ACADEMIC REGULATIONS PROGRAM STRUCTURE and DETAILED SYLLABUS

Bachelor of Technology
(Civil Engineering)

(Effective for the students admitted from the Academic Year 2014-15)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Gokaraju Rangaraju
Institute of Engineering and Technology, Hyderabad
Department of Civil Engineering(B.Tech)
GR14 Regulations

Gokaraju Rangaraju Institute of Engineering &Technology 2014 Regulations (GR14 Regulations) are given hereunder. These regulations govern the programmes offered by the Department of Civil Engineering with effect from the students admitted to the programmes in 2014-15 academic year.

1. **Programme Offered:** The programme offered by the Department is B.Tech in Civil Engineering, a four-year regular programme.

2. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.

3. **Admissions:** Admission to the B.Tech in Civil Engineering shall be made subject to the eligibility, qualifications and specialization prescribed by the State Government/University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the Government/University or on the basis of any other order of merit approved by the Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. **Programme Pattern:**
    a) Each Academic year of study is divided into two semesters.
    b) Minimum number of instruction days in each semester is 90.
    c) The total credits for the Programme is 200.
    d) All the registered credits will be considered for the calculation of the final percentage of marks.

5. **Award of B.Tech Degree:** A student will be declared eligible for the award of B.Tech Degree if he/she fulfills the following academic requirements:
    a) A student shall be declared eligible for the award of B.Tech degree, if he/she pursues the course of study and completes it successfully in not less than four academic years and not more than eight academic years.
    b) A student has to register for all 200 credits and secure all credits.
    c) A student, who fails to fulfill all the academic requirements for the award of the degree within eight academic years from the date of admission, shall forfeit his/her seat in B.Tech course.

d) The degree of B.Tech in Civil Engineering shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the requirements for the award of the degree.

6. **Attendance Requirements:**
   a) A student shall be eligible to appear for the semester-end examinations if he/she puts in a minimum of 75% of attendance in aggregate in all the courses concerned in the semester.
   b) Condonation of shortage of attendance in aggregate up to 10% (65% and above but less than 75%) in a semester may be granted. A committee headed by Dean, Academic Affairs shall be the deciding authority for granting the condonation.
   c) Students who have been granted condonation shall pay a fee as decided by the Academic Council.
   d) Shortage of Attendance more than 10% (attendance less than 65% in aggregate) shall in no case be condoned.
   e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. They may seek re-registration for that semester when offered next with the academic regulations of the batch into which he/she gets re-registered.

7. **Paper Setting, Evaluation of Answer Scripts, Marks and Assessment:**
   a) Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Academic Council from time to time.
   b) Distribution and Weightage of Marks

S.No.		End exams (External)	Internal	Total
1	Theory	70	30	100
2	Practical	50	25	75
3	Engineering Graphics	70	30	100
4	Industry Mini Project	50	25	75
5	Comprehensive Viva	100	-	100
6	Seminar	-	50	50
7	Project	150	50	200

c) Continuous Internal Evaluation and Semester End Examinations
The assessment of the student's performance in each course will be based on continuous internal evaluation and semester-end examinations. The marks for each of the component of assessment are fixed as shown in the following Table.

Assessment Procedure

S.No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Theory	30	Internal Exams & Continuous Evaluation	1) Two mid semester examinations shall be conducted for 20 marks each for duration of 2 hours. Average of the two mid exams shall be considered i) Subjective - 15 marks ii) Objective - 5 marks 2) Tutorials - 5 marks 3) Attendance - 5 marks
		70	Semester-end examination	The semester-end examination is for a duration of 3 hours
2	Practical	25	Internal Exams & Continuous Evaluation	1) Lab Internal :10 marks 2) Record : 5 marks 3) Continuous : 5 marks Assessment 4) Attendance : 5 marks
		50	Semester-end examination	The semester-end examination is for a duration of 3 hours.

d) Industry Oriented Mini Project: The Mini Project is to be taken up with relevance to Industry and is evaluated for 75 marks. Out of 75, 25 marks are for internal evaluation and 50 marks are for external evaluation. The supervisor continuously assesses the student for 15 marks (Attendance – 5 marks, Continuous Assessment – 5 marks, Report – 5 marks). At the

end of the semester, Mini Projects shall be displayed in the road show at the department level for the benefit of all students and staff and the same is to be evaluated by the Mini Project Review Committee for 10 marks. The Mini Project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for 50 marks.

Mini Project Review Committee consists of HOD, Mini Project Coordinator and Supervisor.

e) Comprehensive Viva: The Comprehensive Viva shall be conducted by a Committee consisting of HOD and two senior faculty members of the department. The student shall be assessed for his/her understanding of various courses studied during the programme of study. The Viva-Voce shall be evaluated for 100 marks.

f) Seminar: For the seminar, the student shall collect information on a specialized topic and prepare a technical report and present the same to a Committee consisting of HOD, two senior faculty and the seminar coordinator of the department. The student shall be assessed for his/her understanding of the topic, its application and its relation with various courses studied during the programme of study for 50 marks.

g) Major Project: The project work is evaluated for 200 marks. Out of 200, 50 marks shall be for internal evaluation and 150 marks for the external evaluation. The supervisor assesses the student for 25 marks (Attendance – 5 marks, Continuous Assessment – 15 marks, Report – 5 marks). At the end of the semester, Projects shall be displayed in the road show at the department level for the benefit of all the students and staff and the same is to be evaluated by the Project Review Committee for 25marks. The external evaluation for Project Work is a Viva-Voce examination which is conducted by the Project Review Committee in the presence of external examiner and is evaluated for 150 marks.

Project Review Committee consists of HOD, Project Coordinator and Supervisor.

h) Engineering Graphics
- Two internal examinations, each is of 20 marks .The average of the two internal tests shall be considered for the award of marks.
- Submission of day to day work - 5 marks.
- Attendance - 5 marks.

8. Recounting of Marks in the End Examination Answer Books: A student can request for re-counting of his/her answer book on payment of a prescribed fee.

9. **Re-evaluation of the End Examination Answer Books:** A student can request for re-evaluation of his/her answer book on payment of a prescribed fee.

10. **Supplementary Examinations:** A student who has failed in an end semester examination can appear for a supplementary examination, as per the schedule announced by the College/Institute.

11. **Malpractices in Examinations:** Disciplinary action shall be taken in case of malpractices during Mid/ End-examinations as per the rules framed by the Academic Council.

12. **Academic Requirements:**
    a) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or laboratories if he/she securesnot less than 35% of marks in the Semester-end Examination and a minimum of 40% of the sum total of the Internal Evaluation and Semester-end examination taken together.
    b) A student shall be promoted from II year to III year; or from III year to IV year only if he/she fulfills the academic requirements of minimum credits from the following examinations whether the candidate takes the examination or not.

Phase	Minimum Credits	No. of Examinations				
		I-I	**I-II**	**II-I**	**II-II**	**III-I**
II to III Year	37	2 Regular 1 Supply	1 Regular 1 Supply	1 Regular —	--- ---	--- —
III to IV Year	62	3 Regular 2 Supply	2 Regular 2 Supply	2 Regular 1 Supply	1 Regular 1 Supply	1 Regular

13. Award of Class: After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B. Tech Degree by Jawaharlal Nehru Technological University Hyderabad, he/she shall be placed in one of the following four classes (the marks awarded are from the aggregate marks secured for the 200 credits):

Class Awarded	% of Marks Secured
First Class with Distinction	Marks $\geq$ 70%
First Class	60% $\leq$ Marks < 70%
Second Class	50% $\leq$ Marks < 60%
Pass Class	40% $\leq$ Marks < 50%

14. Withholding of Results: If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against him, the result of the student (for that Semester) may be withheld and he will not be allowed to go into the next Semester. The award or issue of the Degree may also be withheld in such cases.

