ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

FOR

M. Tech (GEO INFORMATICS & SURVEYING TECHNOLOGY)
(with effect from 2012-2013)

Department of Civil Engineering
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
KUKATPALLY, HYDERABAD – 500 085.

ACADEMIC REGULATIONS 2009 FOR M.TECH (REGULAR) DEGREE COURSE

(Effective for the students admitted into first year from the academic year 2009-2010)

The M.Tech Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the program and fulfil all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS:

Admission to the above program shall be made subject to the eligibility, qualifications and specialization prescribed by the University from time to time.

Admissions shall be made on the basis of merit rank obtained by the qualifying candidate at an Entrance Test conducted by the University or on the basis of any other order of merit approved by the University, subject to reservations prescribed by the university from time to time.

2.0 AWARD OF M. TECH. DEGREE:

2.1 A student shall be declared eligible for the award of the M.Tech degree, if he pursues a course of study and completes it successfully for not less than two academic years and not more then four academic years.

2.2 A student, who fails to fulfil all the academic requirements for the award of the degree within four academic years from the year of his admission, shall forfeit his seat in M.Tech course.

2.3 The minimum instruction for each semester 90 clear instruction days.

3.0 A. COURSE OF STUDY:

The following specializations are offered at present for the M.Tech course of study.

1. Advanced Manufacturing Systems
2. Aerospace Engineering
3. Automation
4. Bio-Technology
5. CAD/CAM
6. Chemical Engineering
7. Communication Systems
8. Computer Networks
9. Computer Networks and Information Security
10. Computer Science
11. Computer Science and Engineering
12. Computers and Communication Engineering.
13. Control Engineering
14. Control Systems
15. Design for Manufacturing/ Design and Manufacturing
16. Digital Electronics and Communication Engineering.
17. Digital Electronics and Communication Systems
18. Digital Systems and Computer Electronics
19. Electrical Power Engineering
20. Electrical Power Systems
21. Electronics and Communication Engineering
22. Electronics & Instrumentation
23. Embedded Systems
24. Embedded Systems and VLSI Design
25. Geotechnical Engineering.
26. Heating Ventilation & Air Conditioning.
27. Highway Engineering
28. Image Processing
29. Industrial Engineering and Management

30. Information Technology
31. Machine Design
32. Mechatronics.
33. Neural Networks
34. Parallel Computing
35. Power and Industrial Drives
36. Power Electronics
37. Power Electronics and Electrical Drives
38. Power Engineering and Energy Systems
39. Power System Control and Automation
40. Power System with Emphasis H.V. Engineering / H.V. Engineering
41. Real Time Systems
42. Systems & Signal Processing
43. Software Engineering
44. Structural Engineering
45. Thermal Engineering.
46. VLSI
47. VLSI and Embedded Systems
48. VLSI Design
49. VLSI System Design
50. Web Technology
51. Wireless and Mobile Communication
52. Production Engineering.
53. Power Plant Engineering & Energy Management
54. Nano Technology
55. Geoinformatics and Surveying Technology
56. Engineering Design
57. Microwave & Radar Engineering
58. Environmental Engineering

and any other course as approved by the authorities of the University from time to time.

3.0 B. Departments officering M.Tech Programmes with specializations mentioned below:

ECE	Communication Systems
	Computers and Communication Engineering.
	Digital Electronics and Communication Engineering.
	Digital Electronics and Communication Systems
	Digital Systems and Computer Electronics
	Electronics and Communication Engineering
	Electronics & Instrumentation
	Embedded Systems
	Embedded Systems and VLSI Design
	Systems and Signal Processing
	VLSI
	VLSI and Embedded Systems
	VLSI Design
	VLSI System Design
	Wireless and Mobile Communication
	Microwave & Radar Engineering
CSE	Computer Networks
	Computer Networks and Information Security
	Computer Science
	Computer Science and Engineering
	Image Processing
	Information Technology

	Neural Networks
	Parallel Computing
	Real Time Systems
	Software Engineering
	Web Technology
ME	Advanced Manufacturing Systems
	Automation
	CAD/CAM
	Design for Manufacturing/ Design and Manufacturing
	Heating Ventilation & Air Conditioning.
	Industrial Engineering and Management
	Machine Design
	Mechatronics
	Thermal Engineering
	Production Engineering.
	Power Plant Engineering & Energy Management
	Engineering Design
EEE	Control Engineering.
	Control Systems
	Electrical Power Engineering
	Electrical Power Systems
	Power and Industrial Drives
	Power Electronics
	Power Electronics and Electrical Drives
	Power Engineering and Energy Systems
	Power System Control and Automation
	Power System with Emphasis H.V. Engineering/ H.V. Engineering
Civil Engg.	Geotechnical Engineering.
	Highway Engineering
	Structural Engineering
	Geo-informatics and Surveying Technology
	Environmental Engineering
Aeronautical Engg.	Aerospace Engineering
Bio-technology	Bio-Technology
Chemical Engg.	Chemical Engineering
Nano Technology	Nano Technology

4.0 ATTENDANCE:

The programs are offered on a unit basis with each subject being considered a unit.

4.1 A candidate shall be deemed to have eligibility to write end semester examinations in a subject if he has put in at least 75% of attendance in that subject.

4.2 Shortage of attendance up to 10% in any subject (i.e. 65% and above and below 75%) may be condoned by the College Academic Committee on genuine and valid reasons on representation by the candidate with supporting evidence.

4.3 A candidate shall get minimum required attendance at least in three (3) theory subjects in the present semester to get promoted to the next semester. In order to qualify for the award of the M.Tech. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

4.4 Shortage of attendance below 65% shall **in no case be condoned**.

4.5 A stipulated fee shall be payable towards condonation of shortage of attendance.

5.0 EVALUATION:

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Internal Evaluation and End Semester Examination.

5.1 For the theory subjects 60 marks shall be awarded based on the performance in the End Semester Examination, 40 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the better of the marks secured in the two Mid Term-Examinations conducted one in the middle of the Semester and the other immediately after the completion of instruction. Each mid term examination shall be conducted for a duration of 120 minutes with 4 questions to be answered out of 6 questions.

5.2 For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations, 40 marks shall be awarded based on the day-to-day performance as Internal Marks.

5.3 There shall be two seminar presentations during I year I semester and II Semesters. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the Department in a report form and shall make an oral presentation before the Departmental Committee. The Departmental Committee consists of Head of the Department, supervisor and two other senior faculty members of the department. For each Seminar there will be only internal evaluation of 50 marks. A candidate has to secure a minimum of 50% to be declared successful.

