights

Course Code:	
Theory: MTT111	
Teaching Scheme:	**Examination Scheme:**
Lectures: 1 Hr/Week	Theory Paper: 1 Credit

Objectives:

- To meet the needs of generalists as well as those who intend to specialize.
- 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.
- 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.

Prerequisites: Basic concepts of Indian law and American law

Contents:

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

Grading Policy:

Tests: I- 10%, **II** – 10%

Assignments/Homework: 20%

Final Examination: 60%

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.

ARTICULATION MATRIX for one program of your choice

1. **Program:** M.Tech. **Specialization:** Computer Science Engineering & Technology

(Choose only core courses)

Sr. No.	Sem	CourseTitle	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1	I	DBMS	✓	✓	✓									
2		OS	✓	✓										
3		ML	✓	✓	✓									
4		RS	✓	✓	✓				✓					
5		ACA	✓											
6	II	ACN	✓	✓										
7		DM	✓	✓										
8		GeoSpacial	✓	✓	✓				✓					
9		IPR						✓						
10		IPPR	✓	✓										
11		AA	✓	✓										
12	III	Seminar									✓	✓		
13		Dissertation			✓						✓	✓	✓	
14														
15	I	DBMS PR		✓	✓		✓	✓			✓			

16		OS PR												
17		ML PR		✓	✓		✓	✓			✓			
18		RS PR		✓	✓		✓	✓	✓					
19														
20	II	ACN PR					✓				✓			
21		DM PR		✓	✓		✓	✓			✓			
22		Geo PR		✓	✓		✓	✓	✓					
23		IPPR PR		✓	✓		✓							
24														
25	IV	Dissertation		✓	✓						✓	✓	✓	