15. Transfer of Students from the Constituent Colleges of JNTUH or from other Colleges/ Universities: Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities shall be considered only on case-to-case basis by the Academic Council of the Institute.

16. Transitory Regulations: Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the Degree Programme, may be considered eligible for re-admission/re-registration to the same or equivalent subjects as and when they are offered.

17. General Rules
   a) The academic regulations should be read as a whole for the purpose of any interpretation.
   b) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.
   c) In case of any error in the above rules and regulations, the decision of the Academic Council is final.
   d) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

Academic Regulations GR14 for B.Tech (Lateral Entry)
(Effective for the students admitted into II year from the Academic Year 2015-16)

1. **All regulations as applicable for B.Tech Four year degree programme (Regular) will hold good for B.Tech. (Lateral Entry Scheme) except for the following rules:**

   a) Pursued a programme of study for not less than three academic years and not more than six academic years

   b) Registered for 150 credits and secured 150 credits. The marks obtained in all 150 credits shall be considered for the calculation of the final percentage of marks

   c) Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech programme

2. **Academic Requirements**
   A student shall be promoted from III year to IV year only if he/she fulfils the academic requirements of minimum credits from the following examination whether the candidate takes the examination or not

Phase	Minimum Credits	No. of Examinations		
		II-I	**II-II**	**III-I**
III to IV Year	37	2 Regular 1 Supply	1 Regular 1 Supply	1 Regular —

3. **Award of Degree or Class**
   After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B. Tech Degree by Jawaharlal Nehru Technological University Hyderabad, he/she shall be placed in one of the following four classes (the marks awarded are from the aggregate marks secured for the 150 credits):

Class Awarded	% of Marks Secured
First class with Distinction	Marks ≥ 70%
First class	60% ≤ Marks < 70%
Second class	50% ≤ Marks < 60%
Pass class	40% ≤ Marks < 50%

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
B.Tech (CE) PROGRAMME STRUCTURE

I B.Tech (CE)　　　　　　　　　　　　　　　　　　　　I Semester

Group	Sub-Code	Subject	L	T	P	Credits	Hours	Marks
BS	GR14A1001	Linear Algebra and Single Variable Calculus	2	1	-	3	4	100
BS	GR14A1002	Advanced Calculus	2	1	-	3	4	100
BS	GR14A1008	Engineering Chemistry	2	1	-	3	4	100
ES	GR14A1023	Engineering Graphics	1	-	2	3	5	100
ES	GR14A1018	Basic Electrical Engineering	3	1	-	4	5	100
ES	GR14A1012	Engineering Mechanics-STATICS	2	1	-	3	4	100
HS	GR14A1024	Business Communication and soft skills	-	-	2	2	4	75
ES	GR14A1026	IT Workshop	-	-	2	2	4	75
BS	GR14A1030	Engineering Chemistry lab	-	-	2	2	4	75
		Total	**12**	**5**	**8**	**25**	**38**	**825**

I B.Tech (CE)　　　　　　　　　　　　　　　　　　　　II Semester

Group	Sub-Code	Subject	L	T	P	Credits	Hours	Marks
BS	GR14A1003	Transform Calculus and Fourier Series	2	1	-	3	4	100
BS	GR14A1004	Numerical Methods	2	1	-	3	4	100
BS	GR14A1006	Physics for Engineers	2	1	-	3	4	100
ES	GR14A1005	English	2	1	-	3	4	100
ES	GR14A1011	Computer Programming and data structures	2	1	-	3	4	100
ES	GR14A1020	Engineering Mechanics -DYNAMICS	3	1	-	4	5	100
HS	GR14A1025	Engineering Workshop	-	-	2	2	4	75
ES	GR14A1029	Engineering Physics Lab	-	-	2	2	4	75
BS	GR14A1028	Computer Programming and data structures Lab			2	2	4	75
		Total	**13**	**6**	**6**	**25**	**37**	**825**

II B.Tech (CE)   I Semester

Group	Sub-Code	Subject	L	T	P	Credits	Hours	Marks
PC	GR14A2003	Building Materials and Construction Planning	3	1	-	4	5	100
PC	GR14A2004	Electrical Technology	2	1	-	3	4	100
PC	GR14A2005	Strength of Materials-I	3	1	-	4	5	100
PC	GR14A2006	Surveying	3	1	-	4	5	100
PC	GR14A2007	Fluid Mechanics	3	1	-	4	5	100
PC	GR14A2008	Fluid Mechanics Lab	-	-	2	2	4	75
PC	GR14A2009	Surveying Lab - I	-	-	2	2	4	75
PC	GR14A2010	Computer Aided Drafting of Building Lab	-	-	2	2	4	75
		Total	**14**	**05**	**06**	**25**	**36**	**725**
MC	GR14A2002	Value Education and Ethics	-	-	2	2	2	100

II B.Tech (CE)   II Semester

Group	Sub-Code	Subject	L	T	P	Credits	Hours	Marks
BS	GR14A2011	Probability and Statistics	2	1	-	3	4	100
PC	GR14A2012	Strength of Materials-II	3	1	-	4	5	100
PC	GR14A2013	Hydraulics and Hydraulic Machinery	3	1	-	4	5	100
PC	GR14A2014	Engineering Geology	3	1	-	4	5	100
PC	GR14A2015	Structural Analysis	3	1	-	4	5	100
PC	GR14A2016	Strength of Materials Lab	-	-	2	2	4	75
PC	GR14A2017	Hydraulics and Hydraulic Machinery Lab	-	-	2	2	4	75
PC	GR14A2018	Surveying Lab - II	-	-	2	2	4	75
		Total	**14**	**05**	**06**	**25**	**36**	**725**
MC	GR14A2001	Environmental Science	-	-	-	0	2	100
MC	GR14A2106	Gender Sensitization Lab	-	-	2	2	2	75

III B.Tech (CE)   I Semester

Group	Sub-Code	Subject	L	T	P	Credits	Hours	Marks
ES	GR14A3001	Concrete technology	3	1	-	4	5	100
ES	GR14A3002	Design of Reinforced Concrete Structures	3	1	-	4	5	100
HS	GR14A2104	Managerial Economics and Financial Analysis	2	1	-	3	4	100
ES	GR14A3003	Water resources Engineering-I	3	1	-	4	5	100
ES	GR14A3004	Advanced Structural Analysis	3	1	-	4	5	100
ES	GR14A3005	Concrete Technology Lab	-	-	2	2	4	75
ES	GR14A3006	Engineering Geology Lab	-	-	2	2	4	75
HS	GR14A3100	Advanced English Communication Skill Lab	-	-	2	2	4	75
		Total	**14**	**05**	**06**	**25**	**36**	**725**

III B.Tech (CE)   II Semester

Group	Sub-Code	Subject	L	T	P	Credits	Hours	Marks
ES	GR14A3007	Design of Steel Structures	3	1	-	4	5	100
ES	GR14A3008	Transportation Engineering	3	1	-	4	5	100
ES	GR14A3009	Water Resources Engineering-II	2	1	-	3	4	100
ES	GR14A3010	Geotechnical Engineering-I	3	1	-	4	5	100
Open Elective								
HS	GR14A3102	Management Science	3	1	-	4	5	100
ES	GR14A3011	Disaster management and Mitigation	3	1	-	4	5	100
ES	GR14A3012	Bridge Engineering	3	1	-	4	5	100
ES	GR14A3013	Geotechnical Engineering Lab	-	-	2	2	4	75
ES	GR14A3014	Highway Materials Lab	-	-	2	2	4	75
SPW	GR14A3101	Industry Oriented Mini Project	-	-	2	2	4	75
		Total	**14**	**05**	**06**	**25**	**36**	**725**