5.4 There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects he/she studies during the M.Tech course of study. The Comprehensive Viva-Voce is valued for 100 marks by the Committee. There are no internal marks for the Comprehensive viva-Voce

5.5 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

5.6 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.4) he has to reappear for the End Examination in that subject. A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and he has failed in the end examination. In such case candidate must re-register for the subject(s) and secure required minimum attendance. The attendance of re-registered subject(s) shall be calculated separately to decide upon the eligibility for writing the end examination in those subject(s). In the event of taking another chance, the internal marks and end examination marks obtained in the previous attempt are nullified.

Conditions to avail the benefit of Improvement of Internal Marks:

(i) The candidate should have completed the course work in the College.

(ii) The candidate should pass all the subjects for which the internal marks secured are more than 50%, before availing the benefit of Improvement of Internal Marks.

(iii) The candidate will be given only one chance for each subject for improvement of internal marks for a maximum of three subjects provided the internal marks secured are less than 50% in each subject and the candidate has failed in the end examination.

(iv) In the event of availing improvement of internal marks, the internal marks and the end examination marks, secured in the previous attempt are cancelled.

5.7 In case the candidate secures less than the required attendance in any subject(s), he shall not be permitted to appear for the End Examination in that subject(s). He shall re-register the subject when next offered.

5.8 Laboratory examination for M.Tech courses must be conducted with two Examiners, one of them being Laboratory Class Teacher and second examiner shall be other Laboratory Teacher.

6.0 EVALUATION OF PROJECT / DISSERTATION WORK:

Every candidate shall be required to submit thesis or dissertation after taking up a topic approved by the Project Review Committee.

6.1 A Project Review Committee (PRC) shall be constituted with Principal as chair person Heads of all the Departments which are offering the M.Tech programs and two other senior faculty members.

6.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects (theory and practical subjects).

6.3 After satisfying 6.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the Departmental Committee for its approval. Only after obtaining the approval of Departmental Committee the student can initiate the Project work.

6.4 If a candidate wishes to change his supervisor or topic of the project he can do so with approval of Departmental Committee. However, the Departmental Committee shall examine whether the change of topic/supervisor leads to a major change of his initial plans of project proposal. If so, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

6.5 A candidate shall submit status report (in a bound-form) in two stages at least with a gap of 3 months between them.

6.6 The work on the project shall be initiated in the beginning of the second year and the duration of the project is for two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the daft copy of thesis to the Principal (through Head of the Department) and shall make an oral presentation before the PRC.

6.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College / School / Institute.

6.8 The thesis shall be adjudicated by one examiner selected by the University. For this, Principal of the College shall submit a panel of 5 examiners, who are eminent in that field with the help of the concerned guide and head of the department.

6.9 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis, in the time frame as described by PRC. If the report of the examiner is unfavourable again, the thesis shall be summarily rejected.

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

    A. Excellent
    B. Good
    C. Satisfactory
    D. Unsatisfactory

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

If the report of the viva-voce is unsatisfactory, the candidate will retake the viva-voce examination after three months. If he fails to get a satisfactory report at the second viva-voce examination, he will not be eligible for the award of the degree.

7.0 AWARD OF DEGREE AND CLASS:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not less than 50%
Pass Class	Below 50% but not less than 40%

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

8.0   WITH-HOLDING OF RESULTS:

If the candidate has not paid any dues to the university or if any case of in-discipline is pending against him, the result of the candidate will be withheld and he will not be allowed into the next higher semester. The issue of the degree is liable to be withheld in such cases.

9.0   TRANSITORY REGULATIONS:

Candidate who have discontinued or have been detained for want of attendance or who have failed after having undergone the course are eligible for admission to the same or equivalent subjects as and when subjects are offered, subject to 5.5 and 2.0

10.0   GENERAL:

10.1   The academic regulations should be read as a whole for purpose of any interpretation.

10.2   In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

10.3   The University may change or amend the academic regulations and syllabus at any time and the changes and amendments made shall be applicable to all the students with effect from the date notified by the University.

10.4   Wherever the word he, him or his occur, it will also include she, her and hers.

10.5   There shall be no transfers within the constituent colleges of Jawaharlal Nehru Technological University.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical

	after the examination.	examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class-work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1.   Punishments to the candidates as per the above guidelines.
2.   Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
    (i)   A show cause notice shall be issued to the college.
    (ii)   Impose a suitable fine on the college.
    (iii)   Shifting the examination center from the college to another college for a specific period of not less than one year.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH (GEO INFORMATICS & SURVEYING TECHNOLOGY)
COURSE STRUCTURE AND SYLLABUS

I YEAR I SEMESTER

Code	Group	Subject	L	P	Credit
		Elements of Photogrammetry	3	0	3
		Digital Image Processing--I	3	0	3
		Introduction To Remote Sensing	3	0	3
		Fundamentals of GIS	3	0	3
		Surveying	3	0	3
	Elective –I	Web Technologies Internet GIS	3	0	3
	Lab	Digital Image Processing Lab	0	3	2
		Seminar	-	-	2
		Total Credits (6 Theory + 1 Lab.)			22

I YEAR II SEMESTER

Code	Group	Subject	L	P	Credit
		Digital Photogrammetry	3	0	3
		GIS Analysis and Applications	3	0	3
		Remote Sensing Applications	3	0	3
		GNSS Surveying	3	0	3
		GIS Project Planning & Management	3	0	3
	Elective -II	Digital Image Processing-II Advanced Geo Spatial Technology Remote Sensing and GIS for Environmental Engineering Remote Sensing and GIS for Urban Planning and Management	3	0	3
	Lab	GIS Lab	0	3	2
		Seminar	-	-	2
		Total Credits (6 Theory + 1 Lab.)			22

II YEAR   - I Semester

Code	Group	Subject	L	P	Credit
		Comprehensive Viva	-	-	2
		Project Seminar	0	3	2
		Project work	-	-	18
		Total Credits			22

II YEAR - II Semester

Code	Group	Subject	L	P	Credit
		Project work and Seminar	-	-	22
		Total Credits			22

ELEMENTS OF PHOTOGRAMMETRY

Unit I: Introduction to Photogrammetry & Vertical Photographs:
Definition of Photogrammetry - types of photographs, vertical aerial photographs, Geometry of vertical photographs, Scale of a vertical photograph over flat terrain, Scale of a Vertical photograph over variable terrain - average photo scale, methods of determining scale of vertical photographs, Ground coordinates from a vertical photograph, Relief Displacement, Flying height of a vertical photograph, Error evaluation.

Unit II: Stereoscopic Parallax:
Photographic "Flight-Line" Axes for Parallax Measurement – Monoscopic methods Parallax measurement – Principle of the Floating Mark – Stereoscopic methods of Parallax Measurement – Parallax equation – Elevations by parallax Differences – Approximate Equation for elevations from Parallax Differences – Measurement of Parallax Differences with Stereoscope& Parallax Bar- Parallax Correction Graph – Computing Flying Height and Air Base – Error Evaluation.

Unit III: Elementary Methods of Planimetric Mapping for GIS, Photomaps & Mosaics :
Planimetric Mapping by Direct Tracing – Planimetric Mapping with Reflection and Projection Instruments – Georeferencing of Digital Imagery – Planimetric Mapping Using a Tablet Digitizer – Heads-up Digitizing – Photomaps and mosaics, Kinds of mosaics, uncontrolled digital mosaics, semi controlled Digital mosaics and Controlled Digital Mosaics

Unit IV: Tilted Photographs:
Introduction, Angular Orientation in Tilt, Swing, and Azimuth, Auxiliary Tilted Photo coordinate system, Scale of a Tilted Photograph, Relief Displacement on a Tilted Photograph, Tilt Displacement, Angular Orientation in Omega, Phi and Kappa, Determining the elements of Exterior Orientation, Rectification of Tilted photographs, Geometry of Rectification, Analytical Rectification, Optical-Mechanical Rectification, Digital Rectification, Atmospheric Refraction in tilted aerial photographs.

Unit V: Stereoscopic Plotting Instruments:
Classification of stereoscopic Plotters **-** Direct optical projection Stereo plotters: components, Projection systems, Viewing systems, Measuring and tracing systems, Interior Orientation, Relative Orientation, Absolute Orientation, Analytical plotter: Introduction, System components and Methods of operations and its advantages. Project planning: Flight planning: Introduction, Photographic end lap and side lap, Purpose of the Photography, Photo Scale, Flying Height, Stereoscopic Plotter Considerations, Ground coverage, Weather conditions, Season of year, Flight Map, Specifications, Cost estimating and Scheduling.

TEXT BOOK:
   1. **Elements of Photogrammetry** by PAUL R. WOLF, 3rd edition, ISBN 007-123689-9
   2 Introduction to Modern Photogrammetry (Paperback) by Edward M. Mikhail, James S. Bethel

REFERENCE:
   1. **Manual of Photogrammetry – American Society of Photogrammetry** By ALBERT.D
   2. **Aerial Photographic Interpretation** by D. R. Lueder, McGraw-Hill Companies
   3. **Photogrammetry- Vol I** by Krauss, J., - Springler – Verlag Publications
   4. **Photogrammetry 3rd Edition by** Moffitt, Francis H. & Mikhail, Edward M., - Harper and Row Publishers.
   5. **Principles and Applications of Photo Geology** By SHIV PANDEY

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I YEAR -I SEM. M.Tech (GIST)

DIGITAL IMAGE PROCESSING-I

Unit I: Sensor, Satellite Data, and Data Model:
Satellite systems, Data acquisition & storage - Data formats - Data products.-Image display system.

Sensor model-Resolutions - Pixel characters - Image formation. The histogram and its significance-ENTROPY and its significance -Univariate & multivariate Image statistics – Spatial Statistics.

Unit II: Geometric Preprocessing:
Over view of Image Processing, Geometric distortion, Image registration, resampling, orthorectification – Image Mosaic.

Unit III: Image Enhancements:
Image characteristics- Spectral signatures .contrast enhancements- Image domain filtering. first order, second order ,directional filters , linear and non linear filters, Spatial enhancement, Multiband enhancements, ratioing, indices and Principal component analysis , Point, local and regional operators - Fourier transform-Fourier domain filtering, Ideal, Butterworth and Gaussian filters; scale-space transform, wavelet transform.

Unit IV: Information Extraction:
Classification algorithms**:** Non- parametric, parametric, Feature extraction, Un Supervised, training sets-Supervised methods and algorithms.
Accuracy Assessment: Sources of Classification Error, Interpretation of the Error Matrix. Measurement of Classification Accuracy

Unit V: Image Analyses :
Pattern recognition, boundary detection and representation, textural and contextual Analysis.

TEXT BOOKS:
1. John R.Jenson, .Introductory Digital Image Processing., Prentice Hall Series, 1996.
2. John A. Richards, Springer-Verlag, .Remote Sensing Digital Image Analysis. 1999.
3. Lillisand T.M and R.W.Kiefer (2004) 4th edition. Remote sensing and image interpretation, John Wiley & Sons, New York.
4. Rafael C.Gonzalez, .Digital Image Processing (2nd Edition)., Prentice Hall, 2002.
5. Remote sensing models and methods for Image processing. Schowengerdt 2nd edition
6. Remote Sensing: The Quantitative Approach, edited by Swain, P.H.and Davis, S.M. Mc Graw Hills.

REFERENCES
1. David L. Verbyla .Satellite Remote sensing of Natural Resource Management., Lewis publishers, Florida
2. Anil K. Jain .Fundamentals of Digital Image Processing. Prentice Hall Publications, USA.
3. Image Analysis, Classification and change Detection in Remote Sensing . Mortan J.Century Taylor and Francis, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I YEAR -I SEM. M.Tech (GIST)

INTRODUCTION TO REMOTE SENSING

Unit I: Fundamentals:
Definition – Scope – types- chronological development – Energy sources – Electro Magnetic Radiation

Energy interactions: Energy interaction in the atmosphere – atmospheric windows –energy interaction with earth surface features- spectral reflectance patterns for different regions of EMR. Factors affecting remote sensing Spectral signatures

Platforms: Types of Platforms – Ideal and real remote sensing system. Advantages and limitations of satellite remote sensing.

Unit II: Satellites and Sensors:
Satellite programs of the world - Geostationary satellites and its orbits: sensor characteristics and their applications. Remote Sensing Satellites : Coarse, Medium and High resolution Satellites - LANDSAT, SPOT, IRS, IKONOS , Quick bird, World View and other recent satellites – scanning and orbiting mechanisms – resolutions –Spatial – Spectral – Temporal - Radiometric - Image Interpretation elements.

Unit III: Thermal Remote Sensing:
Radiant flux – heat transfer – thermal infrared radiation – thermal properties of materials – emissivity of materials – thermal inertia of Earth surface features.
Thermal IR detection and imaging – characteristics of TIR images. Factors controlling IR Survey – applications.