IV B.Tech (CE)   I Semester

Group	Sub-Code	Subject	L	T	P	Credits	Hours	Marks
ES	GR14A4001	Geotechnical Engineering-II	3	1	-	4	5	100
ES	GR14A4002	Estimating & Costing	3	1	-	4	5	100
ES	GR14A4003	Environmental Engineering	2	1	-	3	4	100
Elective - I			3	1	-	4	5	100
ES	GR14A4004	Ground Water Development & Management						
ES	GR14A4005	Prestressed Concrete						
ES	GR14A4006	Optimization techniques in Civil Engineering						
Elective - II			3	1	-	4	5	100
ES	GR14A4007	Finite Element Methods						
ES	GR14A4008	Water Resources System Planning & Management						
ES	GR14A4009	Ground Improvement Techniques						
ES	GR14A4010	Irrigation Design & Drawing	-	-	2	2	4	75
ES	GR14A4011	Environmental Engineering Lab	-	-	2	2	4	75
ES	GR14A4012	Computer Applications in Structural Engineering Lab	-	-	2	2	4	75
		Total	**14**	**05**	**06**	**25**	**36**	**725**

IV B.Tech (CE)   II Semester

Group	Sub-Code	Subject	L	T	P	Credits	Hours	Marks
ES	GR14A4013	Construction Technology & Project Management	2	1	-	3	4	100
Elective - III			2	1	-	3	4	100
ES	GR14A4014	Advanced Reinforced concrete Structural Design						
ES	GR14A4015	Pavement Analysis & Design						
ES	GR14A4016	Water Shed Management						
Elective - IV			2	1	-	3	4	100
ES	GR14A4017	Remote Sensing & GIS						
ES	GR14A4018	Airport, Docs & Harbor Engineering						
ES	GR14A4019	Environmental Impact Assessment						
ES	GR14A4145	Advanced Steel Structural Design						
ES	GR14A4020	GIS Lab	-	-	2	2	4	75
SPW	GR14A4142	Comprehensive viva	-	-	2	2	4	75
SPW	GR14A4143	Seminar	-	-	2	2	4	75
SPW	GR14A4144	Major Project	10	-	-	10	10	200
		Total	**16**	**03**	**06**	**25**	**34**	**775**

I-Year

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LINEAR ALGEBRA AND SINGLE VARIABLE CALCULUS

Course Code: GR14A1001   L:2 T:1 P:0 C:3
I Year I Semester

Prerequisites: Vector algebra, Matrix algebra and Pre-calculus

Course Objectives: The objective of this course is to provide the student with
- Introduce the ideas of linearity and linear systems, which lie at the core level of many engineering concepts
- Explore the extensions of differential calculus, which form the stepping stones to a broader subject called " approximation theory"
- Learn the skill of seeing a mathematical equation in many commonly occurring natural phenomena and acquire preliminary skills to predict their behavior
- Provide an over view of mean value theorems and its applications
- Discuss the significant applications of higher order differential equations.

Course Outcomes: At the end of the course, the student will be able to
- Recognize the concepts of matrix rank to analyze linear algebraic systems
- Compute eigen values and vectors for engineering applications
- Illustrate the concepts of Mean Value Theorems to Describe the Medical Imaging and Industrial Automation.
- Differentiate various differential equations using elementary techniques (Exact or linear constant coefficient equations)
- Demonstrate model and solve linear dynamical systems
- Apply concepts of higher order differential equations to solve typical problems in Electrical circuits.
- Identify the physical phenomena of Simple harmonic motion by concepts of Differential equations.

Unit-I
Linear Algebra and Matrix eigen value problem: Rank of a matrix,Consistency of a system of linear equations-Pseudo inverse of a matrix-Condition number of a matrix-Approximate solution of an over determined system of linear equations using the pseudo inverse-Solution of a system of homogeneous linear equations. Vector norms, Linear dependence of vectors, Gram-Schmidt orthogonalization of vectors, Matrix norms.Determination of eigen values and eigen vectors of a square matrix-Properties of eigen values and eigen vectors of real and complex matrices.

Unit-II
Matrix factorizations and Quadratic Forms: Diagonalization of a matrix-Orthogonal diagonalization of symmetric matrices-Computation of matrix powers- Computation of Singular value decomposition - QR factorization.

Quadratic forms-Definiteness of a quadratic form-Rank, index and signature of a quadratic form- Reduction of a quadratic form into a canonical form by Lagrange's method and by an orthogonal transformation.

Unit-III
Differential Calculus of functions of a single variable: Mean value theorems (Rolles', Lagrange's, Cauchy's, Taylor's and Maclaurin's theorems Geometrical Interpretation without proof) - Approximation of functions by Taylor's and Maclaurin's theorems-Series expansion of functions.

Unit-IV
Linear differential equations of the first order and their applications: Formation of ODE-Methods to solve first order LDE (exact, reducible to exact, linear and Bernoulli equations).

Applications - Growth and decay models - Newton's law of cooling - Applications to electrical circuits (LR and RC circuits) - Geometrical applications - Orthogonal trajectories.

Unit-V
Linear differential equations of the higher order and applications: Equations with constant coefficients-Particular integrals for functions of the type e^{ax}, x^n, sinax, cos ax, $e^{ax}.V(x)$ Exponential shift - Method of variation of parameters.

Applications - Deflection of beams, Simple harmonic motion (simple pendulum, spring-mass systems) and RLC circuits.

Teaching Methodologies
1. Tutorial sheets uploaded in website
2. NPTEL video lectures
3. MATLAB exercises for visualization

Text Books
1. Advanced Engineering Mathematics: R.K.Jain and S.R.K.Iyengar-Narosa Publishing House
2. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley.
3. Higher Engineering Mathematics: B.S.Grewal-Khanna Publications.

References
1. Introduction to Linear Algebra-Gilbert Strang
2. Schaum's outline series on Linear Algebra
3. GRIET reference manual

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED CALCULUS

Course Code: GR14A1002   L:2 T:1 P:0 C:3
I Year I Semester

Prerequisites: Vector algebra, Matrix algebra and Pre-calculus

Course objectives: The objective of this course is to provide the student with
- Introduce the ideas of linearity and linear systems, which lie at the core level of many engineering concepts
- Explore the extensions of differential calculus, which form the stepping stones to a broader subject called " approximation theory"
- Learn the skill of seeing a mathematical equation in many commonly occurring natural phenomena and acquire preliminary skills to predict their behavior
- Provide an over view of mean value theorems and its applications
- Discuss the significant applications of higher order differential equations.

Course Outcomes: At the end of the course, the student will be able to
- Recognize the concepts of matrix rank to analyze linear algebraic systems
- Compute eigen values and vectors for engineering applications
- Illustrate the concepts of Mean Value Theorems to Describe the Medical Imaging and Industrial Automation.
- Differentiate various differential equations using elementary techniques (Exact or linear constant coefficient equations)
- Demonstrate model and solve linear dynamical systems
- Apply concepts of higher order differential equations to solve typical problems in Electrical circuits.
- Identify the physical phenomena of Simple harmonic motion by concepts of Differential equations.