Unit IV: Microwave Remote Sensing:
meaning – airborne radar system – SLAR – components, imaging system, wavelengths – range and azimuth resolution – real aperture and synthetic aperture systems, geometry of radar images - mosaics. image characteristics: wavelength, surface roughness, orientation, moisture content, polarization, look direction and look angle, physical properties, electrical properties: dielectric constant, topographic factors, layover, fore shadowing, radar shadow, corner reflection

Unit V: Hyper Spectral Remote Sensing:
Spectroscopy, Image cube, hyperian/HYSI, Spectral matching, Digital Spectral Data , Libraries, Application of Hyperspsectral data, MODIS

TEXT BOOKS:
1. Lillisand T.M and R.W.Kiefer (2004) 4th edition. Remote sensing and   image interpretation, John Wiley & Sons, New York.
2. JOHN R.JENSEN "Remote sensing for Environment "Pearson edition Pvt   Ltd, New Delhi.
3. Anji Reddy, M., (2001) Remote Sensing and Geographical Information Systems, 2nd edition, BS Publications, Hyderabad.
4. George Joseph,(2005) Fundamentals of Remote sensing 2nd edition , University press, Pvt, Ltd, Hyderabad .
5. Remote sensing by JAMES B.CAMPBEL published by Taylor & fancies Ltd.
6. Sabins F.F Jr Latest Remote Sensing: Principles and Interpretation, W.H.Freeman & Co., New York

REFERENCES:
1. Hayesm L., [1991] Introduction to Remote Sensing, Taylor and Fransis Publication, London.
2. Gibso, P., and Clare H.Power, [2000] Introductory Remote Sensing Principles and concepts, Routledge, 1st edition, London.
3. Henderson, F. M., and Anthony J. Lewis, 1998, Manual of Remote Sensing, Volume 2, Principles and Application of Imaging Radar, 3rd Edition, John Wiley and Sonc Inc, Canada, USA.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I YEAR -I SEM. M.Tech (GIST)

FUNDAMENTALS OF GIS

Unit I: Introduction to GIS & Data Structures:
 Spatial Elements, Spatial Measurement Level, Coordinates systems, Grids, projections , Spatial Location and Reference, Spatial Patterns, Geographic Data Collection, Populations and Sampling Schemes, Inferences from Samples.
Data Structures: Computer Database Structures for Managing Data, Hierarchical Data Structures, Network Systems, Database Management Systems, RDBMS, Relational Model – Structure, Relational algebra, Relational calculus, Commercial query languages, SQL, QUEL, Query by example.

Unit II: Types of GIS Data Models and Input Devices:
Graphic Representation of Entities and Attributes, GIS Data Models, Raster Models, Vector Models, Input Devices, Raster, Vector, Reference Frameworks and Transformation, Map Preparation and the Digitizing Process.

Unit III: GIS Data Input Methods and Data Storage and Editing: Methods of Vector Input, Method of Raster Input, Remote sensing, Raster Data Input, External Databases. - Storage of GIS Databases, Storing of Raster Data, Editing the GIS Database, Detecting and Editing Errors of Different Types, Entity Errors: Vector, Attribute Errors: Raster and Vector, Dealing with Projection Change, Edge Matching, Conflation and Rubber Sheeting, Templating.

Unit IV: Database Systems & Entity Relationship Model:
Definition, Purpose, Data abstraction, Instances and Schemes, Data independence, Introduction to DDL, DML, Database manager, Database administrator, Database users, Overall system structure.
Entity Relationship Model: Entities, Entity sets, Relationships, Relationship sets, Mapping constraints, Primary keys, E-R diagrams, Reduction of E-R diagrams to tables, Generalization, Aggregation.

Unit V: Concepts of Data Warehousing & ETL Architecture:
Basic concepts, Data warehouse Implementation Approach, Architecture – Data Acquisition – Extraction, Transformation and Loading- Data Mart, comparison of OLTP & DSS -Schemas, Dimension table – Facts- Different Scenarios

TEXT BOOKs:
1. **Fundamental of GIS** by MICHAEL N DEMERS – MN DEMERS, Published by John Wiley & Sons Inc
2. **Principles of GIS** by P.A. Burrough, Rachael Mc Donnell
3. **3. Principles of Geographical Information Systems for Land Resources Assessment** by P.A. Burrough
4. **Database System concepts** by HENRY F. KORTH, Abraham Siberschatz Mc Graw 1988
5. **Database Management Systems** by Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition.
6. **Data Warehousing, Data Mining & OLAP**, by Alex Berson and Stephen J.   Smith, "Tata McGraw – Hill Edition, Tenth Reprint 2007.

REFERENCES:
1. **Geographic Information System- An Introductory** – Jeffrey Star and John Estates – Pretence Hall Inc.
2. **Basic Readings in Geographic Information System –** Marble, D.F and Calkins, H.W – Spad Systems Ltd.
3. **Database Management Systems by P.Radha Krishna HI-TECH Publications 2005.**

SURVEYING

Unit I: Fundamentals of Surveying:
Principles of surveying, types of surveying, classification of surveys & maps, Plan Vs Map, Accuracy Vs Precision, sources and kinds of error; Least Squares adjustments and applications.

Unit II: Surveying & Levelling:
Chains: types, errors in chaining, chain triangulation, basic problems in chain surveying; Compass: types, designation of bearings, azimuth, bearing, relationship between bearings & azimuths. Plane table: instruments used for plane table survey, methods of plane tabling;

Leveling – definition, leveling instruments, methods of leveling (Dumpy level, Theodolite , Digital Level); Tacheometric surveying – principle, methods to determine horizontal distance, uses of Tachometric Surveying.

Unit III: EDM & Total Station:
Principle, instrument characteristics, accessories, operation, EDM without reflecting prisms; **Total Station –** types, instrument description, field techniques, Traversing, motorized total stations; field procedures for total stations in topographic surveys.

Unit IV: Topographical Surveying: Concepts and Techniques:
Definition, Procedure in topographic surveying , uses of topographical maps, Relief, methods of representing relief, contour and contour interval, characteristics of a contour, methods of locating contours, Interpolation of contours, Dam Surveys.

Unit V Project Planning I:
Systems of Co-ordinates, constitution of survey party, Planning, execution and completion of a topographical survey, Quality Vs Quantity. Case Studies.

TEXT BOOKS:
1. Text Book of Plane Surveying By David Clark Part I and Part II
2. Text Book of Surveying by Punmia Part I and Part II

REFERENCES:
1. Surveying and Leveling – Agor
2. Principles of Cartography – K. S. Singh

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I YEAR -I SEM. M.Tech (GIST)

WEB TECHNOLOGIES
(Elective-I)

Unit I: Introduction of HTML and XML:
Introduction to client server system, HTML 5 protocols: HTTP, SMTP, POP3, MIME, IMAP, and FTP. HTML- Common tags, List, Tables, Forms, Frames, Cascading StyleSheet (CSS), Introduction to XML, Comparative study of XML and HTMl, XML: Document Type Definition, Schema, Parsers (Dom and SAX).

Unit II: JavaScript:
Introduction to javascript, javascript objects, programming using java script if-else, switch, popup box, while loop, for loop, event handling.

Unit III: Introduction to Microsoft .NET framework:
Introduction to Microsoft .NET framework: arrays, operators, flow control statements, functions and properties, collection and generics. Getting started with ASP.NET – web forms, controls-web form validation, website navigation, enhancing websites using master pages.

Unit IV: State Management and Error handling:
Error handling, debugging and tracking ASP.NET, state management in ASP.NET application, web user control and custom web server control, globalization, web service protocols (SOAP, WSDL, DISCO, VDDI).