Unit-I
Differential Calculus of functions of several variables and Function Optimization: Partial differentiation - Hessian matrix-Total differentiation-Jacobians. Optimization of functions of several variables without constraints-Constrained optimization of functions of several variables with equality constraints-The Lagrange's multiplier method.

Unit-II
Curve tracing principles and Applications of integration: Basic principles of tracing Cartesian, polar and parametric curves -Applications of the definite integral to evaluate arc lengths, surface areas of revolution and volumes of revolution.

Unit-III
Multiple integrals and applications: Evaluation of Double integrals in Cartesian and polar coordinates-Changing the order of integration- Change of variables - Evaluation of triple integrals in Cartesian, cylindrical and spherical polar coordinates. Application of multiple integrals to evaluate plane areas and volumes of solids.
Unit-IV
Vector Calculus: Vector differentiation in Cartesian coordinates-Gradient, Divergence and Curl and their physical interpretation-Directional derivatives-Angle between surfaces, Vector Identities, Irrotational fields and scalar potentials. Vector integration-Evaluation of line integrals-Work done by conservative fields-Surface integrals.

Unit-V
Vector Field theorems: Green's theorem in the plane-Divergence theorem of Gauss-Stoke's theorem (Without Proofs).

Teaching Methodologies
1. Tutorial sheets uploaded in website
2. NPTEL video lectures
3. MATLAB exercises for visualization

Text Books
1. Advanced Engineering Mathematics: R.K.Jain and S.R.K.Iyengar Narosa Publishing House
2. Schaum's outline series on Vector Analysis
3. Higher Engineering Mathematics: B.S.Grewal-Khanna Publications

Reference Books
1. Advanced Engineering Mathematics: Erwin Kreyszig-Wiley
2. Calculus and Analytical Geometry-Thomas & Finney-Narosa
3. Higher Engineering Mathematics: B.S.Grewal-Khanna Publications

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY

Course Code: GR14A1008   L:2 T:1 P:0 C:3
I Year I Semester

Prerequisites: Fundamentals in Engineering Chemistry Theory Course

Course Objectives: The objective of this course is to provide
- Explain the chemistry of water analysis essential for the functioning of certain core industries.
- Demonstrate how the chemistry of batteries and fuel cells provide energy vital for devices.
- Introduce a variety of engineering materials used in modern technology including
- Semiconductors, conducting polymers, liquid crystals, etc., to relate the molecular and crystal structure and properties to their engineering applications.
- Illustrate materials processing methods for industrial production of plastics, rubbers, silicon

Course Outcomes: At the end of the course, the student will be able to
- Analyse water for the industry required specifications.
- Understand the fundamental principles of electrochemistry for energy production and corrosion prevention.
- Know the origin of different types of engineering materials used in modern technology.
- Design new materials for novel applications.
- Develop the skills required for synthesis and analysis of materials.
- Relate the structure of materials to their properties and applications.
- Understand the processing of fossil fuels for the effective utilization of chemical energy
- Know the necessity of sustainable, environmentally-friendly energy sources like solar energy.

Unit-I
Water Technology: Sources of natural water, impurities, hardness: causes, types, expression, units, estimation of   hardness of water using complex metric titration method, problems on hardness, Boiler feed water, boiler troubles(scale, sludge, carry over, Caustic Embrittlement, Boiler Corrosion). Internal reatment methods(carbonate, phosphate, calgon), Softening of water – Lime Soda, Ion-Exchange process.   Alkalinity of water and its determination, Potable water- its characteristics and steps involved in Municipal Water Treatment, Chlorination-

Break Point Chlorination, sterilization by ozonation. Desalination of Brackish water - Reverse Osmosis. Waste water-types of effluents, domestic and industrial effluents(on over view)

Unit-II
Electrochemistry & Corrosion: Concept of Conductances-specific, equivalent, molar conductances and their inter relation ships applications of conductance-conductometric titrations-(Strong acid Vs Strong Base and Weak Acid Vs Strong Base). EMF of a cell, Electrode- Single Electrode Potential, Standard Electrode potential, Electro chemical series and its applications, Electrochemical Cells-types, Galvanic cell: cell representation, Cell reactions, Cell EMF, Electrolytic cells, Concentration cell. Batteries-types Lithium Cell(Li-thionyl Chloride), Secondary cells: $Pb-PbO_2$ cell, Fuel cells: H_2-O_2 fuel cells and their applications.

Causes and effects of corrosion-types of corrosion- chemical (Dry) corrosion-types and their mechanism, Electrochemical (Wet) corrosion and its mechanism, factors affecting the rate of corrosion – nature of metal and nature of environment. Corrosion Control Methods-Cathodic Protection: Sacrificial Anodic, Impressed Current Cathodic protection. Metallic Coatings –Anodic and Cathodic coatings, Methods of application of metallic coatings- Hot Dipping method(Galvanisation), Cementation(Sheradising), Electroplating(Cu coating), Organic Coatings: Paints – its constituents and their functions.

Unit-III
Engineering Materials I: Cement-types-portland cement –composition, Setting & Hardening of Portland cement. Ceramics-types-ceramic products - white wares, Stone ware, properties and applications of ceramics.   Refractories-classification,properties(refractoriness,RUL,thermal spalling, thermal conductivity) and their application.

Lubricants: Classification with examples, mechanisms of lubrication (thick film, thin film, extreme pressure), properties of lubricants- viscosity, flash point, fire point, cloud point, pour point (Definition and significance).

Unit-IV
Engineering Materials II: Electronic materials : Semi conductors, Preparation of Pure Ge and Si by Zone Refining, Czochralski Crystal Pulling, Doping Techniques-Epitaxy, Diffusion & ion implantation.

Polymer Materials: Monomer, polymer, types of polymerization-addition and condensation, Plastics-Thermoplastic resins, Thermo set resins. Compounding & fabrication of plastics (compression & Injection moulding), Preparation, Properties, Engineering applications of Hi Density Poly Ethylene(HDPE), Poly

Vinyl Chloride(PVC), Bakelite & Nylon 6,6.   Liquid Crystal Polymers and their applications, Organic Light Emmiting Diodes (an Over View). Biodegradable polymers-their advantages and their applications. Elastomers – preparation, properties and applications of Butyl rubber, Thiokol rubber, Styrene-Butadiene Rubber. Conducting Polymers-classification with examples-mechanism of conduction in trans poly acetylene and their applications.
Rubber. Conducting Polymers-classification with examples-mechanism of conduction in trans poly acetylene and their applications.

Unit-V
Energy sources: Fossil Fuels: Coal –types, analysis of coal- proximate and ultimate analysis and their significance,   Calorific value of fuel – HCV, LCV, Determination of Calorific Value using BOMB calorimeter,   Theoretical calculation of Calorific Value by Dulong's formula, Numerical Problems. Petroleum-its composition-synthetic petrol – Bergius and Fischer Tropsch's process method , cracking (Definition) and its significance, knocking and its mechanism in Internal Combustion engines, Octane Rating of Gasoline, Composition, and applications of natural gas, LPG, CNG. Bio-fuels: preparation of Bio-diesel by transesterification method, advantages of Bio-fuel.

Teaching Methodologies
1. White Board with marker, OHP & Power Point Presentation
2. Conducting quizzes,
3. Conducting Experiments
4. Assignment uploaded in website.

Text Books
1. A text book of engineering chemistry by PC Jain and Monica Jain, Dhanpat Rai publishing company.