Unit V: .NET framework and web services:
Web services and .NET framework(exposing web services, consuming web services, .NET remoting, namespace, web service architecture), ADO.NET programming objects and architecture, connected model (command objects), disconnected model (data sets), introduction to LINQ.

TEXT BOOK:
Web programming, building Internet application, Chris Bates 2ⁿᵈ edition WILEY Dreamtech.

REFERENCES:
 1) **Pro ASP.Net 4 in C# 2010 by Mathew MacDonald, Adan Freeman   (paperback)**
 2) **Beginning ASP.net 4: in C# & VB (Wrox programer to programmes by Ima Spanjaars (paper back)**
 3) **An Introduction to Web design and programming, Wang, Thomson**

INTERNET GIS
(Elective-I)

Unit I: Introduction to Distributed Internet GIS:
Introduction, Distributed GIS – Basic components, Applications. Networking**:** Network environment protocols, TCP/IP, LAN, WAN, Data exchange b/w 2 terminals.

Unit II: Client/Server Computing:
Client, server, glue, client-server system partition, 2-tier, 3-tier & n-tier architectures, advantages & disadvantages of client-server architecture.

Unit III: Distributed Component Framework:
DCOM and .NET, DCOM Architecture and Interface, Advantages & disadvantages of DCOM, CORBA, CORBA Architecture and Interface, advantages & disadvantages CORBA.

Unit IV: Web Services in GIS Domain :
Interoperability in GIS, OGC and its specifications, OGC specifications for GIS web services (WMS, WFS, WCS, WPS, SLD etc) Google Earth, KML Virtual Earth & Bhuvan.

Unit V: Web mapping: Static map publishing, clickable maps, architecture of static web publishing, web mapping architecture
Client -HTML viewer, HTTP server with CGI, Map server & other server, side applications, Web-Mapping options & objects, Web mapping applications.

TEXT BOOK
Internet GIS – "Distributed Geographic Information Services For Internet And Wireless Networks" – by Zhong-ren peng and Ming- Hsiang Tsou

DIGITAL IMAGE PROCESSING LABORATORY

1. Reading and Displaying Satellite Data from BIL, BSQ and BIP formats

2. Generation of False Color Composite (FCC)

3. Geo referencing the base map / image

4. Geometric correction of satellite image

5. Extracting area of Interest and Mosaicing.

6. Enhancement using Band ratio and NDVI

7. Enhancement using different Filtering techniques

8. Principal Component Analysis (PCA)

9. Image Fusion Techniques

10. Fourier Analysis

11. Unsupervised Classification

12. Supervised Classification & accuracy assessments

13. Change detection

14. Aerial Traingulation & Ortho rectification with LPS.

DIGITAL PHOTOGRAMMETRY

Unit I: INTRODUCTION & DIGITAL PHOTOGRAMMETRIC WORK STATIONS:

Definition of Digital Photogrammetry & Its Development, Comparison between Three Phases of Photogrammetry (Analogue, Analytical and Digital) Advantages of Digital Photogrammetry

Hardware & Software Components of DPWS, Various Inputs for Digital Photogrammetry: Control Point selection, Scanned Photo, Digital Photographs, Remote Sensing Imagery

Photogrammetric Scanners: Principle of Image Scanning, Configuration of Scanners, Method of Scanning, File Format and Size.

Unit II: IMAGE MEASUREMENTS & THEIR REFINEMENT:

Introduction to Coordinate Systems And Image Measurements, Simple Scales for Photographic measurements, Measuring Photo Coordinates with Simple Scales, Trilaterative method of Photo Coordinate Measurement, Measurement of Photo Coordinates with Tablet Digitizers, Mono Comparator measurement of Photo Coordinates.

Refinement of Measured Image Coordinates: Distortions of Photographic Films and Paper, Shrinkage Correction, Lens Distortions Corrections, Atmospheric Refraction Correction, Earth Curvature Correction, Reduction of Coordinates to an Origin at the Principal Point.

Unit III : ORIENTATION PROCEDURES IN DIGITAL PHOTOGRAMMETRY:

Inner orientation (IO), Mathematical transformations, Epipolar geometry, Exterior Orientation (EO), Auto Tie Point Generation, Digital Image Matching Process: Area Based, Feature and Relation Based, Collinearity Condition

Space Resection Method, Space Intersection, Aerial Triangulation and Bundle Block Adjustment, Use Of GPS And IMU in Digital Photogrammetry

Unit IV : 3D VISUALIZATION & STEREO-COMPILATION:

Principle and Method of 3d Visualization: Anaglyph Polarized and Hybrid Techniques, Feature Extraction, Feature Coding, Data Model and Feature Class.

Definition DEM, DTM, DSM, Various Inputs to DEM/DTM, DTM Specification And Accuracy, Application of DTM, Various Interpolation Techniques: Grid, TIN, Break Lines, Mass Points, Digital Orthophoto Generation (Pre-processing, Main processing, Post processing) and its uses.

UNIT V : AIR BORNE LASER TERRAIN MAPPING (LiDAR):

Introduction to Laser Ranging, Principle of LiDAR, System Components, Range Measurements, LiDAR Error Sources, Accuracy, Applications & Advantages of ALTM.

TEXT BOOKS:

1. Elements of Photogrammetry with application in GIS (3rd edition)- Paul R. Wolf & bon A. Dewitt, McGraw Hill.
2. Digital Photogrammetry by Karl Krauss
3. Introduction to Modern Photogrammetry (Paperback)by Edward M. Mikhail, James S. Bethel

REFERENCE BOOKS:

1. Manual of Photogrammetry – American society of Photogrammetry & R.S by Albert.D
2. Photogrammetry by Francis H. Moffitt, Edward M. Mikhail.
3. Modern Photogrammetry – Deward M. Midhail.
4. Photogrammetry Vol-I by – Drauss J, Springler- Verlag publication.
5. Digital Photogrammetry by –Michel Kasser & Yves. Egels.
6. Geographic information systems an introduction by Bernhardsen, 3rd edition.

GIS ANALYSIS & APPLICATIONS

Unit I: Spatial analysis & Arrangements:
Spatial analysis**:** Introduction, Analysis framework, defining spatial characteristics, working with higher level objects, measuring polygons, measuring shape, measuring distance
Spatial Arrangements: Point patterns, Thiessen Polygons, Area patterns, linear patterns, Directionality and continuity of linear and aerial objects, Gravity model, Routing and Allocation, missing variables, Overlay and types

Unit II: Statistical surfaces and classification:
Surfaces, surface mapping, sampling the statistical surface, DEM, Raster interpolation- methods, Uses, Weighted Analysis, Classification Principles, Reclassification Elements, Neighborhood Functions, Polygonal Neighborhoods, Buffers

Unit III: Natural Resource Applications:
Forest management - Forestry: Resource Inventory, Forest Fire Growth modeling – Wild life management.
Land: Land use Planning, Watershed Management studies – Water - Identification of Ground Water Recharge - Resource Information System.