Reference Books
1. A text book of engineering chemistry by SS Dara and SS Umre, S Chand publications.
2. A text book of engineering chemistry by Dr Y Bharathi kumari and Dr Ch Jyothsna, VGS publications.
3. A text book of engineering chemistry by R.P.Mani, K.N.Mishra, B.Rama Devi, V.R.Reddy, cengage learning publications

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING GRAPHICS

Course Code: GR14A1023   L:1 T:0 P:2 C:3
I Year I Semester

Prerequisites: Knowledge in dimensions and units, Usage of geometrical instruments and analytical ability.

Course Objectives: The objective of this course is to provide the student with
- To distinguish and differentiate the importance of engineering drawing.
- The course of study elevates the interpretation level of manuscripts into engineering drawing.
- Distinguish the basic principles and different steps involved in principle of planes of projections.
- By Interpreting the basic principles, can focus on cause to extend and relate the information of objects.
- Visualize the difference views of a given object through Orthographic and isometric projections

Course Outcomes: At the end of the course, the student will be able to
- Demonstrate different types of lines, the use of different types of pencils and drafter to represent
- Illustrate the basic drawing techniques, conic sections, cycloid curves, involutes and engineering
- Explain the basic concept of principle of planes of projections in front view and top view.
- Make use of orthographic projections of points, lines , planes and solids
- Analyze the structure which was hypostatically designed ex: development of surfaces, section of
- Explain the logic to convert pictorial vies to orthographic projections and orthographic projections to
- Evaluate conversions of isometric views to orthographic views helps in inventing new machinery.

Unit -I
Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions. Curves used in Engineering Practice & their Constructions: a) Conic Sections, b) Cycloid, Epicycloid and Hypocycloid, c) Involutes.

Scales: Different types of scales. Plain Scale, Diagonal Scale &Vernier Scale

Unit-II
Orthographic Projections: Principles of Orthographic Projections – Conventions – First and Third Angle Projections. Projections of Points and Lines inclined to both planes, True lengths, traces.

Unit-III
Projection of Regular Planes: Plane parallel to one reference plane and perpendicular to other; planes inclined to one reference plane and perpendicular to other; Plane inclined to both the reference planes.

Projections of Solids: Projections of Regular Solids inclined to both planes.

Unit-IV
Sections of Solids: Types of section planes, Section by a plane perpendicular to V.P., Section by a plane perpendicular to H.P.

Development of Surfaces: Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts.

Unit-V
Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

Transformation of Projections: Conversion of Isometric Views to Orthographic Views – Conventions.

Teaching Methodology
Power point Presentations, Working models, white board & marker

Text Books
   1. Engineering Drawing, N.D. Bhat / Charotar
   2. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishers

References Books
   1. Engineering Drawing and Graphics, Venugopal / New age.
   2. Engineering Drawing- Johle/Tata Macgraw Hill.
   3. Engineering Drawing, Narayana and Kannaiah / Scietech publishers.
      Engineering Drawing, Narayana and Kannaiah / Scietech publishers.
   4. Engineering Drawing – BasanthAgrawal/ C M Agrawal; 2e McGraw Hill Education

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

BASIC ELECTRICAL ENGINEERING

Course Code: GR14A1018   L:3 T:1 P:0 C:4
I Year I Semester

Prerequisites: Fundamentals in Engineering Mathematics and Physics.

Course Objectives : BEE (Basic Electric Engineering) is common to first year branches of UG Engineering(except BT). At the end of the course the student is expected to
- Know the fundamentals of Electrical Engineering.
- Practical implementation of fundamental theory concepts.
- Solve problems in the fundamentals of electrical engineering.
- Understand the basic principles of general electrical machinery.
- Know the applications of electrical engineering in real time.
- Understand the common real time application of Electrical machinery.
- Learn basic house wiring.

Course Outcomes: At the end of the course, the student will be able to
- Strong basics of Electrical Engineering and practical implementation of Electrical fundamentals.
- Different applications of commonly used electric machinery.
- The methods for numerical solutions to fundamental electrical engineering.
- The basic principles involved in electrical engineering concepts.
- Practical methods of basic house wiring.
- The methods to solve AC circuits.
- Basics of electric machines used in industries.

Unit-I
Basic Laws: Ohm's law , Kirchhoff's voltage and current laws , Nodes-Branches and Loops , Series elements and Voltage Division , Parallel elements and Current Division , Star-Delta transformation, Independent sources and Dependent sources , Source transformation.

Unit-II
AC Fundamentals-I: Review of Complex Algebra , Sinusoids , Phasors , Phasor Relations of Circuit elements , Impedance and Admittance , Impedance Combinations , Series and Parallel combination of Inductors and Capacitors, Mesh analysis and Nodal Analysis.

Unit-III
AC Fundamentals-II: RMS and Average values, Form factor, Steady State Analysis of Series, Parallel and Series Parallel combinations of R, L,C with Sinusoidal excitation, Instantaneous power, Average power, Real power, Reactive power and Apparent power, concept of Power factor, Frequency.

Unit-IV
Resonance and Network Theorems: Resonance in Electric circuits: Analysis of Series and Parallel Resonance, Theorems: Superposition theorem, Thevinin's theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity theorem.

Unit-V
Fundamentals Of Electrical Machines: Construction, Principle, Operation and Applications of –
   (I)   DC Motor,
   (ii) Single phase Transformer
   (iii) Single phase Induction motor

Text Books
   1. Fundamentals of Electric Circuits by Charles K.Alexander, Matthew N.O.Sadiku, Tata McGraw Hill Company.

Reference Books
   1. Circuit Theory (Analysis and Synthesis) by A. Chakrabarti – Dhanpat Rai & Co
   2. Network Theory by Prof. B. N. Yoganarasimham.
   3. Engineering Circuit Analysis by William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin by Tata McGraw Hill Company.
   4. Electrical Engineering Fundamentals by Vincent Deltoro   5. Circuit Theory by Sudhakar and Shyam Mohan

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING MECHANICS-STATICS

Course Code: GR14A1012   L:2 T:1 P:0 C:3
I Year I Semester

Prerequisites: A good working knowledge of calculus, vector algebra, General Physics is required.

Course Objectives: This is Engineering Applied Science-Dynamics Subject to Mechanical Branch of UG Engineering. At the end of the course student is expected to
- Explain basic principles describing the equilibrium of system of forces under static conditions
- Illustrate the concepts of friction and related problems
- Apply the concepts of centroid, moment of inertia, product of inertia and mass moment of inertia to practical problems
- Analyze trusses by using method of joints and method of section
- Demonstrate principles of virtual work to the static problems

Course Outcomes: At the end of the course, the students should be able to
- Solve forces and moments for planer system problems
- Evaluate basic equilibrium, friction problems
- Distinguish between Centroid and Centre of Gravity
- Differentiate between area moment of inertia and mass moment of inertia
- Evaluate trusses by method of joints and method of sections
- Analyze mass moment of Inertia and area moment of inertia
- Solve virtual work problems

Unit-I
Forces, Moments, Equilibrium: Introduction to Engineering Mechanics, Basic Concepts.

System of forces: Coplanar forces, concurrent forces, Resultant, Moment of forces and its application, Varignon's principle, Couples and resultant of force system.
Equilibrium of systems of forces: Free body diagrams, equations of equilibrium of coplanar systems, Lami's theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of triangle of forces, converse of the law of polygon of forces, conditions of equilibrium.
Unit-II
Friction: Introduction, Types of friction, Laws of Solid friction, definitions-

coefficient of friction, Angle of friction, Angle of repose. Equilibrium of a body on horizontal rough plane-under horizontal & inclined force. Equilibrium of a body on a rough inclined plane- with force acting parallel to the plane and inclined to the plane.