Unit IV: LIS, Utilities & LBS Applications:
LIS: Land Information System (LIS) - Tax mapping - Other LIS applications.
Utilities applications: Water - Electric & Telecommunication.
LBS: Location Based Services Applications: Vehicle Tracking: Automatic Vehicle Location (AVL) - Components of AVL: In Vehicle Equipment, Various Communication Channel, Web Server, Client - Vehicle Tracking - Alarms used in Vehicle Tracking, Fleet Management - Vehicle Navigation - Emergency Call: Address Geocoding, Distress Call Application

Unit V: **Health & Environment Applications:**
Health applications: Disease Surveillance, Health Information System - 3D GIS.
Environment: Planning & Policy - Water Pollution - Air Pollution –Noise Pollution -Climate Change.

References:
1. Laura Lang, Managing Natural Resources with GIS, ESRI Press,1998.
2. Uzair M.Shamsi, U.M.Shamsi GIS Tools for Water, Wastewater and Stormwater Systems, Asce Press, 2002.
3. Alan L., MD Melnick, Introduction to Geographic Information Systems for Public Health, Aspen Publishers, 1st Edition,2002.
4. Amim Hammad, Hassan karimi, Telegeoinformatics: Location-based Computing and Services, CRC Press, 1st Edition,2004.
5. Paul A Longley, Michael F Goodchild, David J Maguire, David W Rhind, Geographical Information Systems, Volume I and II, John Wiley and Sons, Inc., 1999
6. Van Dijk M.G.Bos, GIS and Remote Sensing Techniques in Land-And-Water_Management, Kluwer Academic Publishers, 2001
7. Laura Lang, GIS for Health Organizations, ESRI Press, 2000
8. Lisa Godin, GIS in Telecommunications Management, ESRI Press, 1st Edition, 2001.

REMOTE SENSING APPLICATIONS

Unit I: Forest & Water Applications:
Forests – Forest type classification using multispectral data and density mapping. Forest stock mapping. Forest change detection. Forest fire detection and burned area mapping and fire vulnerability assessment. Applications of Laser in vegetation studies – Aerial and terrestrial.
Water –Surface water resources assessment and management, Reservoir sedimentation. Performance evaluation of command areas. Integrated watershed development, water quality monitoring and mapping. Wetland mapping. Snow and Glaciers: Snow Cover Mapping, Glacier Mapping, Forecasting snow melt runoff.

Unit II: Soil & Agriculture Applications:
Soils– Soil mapping including generation of derivative maps like land capability, land irrigability and suitability for specific purpose. Land degradation mapping and monitoring, Soil erosion assessment and modeling, Soil moisture estimation using thermal and microwave data.
Agriculture- Crop inventory and acreage estimation. Crop yield modeling – Crop production forecasting- FASAL program. Vegetation Indices- Crop condition assessment, Precision Agriculture– Real-time crop monitoring.

Unit III: Urban Applications:
Concepts of Urban and Regional planning and its applications, urban services and network planning, Urban landuse planning Urban growth /Sprawl; Slum detection, monitoring and updating, Study of Transportation Systems.

Unit IV: Environmental Studies:
Remote Sensing satellites for environmental Studies- an Overview; Environmental Policy- Legislation on water, air, noise, environmental protection act with special reference to legislation in India. Environmental Impact Assessment- an overview concepts, strategies, & methodologies.

Unit V: Disaster Management-, Types of disasters – earthquakes and Tsunamis – volcanoes – landslides. Use of GIS in Risk Assessment, Mitigation & Preparedness.

TEXT BOOKS:
1. Lillisand T.M and R.W.Kiefer (2004) 4th edition. Remote sensing and image interpretation, John Wiley & Sons, New York.
2. JOHN R.JENSEN "Remote sensing for Environment" Pearson edition Pvt Ltd, New Delhi.
3. Anji Reddy, M., (2001) Remote Sensing and Geographical Information Systems, 2nd edition, BS Publications, Hyderabad.
4. George Joseph,(2005) Fundamentals of Remote sensing 2nd edition , University press, Pvt, Ltd, Hyderabad .
5. Remote sensing by JAMES B.CAMPBEL published by Taylor & fancies Ltd.
6. Sabins F.F Jr Latest Remote Sensing: Principles and Interpretation, W.H.Freeman & Co., New York.
7. Nyle C. Brady, Nature and Properties of Soils 9th Edition Eurasia Publishing House (P) Ltd., New Delhi.
8. Ravi P. Gupta, 2003, Remote Sensing Geology. Springer-Verlag Berlin, Heidelberg, Germany.

REFERENCES:

1. American Society of Photogrammetry, (Latest edition). Manual of Remote Sensing , ASP, Fall church, Virgina.
2. Barett, E.C.,[1990] Satellite Remote Sensing for Hydrology and Water Management, Garden and Breach Science Publications, Switzerland.
3. Buiter, H.J., and Jan G.P.W. Clevers, [1999].Land Observation by Remote Sensing, Taylor and Francis, 1999, London.
4. Skidmore, A., and Hendrik Prins (Editors),[2002] Environmental Modelling with GIS and Remote Sensing, Taylor and Francis Ltd., 2 nd Edition, London.
5. Alexey Bunkin and Konstantin Voliak, Laser Remote Sensing of the Ocean, John Wiley and Sons. 2001, Canada.

WEBSITES

ww2010.atmos.uiuc.edu/(Gh)/guides/rs/sat/goes/home.rxml
www.ccrs.nrcan.gc.ca/ccrs/misc/issues/hazards_e.html#spills
www.crisp.nus.edu.sg/~research/research/forest/forest.html
www.cr.usgs.gov/earthshots/slow/tableofontents
www.indiana.edu/~climate/336/rsdata.html
www.nrsa.gov.in/engnrsa./spacesolutions/index.html
www.unn.ac.uk/~evgpl/eog/rsguide/rsguide.htm
www. terraweb.wr.usgs.gov/coastal.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I YEAR -II SEM. M.Tech (GIST)

GNSS SURVEYING

UNIT I Basics
Definition - Fundamental goals of Geodesy - Definitions - basic concepts - Historical perspective - development applications in Satellite Geodesy - Geoid and Ellipsoid satellite orbital motion - Keplerian motion - Kepler"s Law - Perturbing forces - Geodetic satellite

UNIT II Different Techniques
Determination of direction by photography - SECOR - Electronic observation techniques - Doppler effect - Positioning concept - Development of TRANSIT satellites.

UNIT III Satellite System
GPS - Different segments - space control and user segments - satellite configuration - GPS signal structure - Orbit determination and Orbit representation Anti Spoofing and Selective Availability - Task of control segment - GPS receivers - main receiver components - Example of GPS receivers.

UNIT IV GPS Data Processing
GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation - data processing - software modules - solutions of cycle slips ambiguities RINEX format. Concepts of rapid static methods with GPS semi kinematic and pure kinematic methods - basic constellation of satellite geometry & accuracy measures.

UNIT V Applications of Satellite Geodesy
Geodetic control surveys, Cadastral surveying, Photogrammetry & Remote Sensing, Engineering applications and Monitoring - GIS. GLONASS , GALILEO, COMPASS and IRNSS satellite configuration comparison - Satellite Laser Ranging & Applications - Concepts of satellite altimetry.

TEXTBOOKS:
1. **Satellite Geodesy** by GUNTER SEEBER, Copy Right 2003 by WALTER DE GRUYTER 1993, ISBN: 3-11-017549-5.
2. **Global Positioning System – Theory and Practice –** Hofmann W.B, Lichtenegger. H, Collins. J – Springer Verlag Wein, New York.-2008
3. **"GPS Satellite Surveying",** Alfred Leick 3rd Edition, John Wiley and Sons 2004.

REFERENCES:
1. Global Navigation Satellite Systems by G. S. Rao 2010 Tata McGraw Hill Education Pvt Ltd.
2. **"GPS Theory, Algorithms and Applications** .Guocheng Xu," Springer-Verlag, 2003.

GIS PROJECT PLANNING & MANAGEMENT

Unit I: GIS Project Management Process:
Project phases and Project life cycle, project stakeholders, system development lifecycle, Software development models, Project initiation, systems planning and methodology, systems analysis and user requirements studies, GIS software evaluation and selection, Hardware considerations and acquisition, Geographic database design – conceptual, logical, and physical data modeling, planning and database issues - screening of project ideas, selection of project based on techno-economic feasibility analysis.

Unit II: Geo-informatics Project Planning:
Government Geo-informatics projects, Corporate or Enterprise GIS, Health GIS, Census GIS, GIS Market/Business, GIS Strategic Plan, Needs Assessment and Requirements Analysis, Organizational Involvement, Evaluating Existing Data, Accuracy, Completeness. Maintenance, Software and hardware Selection, Technical Environment, Assessing Costs and Benefits, Pulling the needs and ends together.

Unit III: Project Scope Cost & Quality Management:
Scope: Scope-Project scope definition, Creation of WBS, Scope verification, Scope change control.
Costs : Elements of cost, costing techniques, resources planning, cost components of a geo -informatics project- men, Hardware and software costs, cost of Remote Sensed Data /Imageries, Maintenance cost, organizational cost, service charges, outsourcing cost, pricing the product / service. Cost budgeting.
Quality: Quality Planning, Quality Assurance and Quality Control.

Unit IV: Project Appraisal and Scheduling:
Project Appraisal - Project appraisal Methods -Discounting and non discounting techniques, Benefit Cost Ratio, Break Even Point Analysis, Cost and Return simulation, return on investment.
Project scheduling- network analysis, PERT and CPM techniques, Gant chart, time and cost crashing. Project cost and time control, feed back mechanisms, quality control / quality assurance. Data standards, interoperability, ISO standards.

Unit V: Trends in GIS and Risk Management:
Enterprise GIS, Corporate GIS, BPO in GIS, Spatial Data Warehouse, Interoperability and Open GIS, NSDI.
Risk management planning, project risk identification, quantitative and qualitative risk analysis, risk response planning, risk monitoring and control.

REFERENCE BOOKS:
1. A guide to the Project Management Body of Knowledge -2000 edition, Project Management Institute, USA
2. The Design and Implementation of Geographic Information Systems, John E. Harmon, Steven J. Anderson by Wiley Publishers ISBN: 0-471-20488-9
3. Geographic Information Systems, abridged by Paul A Longley, Michael F Goodchild, David J.
4. Maguire, and David W. Rhind, second edition, 2005
5. Project Management using PERT / CPM – Weist & Levy, PHI
6. Concepts and Techniques of Geographic Information System by C P Lo Albert K W Yeung, 2002, EEEPrantice Hall of India Private Ltd.
7. Project Management PERT / CPM & Precedence Diagramming Moder, Philip, Galgotia
8. UNIDO Guide to Project Appraisal

DIGITAL IMAGE PROCESSING-II
(Elective-II)

Unit – I: Image Resolution:
Correction and calibrations- Noise Reduction – Global, Local and Periodic, radiometric calibrations, Senor Calibrations, Atmospheric Correction, Topographic Correction.

Unit -II: Advance Enhancement:
Advanced Enhancement Techniques. PCA, Tasseled Cap Transformation, MNF Transformation, Independent Component Analysis. Color Transformation – RGB to IHS, Natural Color Transformation. Data Fusion Techniques: IHS, Multiplicative, Brovey and Wavelet Based Transformation.

Unit – III: Image Compression Techniques:
Data compression: Methods- lossless & Lossy –Techniques- DFT, wavelet, JPEG, Cosine transformations.

Unit – IV: Classifications:
Parametric & Non Parametric- Training sets Statistics, Minimum distance to mean**,** Maximum Likelyhood, ANN, Weight Vector, Support Vector Machine, Decision Tree Approach, Concepts of hierarchical decision tree for Multi Temporal data, GLCM & Texture based classifiers. Sub pixel classifiers: Fuzzy Classification.
K Mean, ISO Data, Fuzzy K Means, Fuzzy ML Classifiers, Expert and Artificial Intelligence Based Systems, Mathematical Morphology.

Unit – V: Hyper Spectral Image & Change Detection Analysis:
Data Visualization, Dimensional Reduction, Feature Extraction – Characteristic, Pixel Purity Index, Hyper Spectral Mapping Methods: - SAM, Spectral Feature Filtering, Spectral Unmixing.
Change Detection: Nature of Change Detection, Introduction to Change Detection algorithms. Post Classification- Comparision, Ratioing, Vegetative Indices, Change Vector Analysis.

TEXT BOOKS:
1. John R.Jenson, "Introductory Digital Image Processing", Prentice Hall Series, 1996.
2. John A.Richards, Springer-Verlag, "Remote Sensing Digital Image Analysis" 1999.
3. Rafael C.Gonzalez, "Digital Image Processing (2nd Edition)", Prentice Hall, 2002.
4. Remote sensing models and methods for Image processing – Schowengerdt 2nd edition
5. Anil K. Jain "Fundamentals of Digital Image Processing" Prentice Hall Publications, USA.

REFERENCES
1. David L. Verbyla "Satellite Remote sensing of Natural Resource Management", Lewis publishers, Florida
2. Image Analysis, Classification and change Detection in Remote Sensing – Mortan J.Century ,Taylor and Francis, 2007.