Unit-III

Properties of surfaces and Solids: Determination of Areas and volumes, First moment of area and the centroid of sections- Rectangle, circle & triangle from method of integration, Composite sections: T-section, I-section, Angle Sections, Hollow Section by using standard formula.

Unit-IV

Moment of inertia: Second and product moments of plane area. Parallel Axis theorem, Perpendicular axis theorem, Moment of inertia of sections- rectangle, triangle, circle from method of integration, Composite Sections: T-Section, I section, Angle section, Hollow Section by using standard formula. Polar moment of inertia, moment of inertia about inclined axis, principal moments of inertia of plane areas, Principal axes of inertia.

Mass Moment of Inertia: Derivation of mass moment of inertia for rectangular section, circular section, prism, cylinder and sphere from first principles. Relation to area moments of inertia.

Unit-V

Analysis of Trusses: Introduction, Classification of trusses, Assumptions made in the analysis of perfect truss, Methods of analysis of Trusses- Method of Joints and Method of Sections.
Principle of Virtual Work: Equilibrium of ideal systems, efficiency of simple machines, stable and unstable equilibriums.

Teaching Methodology
Power point Presentations, Working models, white board & marker.

Text Books
1. Engineering Mechanics by A. Nelson, Tata-McGrawhill
2. Engineering Mechanics-Timoshenko & Young, Tata-McGrawhill
3. Engineering Mechanics- A.K Tayal, Uma Publications.

Reference Books

1. Engineering Mechanics by Shames L.H, prentice Hall.
2. Engineering Mechanics by Pakirappa, Durga publications.
3. Engineering Mechanics- R.S Khurmi, S Chand Publications
4. Engineering Mechanics- R.C. Hibbler, twelfth edition, Prentice hall.
5. Engineering Mechanics- Basudeb Bhattacharyya, Oxford University press

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUSINESS COMMUNICATION AND SOFT SKILLS

Course Code: GR14A1024   L:0 T:0 P:2 C:2
I Year I Semester

Prerequisites: Familiarity with basic language and communication skills.

Course objectives: The objective of this course is to provide the student with
- Recognize the role and importance of language and communication skills.
- Know the importance and application of phonology.
- Employ the acquired knowledge in classroom with reference to various social and professional spheres.
- Develop the sense of right usage of formal communication.
- Equip with the skills of listening, critical thinking and writing.
- Acquire the ability to work in teams.

Course outcomes: At the completion of this course the student will be able to
- Interpret the role and importance of various forms of communication skills.
- Utilize various media of verbal and non-verbal communication with reference to various professional contexts.
- Enabled to tote professional responsibilities in an analytical manner.
- Accredit the activity of sequencing ideas in an efficacious style.
- Evaluate and use a neutral and correct form of English.
- Formulate behavior in various formal situations.
- Integrate business communication & soft skills to meet the requirement of corporate communication.

Unit-I
Just A Minute (JAM): Introduction to public speaking, analyzing and assimilating ideas, audience, voice modulation, Pronunciation and enunciation.

Unit-II
Phonetics: Introduction to speech sounds; identification of sound symbols; vowel and consonants

Unit-III
Roleplay: Introduction to role play; situation handling; non-verbal communication

Unit-IV
Debate: Introduction and features of Debate; Types of Debate; Understanding critical thinking; building sustainable arguments; assessing credibility of the argument; overcoming obstacles

Unit-V
Describing a Person, Situation, Process and Object: Introduction to techniques of clear, brief and impersonal description to a listener or reader.
Unit-VI
Letter Writing: Manual and Emailing, types and formats, content and body of the letter. Email etiquette.

Unit-VII
Report Writing: Formats and types of reports

Unit-VIII
Mind Mapping: Assimilation of thoughts, expansion of ideas on central idea, suggesting parameters to carry forward the thinking process without deviation.

Reference Books

1. Business Communication; Hory Sankar Mukerjee; Oxford University Press
2. Business Communication; Meenakshi Raman, Prakash Singh; Oxford University Press
3. English and Soft skills; SP DHanavel; Orient Blackswan
4. Soft Skills for Everyone; Jeff Butterfield; Cengage Learning
5. Communication Skills; Viva Career Skills Library
6. Personality Development and Soft Skills; Barun K Mitra; Oxford University Press
7. Six Thinking Hats, Penguin Books, Edward De Bono
8. English for Engineer's; Aeda Abidi, Ritu Chaudhry; Cengage Learning
9. Communication Skills ; Sanjay Kumar , Pushpalatha; Oxford University Press
10. Business English : The Writing Skills you need for today's work place: Geffner, Andrea: Fifth edition, Barron's Educational Series, Newyork

Software Used

1. Sky Pronunciation Suite
2. Clarity
3. Mastering English

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IT WORKSHOP

Course Code: GR14A1026   L:0 T:0 P:2 C:2
I Year I Semester

Prerequisites
- Fundamentals of Computer and its parts.
- Identification of peripherals of computer.

Course Objectives
- To introduce the students to a PC, its basic peripherals and to install software's.
- To increase the ability of the students in effective usage of Internet using web browsers and tools.
- To enable the students in crafting professional word documents, excel spread sheets and power point presentation using Microsoft office tools.
- To provide basic knowledge about the networking devices – Routers and Switches .In addition it include, how to connect those devices using different cables.
- To enable the students to connect the devices by using different cables.
- To provide students about the basic knowledge of HTML and to create a static website.
- To provide the basic knowledge on DBMS concepts and store the data in database.

Course Outcomes: At the end of the course, the Student should have
- Ability to recognize different peripherals and install different system and application softwares.
- Ability to analyze and use of web browsers and related tools.
- Ability to create different documents, presentations and spreadsheet applications.
- Ability to recognize different network devices and their usage.
- Ability to recognize and use different cables.
- Ability to explore the internet for information extraction and other innovative applications.
- Ability to design a static webpage.
- Ability to design and develop database.

PC Hardware
Introduces the students to a personal computer and its basic peripherals, installation of system software like MS Windows, Linux and the required device

drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. **The students should work on working PC to install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.**

Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced. Productivity tools module would enable the students in crafting professional word documents, spread sheets and slide presentations.

Task 1
Installation of OS Every student should install Ubuntu and RedHat Linux on the computer. Lab instructors should verify the installation and follow it up with viva

Task 2
Hands on experience on Open Office: Every student should install open office on the computer. Students would be exposed to create word documents with images, tables, formula and with additional word processing features, Power point presentation, Excel and access. Lab instructors should verify the installation and follow it up with viva.

Task 3
Internet Based Applications: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google.

Task 4
Networking-Network Infrastructure: Understand the concepts of Internet, intranet, and extranet, local area networks (LANs), wide area networks (WANs), wireless networking, network topologies and access methods.
Task 5
Network Hardware: Understand switches, routers, media types, static routing, dynamic routing (routing protocols), default routes; routing table and how it selects best route(s); routing table memory, network address translation (NAT).
Task 6: Network Protocols: Understand the Open Systems Interconnection (OSI) model, IPv4, IPv6-ipv4toipv6 tunneling protocols to ensure backward compatibility, dual IP stack, subnetmask, gateway, ports, packets, reserved address ranges for local use (including local loopback IP).

Task 7
Network Services: Understand names resolution, networking services, TCP/IP-Tools (such as ping), tracert, pathping, Telnet, IPconfig, netstat, reserved address ranges for local use (including local loopback IP), protocols.

Task 8
Database -Core Database Concepts: Understand how data is stored in tables, Understanding DML and DDL statements

Task 9
Creating and Insertion of Data: Understanding Data types, tables and how to insert data in to the tables.