ADVANCED GEOSPATIAL TECHNOLOGY
(Elective-II)

Unit-I: Introduction to Web and Internet GIS:
Distributed Geospatial Services, Server side Internet GIS, Client side Internet GIS and different web GIS architectures, evolution of web mapping.

Unit-II: Centralized and Distributed Web GIS Application Framework:
Introduction to centralized, distributed, enterprise and mobile GIS applications, database servers in enterprise environment, web service framework, XML, SOAP and other web service standards .

Unit -III: Web Services in GIS Domain:
Interoperability in GIS, OGC and its specifications, OGC specifications for GIS web services (WMS, WFS, WCS, WPS, SLD etc)
GIS Servers –commercial (Arc GIS Server) and open source (UMN Map Server, Geo-server), OGC GML and metadata standards, Quality of web GIS Service and Security issues in Distributed GIS.

Unit-IV: Web mapping application development tools:
Introduction to HTML, JavaScript, PHP, .Net framework for web applications, web GIS API (Open Layer or Arc GIS), EPSG and Proj4 libraries, XML and GML schema creation, OGC web service publishing and consuming (WMS, WFS and WCS), SLD creation.
Data querying, processing and analysis in multi-user environment, introduction to AJAX, Web 2.0, 3D web geo-visualizations and Semantic web service. Data security, performance tuning for web mapping application.

Unit-V: Web Mapping Services & Open Source GIS Software:
Spatial data infrastructure- NSDI, Distributed geo-processing, spatial decision analysis in web GIS environment, OGC WPS, Symantec web
Architectures and Database connections, GRASS, POST GRE SQL, JUMP, etc.

SUGGESTED BOOKS:
1. Network GIS- Yang, Chaowei, Wong, David W.S., Kafatos, Menas, ISBN: 978-3-540-36768-0.
2. Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Networks- Zhong-Ren Peng and Ming-Hsiang Tsou John Wiley and Son Inc.
3. Distributed GIS- Frederic P. Miller, Agnes F. Vandome and John McBrewster, ISBN: 6130275595.

Online resources available in Internet on suggested topic, published research papers, articles and technical manuals, Wikipedia- the free encyclopedia.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I YEAR -II SEM. M.Tech (GIST)

REMOTE SENSING AND GIS FOR ENVIRONMENTAL ENGINEERING
(Elective-II)

UNIT I: **Remote Sensing Applications to Environmental Studies**
Introduction, Environmental satellites GEOS, NOAA, AVHRR, CZCR Monitoring land, water, atmosphere and ocean using Remote Sensing Data, case studies.

UNIT II: **Soil Degradation Study**
Taxonomical classification of soils, soil survey interpretation and mapping, impact of agricultural and industrial activity on soil properties. Soil salinity/alkalinity, erosion studies, Applications of GIS in assessing soil salinity, erosion productivity etc.

UNIT III: Water Quality and Ground Water Pollution
Classification of water quality for various purposes. Data base creation and quality modeling using GIS. Database Creation and maintaining water supply network, sewerage network using GIS. Case studies. Aquifer Vulnerability Intrinsic and specific Vulnerability, DRASTIC, SINTACS MODELS MODFLOW, MT3D, contaminant transport model. Case studies using AHP techniques.

UNIT IV: Air Quality Modeling
Atmosphere: Chemicals, Particulate matters present in the atmosphere, allowable limits, Remote Sensing technique to monitor atmosphere constituents, air pollution due to industrial activity, modeling using GIS. Case Studies.

UNIT V: **Environmental Management**
Revenue management-environment and ecological concerns- Resource development in remote areas-Impacts of anthropogenic activity- Solid Waste management- Carbon footprints and sinks, carbon trading, carbon credits and marketing, Indian and international status

TEXT BOOKS & REFERENCES:
1. Ian L.Pepper, charles P.Gerbaand Mark L.Brusseau, Environmental and pollution science 2006.
2. Savigny.D De and Wijeyaratne .P GIS for Health and Environment, Stylus publication, 1994.
3. Reger D.Griffin, Air Quality Assessment andMmanagement (second edition), 2006.
4. Donald L.Wise, Remediation for Hazardous waste contaminated soils 1994.
5. Integrated Solid Waste Management Techobanoglous George, Hilary Theisen, Samuel Vigi,Mc Graw – Hill Inc, Singapore. 1993.
6. Michele Campagna, GIS for sustainable development, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I YEAR -II SEM. M.Tech (GIST)

REMOTE SENSING AND GIS FOR URBAN PLANNING AND MANAGEMENT
(Elective-II)

UNIT I : INTRODUCTION
Remote sensing for detection of urban features – Scale and resolution – Scope and limitations – Interpretation from Aerial and satellite images – Digital image processing techniques – Image fusion.

UNIT II: SETTLEMENT MAPPING
Classification and settlement – settlement structure – Segmentation of Built-up areas – Classification algorithms – Land use/ Land cover mapping – change detection – high resolution remote sensing.

UNIT III: ANALYSIS AND PLANNING
Urban morphology – Housing typology – Population estimation from remote sensing – Infrastructure demand analysis – Urban renewal Land suitability analysis – Plan formulation – Regional, Master and detailed development – Use of remote sensing and GIS in plan preparation – Urban information system – Web GIS .

UNIT IV: TRANSPORTATION PLANNING
Mapping transportation network – Classification – Optimum route/ shortest route – Alignment planning – Traffic and parking studies – Accident analysis.

UNIT V : CURRENT TRENDS
Urban growth modeling – Expert systems in planning – 3D city models – ALTM – Land use Transportation interaction models – Intelligent transportation systems .

TEXT BOOKS & REFERENCES :
1.   Juliana Maantay, John Ziegler, John Pickles, GIS for the Urban Environment, Esri Press 2006.
2.   Allan Brimicombe, GIS Environmental Modeling and Engineering, CRC; 1 edition 2003.
3.   Paul Longley, Michael Batty, Spatial Analysis: Modeling in a GIS Environment Wiley,1997.
4.   Michael F. Goodchild, Louis T. Steyaert , Bradley O. Parks, Carol Johnston, David Maidment, Michael Crane , Sandi Glendinning, GIS and Environmental Modeling: Progress and Research Issues (Hardcover) by,Publisher: Wiley; 1 edition, 1996.
5.   Roland Fletcher, The Limits of Settlement Growth: A Theoretical Outline (New

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I YEAR -II SEM. M.Tech (GIST)

GIS LAB

1. Map Scanning & Geo referencing
2. Map Reading: Topomap, Satellite Image, Aerial Photos, Watershed Atlas
3. Image Interpretation for base map preparation
4. Preparation of Drainage Maps
5. Preparation of Slope maps
6. Preparation of Watershed Maps
7. Preparation of Land Use/Land Cover Maps
8. Change Detection and Map updation.
9. Hands on pocket and Mirror Stereoscope.
10. Surveying with Total Station, GPS & DGPS