Task 10
HTML   Basic HTML Tags: Understand what are the tags used for creation of website

Task 11
 Designing a Static web page: Understand how to create static web page.

Teaching Methodologies
1. Power Point presentations.
2. Assignments.
3. Hands on experiment.

Reference Books
1. Introduction to Information Technology, ITL Education Solutions Limited, Pearson Education.
2. Introduction to Computers, Peter Norton, 6/e Mc Graw Hill
3. Upgrading and Repairing, PC's   18th e, Scott Muller QUE, Pearson Education
4. Comdex Information Technology Course tool kit Vikas Gupta, WILEY Dreamtech
5. IT Essentials PC Hardware and Software Companion Guide, Third Edition by David Anfinson and Ken Quamme- CISCO Press, Pearson Education
6. PC Hardware and A+Handbook Kate J. Chase PHI(Microsoft)
7. ORACLE DATA BASE LOG   PL/SQL Programming SCOTT URMAN, Tata Mc- Graw Hill
8. Introduction to Database Systems, C.J.Date Pearson Education.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY LAB

Course Code: GR14A1030   L:0 T:0 P:2 C:2
I Year I Semester

Prerequisites: Fundamentals in Engineering Chemistry Laboratory

Course Objectives: The objective of this course is to provide
- Introduce practical applications of chemistry concepts to engineering problems.
- Know the laboratory practices implemented in a research and industrial chemistry laboratory.
- Explain the water analysis techniques for removing impurities.
- Demonstrate redox chemistry for analysing engineering materials like cement.
- Explain the measurement of physical properties like viscosity and surface tension of lubricants.

Course Outcomes: At the end of the course, the student will be able to
- Perform analysis of water to the required industrial standards.
- Apply the redox and acid-base titrations for analysing materials used in routine usage like cement, coal, acid in lead acid battery, etc.,
- Develop the skills required for assessing the quality of materials used in industries.
- Design novel ways of instrumental methods of analysis.
- Know the correlation between the measured property and the corresponding application.
- Understand scientific method of designing experiment and learn the skill necessary to perform it.
- Know how to innovate to design alternative energy sources utilizing chemistry for sustainable environment for future generations

List Of Experiments
1. Estimation of Total Hardness in sample water by complexometry
2. Estimation of percentage available chlorine in Bleaching Powder.
3. Estimation of Fe^{2+} by permanganometry.
4. Determination of strength of an acid by potentiometric titration method
5. Determination of strength of an acid using conductometry.
6. Determination of Strength of an acid in Pb-Acid battery titrimetric method

7. Determination of percentage of Iron in Cement sample by colorimetry..

8. Estimation of Calcium in port land cement.

9. Determination of Viscosity of the given unknown liquid by Oswald's viscometer.

10. Determination of surface tention of the given unknown liquid by stalagnometer.

11. Preparation of Thiokol rubber.

12. Determination of percentage Moisture content in a coal sample.

Reference Books

1. Laboratory Manual on Engineering Chemistry, by Dr Sudha Rani, Dhanpat Rai Publishing house.

2. A Text book on Experiments and calculations in Engineering Chemistry, by SS Dara,   S Chand publications.

3. Laboratory Manual of Organic Chemistry, by Raj K Bansal, Wiley Eastern Limited, New age international limited.

4. Engineering Chemistry practical manual prepared by faculty of engineering chemistry, GRIET(A) - (for college circulation only)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

TRANSFORM CALCULUS AND FOURIER SERIES

Course Code: GR14A1003   L:2 T:1 P:0 C:3
I Year II Semester

Prerequisites: Differential and integral calculus, multiple integrals and linear differential equations

Course Objectives: The objective of this course is to provide the student with
- Introduce improper integrals and specially to Beta and Gamma Functions
- Introduce the idea of domain transformation for easy problem solving
- Learn the skill of decomposing a periodic and non-periodic function in to fundamental Components using Fourier series and Fourier transform
- Introduce PDE and acquire the skill of finding analytical solutions of such equations
- Identify the real time problem and formulate the mathematical model.

Course Outcomes: At the end of the course, the student will be able to
- Calculate definite integral values using Beta and Gamma Functions
- Develop the skill of evaluating Laplace and inverse Laplace transform to solve linear systems under initial and boundary conditions
- Illustrate the concepts of Laplace Transform to find the solutions of physical problems such as Electrical circuits.
- Interpret the Fourier series and Fourier transform in the context of signals and systems.
- Solve difference equations by Z-Transform.
- Formulate Partial differential equations by eliminating arbitrary functions and arbitrary constants.
- Determine the solution of Boundary value problems (PDE) by Fourier Transform Method.

Unit-I
Improper Integrals and Beta, Gamma Functions: Beta and Gamma functions – Their properties – Evaluation of improper integrals in terms of Beta and Gamma functions.

Unit-II
Laplace Transform: Definition and existence of the Laplace Transform-Elementary functions-Properties of the Laplace transform-Convolution integral - Convolution theorem-Heaviside's unit step-function-Dirac delta function.

The inverse Laplace transform-Properties-Method of partial fractions-Heaviside's inversion formula-Inversion by convolution theorem.

Application of the Laplace transform to solve initial value problems and boundary value problems in ODE. Solution of a system of linear differential equations-Solution of problems in electrical circuits by Laplace transforms method.

Unit-III

Z-Transform and Fourier series: Definition-Z transform of elementary sequences-Properties- The inverse Z Transform, Application of Z transform to solve difference equations Definition of orthogonal functions-The concept of Weight function-Fourier series of   periodic functions- Fourier expansion of periodic functions-Half range Fourier series expansions.

Unit-IV

Fourier Transform: Exponential Fourier series-The continuous one dimensional Fourier transform-Properties-Convolution-Parseval's identity- Fourier Sine and Cosine transforms.

Unit-V

Partial differential equations: Formation of PDE-Solution of Lagrange's linear equations-Method of separation of variables to solve IBVP like 1-D heat, 1-D wave and BVP like 2-D Laplace's equations. Application of Fourier transform to the solution of partial differential equations.

Teaching Methodologies

1. Tutorial sheets uploaded in website
2. NPTEL video lectures
3. MATLAB exercises for visualization

Text Books

1. Advanced Engineering Mathematics: R. K. Jain and S. R. K. Iyengar Narosa Publishing House.
2. Advanced Engineering Mathematics: Erwin Kreyszig-Wiley
3. Schaum's outline series on Laplace transforms

Reference Books

1. Higher Engineering Mathematics: B. S. Grewal-Khanna Publications
2. Higher Engineering Mathematics: C. Das Chawla-Asian Publishers
3. GRIET reference manual

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

NUMERICAL METHODS

Course Code: GR14A1004   L:2 T:1 P:0 C:3
I Year II Semester

Prerequisites: Elementary calculus, Partial differentiation, Geometry and ordinary differential equations.

Course Objectives: The objective of this course is to provide the student with
- Explain the distinction between analytical and approximate solutions arising in mathematics
- Acquire skills that equip us to approximate a hidden function using data
- Learn methods that provides solutions to problems hitherto unsolvable due to their complex Nature.
- Create ability to model, solve and interpreted the Engg Problem.
- Introduce the various applications of interpolation in Science and Engg.

Course Outcomes: At the end of the course, the student will be able to
- Develop the skill of determining approximate solutions to problems having no analytical Solutions in different contexts
- Solve problems related to cubic spline fitting and approximation of functions using B-splines and least squares
- Develop the skill of finding approximate solutions to problems arising in linear differential Equations
- Identify how the numerical methods play a vital role in many areas in engineering for example Dynamics, elasticity, heat transfer, electromagnetic theory and quantum mechanics.
- Interpret the mathematical results in physical or other terms to see what it practically means and implies.
- Explain the concept of interpolation is useful in predicting future out comes base on the present knowledge.
- Solve the model by selecting and applying a suitable mathematical method.

Unit-I
Root finding techniques and Numerical solution of linear algebraic systems: Bisection method-Regula Falsi- Fixed point iteration method-Newton Raphson method - Rate of convergence of the above methods (without proof).
LU decomposition method-Cholesky's method-Jacobi and Gauss Seidel iteration methods- Convergence of iterative methods (without proof).

Unit-II

Interpolation and Cubic Splines: Finite differences - Forward, backward and central differences, Relationship between operators- Interpolation with uniform data**-**Newton's forward and backward difference interpolation formulas- Gauss forward, Gauss backward and Stirling's central interpolation formulas- Lagrange and Newton's divided difference interpolation formulas for non-uniform data-Cubic spline interpolation.

Unit-III

Curve fitting and B-spline approximation: Method of least squares- Fitting a straight line, and second degree parabola, exponential and power curves to data-Approximation of functions by B-Splines (Linear and Quadratic cases only).

Unit-IV

Numerical differentiation and numerical integration: Numerical differentiation using the Newton's forward, backward and central difference formulas-Numerical integration by Trapezoidal rule, Simpson's 1/3rd and 3/8th rules-Gauss-Legendre one point, two point and three point rules.

Unit-V

Numerical solution of initial and boundary value problems in ODE: Initial Value Problems: Picard's method of successive approximation, Solution by Taylor series method, Euler method, Runge-Kutta methods of second and fourth orders. Predictor-corrector methods, Combinations of first and second order P-C methods. Boundary Value Problems in ODE: Finite difference methods for solving second order linear ODE.

Teaching Methodologies

1. Tutorial sheets uploaded in website
2. NPTEL video lectures
3. MATLAB exercises for visualization

Text Books

1. Advanced Engineering Mathematics: R.K.Jain and S.R.K.Iyengar-Narosa Publishing House.
2. Advanced Engineering Mathematics: Erwin Kreyszig- Wiley.
3. Introductory methods of Numerical Analysis (5th edition)-S.S.Sastry-PHI.

Reference Books

1. Applied Numerical Methods using MATLAB- Yang, Cao, Chung & Morris – Wiley Interscience
2. Numerical methods in Engineering with MATLAB-Jaan Kiusalaas -- Cambridge University Press.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

PHYSICS FOR ENGINEERS

Course Code: GR14A1006   L:2 T:1 P:0 C:3
I Year II Semester

Prerequisites: Fundamentals in Physics and Mathematics.

Course Objectives: The objective of this course is to provide the student with
- Describe the various bonds between the atoms, crystal structures and their packing factors.
- Recognize the basic concepts of Acoustics, Acoustic quieting and ultrasonic applications.
- Discuss the origin of Electrical and Magnetic properties of various materials.
- Interpret the properties of laser light and how it is used for communication in optical fiber networks.
- Explain the latest developments of Nano-technology.

Course Outcomes: At the end of the course, the student will be able to
- Identify and describe various bonds between the atoms and properties of various materials.
- Recognize and design a building based on acoustical requirements.
- Find the advancements in material testing by using non destructive testing techniques.
- Classify various magnetic and dielectric materials and its utilization in various fields.
- Analyze why Laser light is more powerful than normal light and its applications in various fields.
- Demonstrate the applications of optical fibers in communication.
- Extend the knowledge of characterization techniques to know the composition of Nano material.

Unit-I
Crystal Structures: Lattice points, Space lattice, Basis, Bravias lattice, unit cell and lattice parameters, Seven Crystal Systems with 14 Bravias lattices , Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Miller Indices, Inter planer spacing of Cubic crystal system.
Defects in Crystals: Classification of defects, Point Defects: Vacancies, Substitution, Interstitial, Concentration of Vacancies, Frenkel and Schottky Defects, Edge and Screw Dislocations (Qualitative treatment), Burger's Vector.

Unit-II

Acoustics & Acoustic Quieting: Basic Requirement of Acoustically Good Hall, Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time(Qualitative Treatment), Measurement of Absorption Coefficient of a Material, Factors Affecting the Architectural Acoustics and their Remedies. Acoustic Quieting: Aspects of Acoustic Quieting, Methods of Quieting, Mufflers, Sound-proofing.

Ultrasonics: Introduction, Production of ultrasonic waves: Piezo electric & Magnetostriction methods, Properties of ultrasonic waves, Applications of ultrasonics: Introduction to NDT, Ultrasonic testing systems: pulse echo, trough transmission, Resonance systems and Ultrasonic testing methods: Contact and Immersion methods.

Unit-III

Dielectric Properties: Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Types of polarization: Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities (Electronic & Ionic) -Internal Fields in Solids, Clausius -Mossotti Equation, Piezo-electricity and Ferro- electricity. Magnetic Properties: Magnetic Permeability, Magnetic Field Intensity, Magnetic Field Induction, Intensity of Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magnetron, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Hysteresis Curve on the basis of Domain Theory of Ferro Magnetism, Soft and Hard Magnetic Materials, Ferrites and their Applications.

Unit-IV

Lasers: Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Einstein's Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers. Fiber Optics: Structure and Principle of Optical Fiber, Acceptance Angle , Numerical Aperture, Types of Optical Fibers (SMSI,MMSI,MMGI), Attenuation in Optical Fibers, Application of Optical Fibers, Optical fiber Communication Link with block diagram.

Unit-V

Nanotechnology: Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Bottom-up Fabrication: Sol-gel Process; Top-down Fabrication: Chemical Vapor Deposition, Physical, Chemical and Optical properties of Nano materials, Characterization (SEM, EDAX), Applications.

Teaching Methodologies
1. Power Point Presentations
2. Assignments uploaded in website.

Text Books
1. Engineering Physics: P.K.Palanisamy, Scitech Publishers.
2. Engineering Physics: S.O.Pillai, New age International.
3. Applied Physics: T.Bhima Sankaram,G Prasad,BS Publications.

Reference Books
1. Solid State Physics, Charles Kittel, Wiley & Sons (Asia) Pte Ltd.
2. Fundamentals of physics, Halliday,Resnick,Walker.
3. Optical Electronics, A.J Ghatak and K.Thyagarajan, Cambridge University Press.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH

Course Code: GR14A1005   L:2 T:1 P:0 C:3
I Year II Semester

Prerequisites: Familiarity with basic language and communication skills.

Course objectives: The objective of this course is to provide the student with
- Identify the importance to acquire Basic Language Skills in English.
- Relate the vocabulary, Grammar and Structures in English.
- Practice to analyze and express their ideas in the new context.
- Demonstrate the learnt public speaking skills in an enthusiastic manner.
- Integrate oral and written communication skills.

Course outcomes: At the end of the course, the student will be able to
- Read and comprehend a wide range of text and know the importance of lifelong learning.
- Improve English language proficiency with an emphasis on LSRW skills.
- Interpret academic subjects with better understanding.
- Express ideas fluently and appropriately in terms of various social and professional areas.
- Revamp English language skills to meet the corporate needs.
- Present themselves in various formal, social and professional situations.
- Improve literary sense through wide range of selections from various genres.

Unit-I
1. Chapter entitled Sir C.V. Raman: A Path breaker in the saga of Indian Science from "Enjoying Every day English", Published by Sangam Books, Hyderabad.
2. Chapter Entitled Mother Teresa from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Tutorial-1: Present a small biographical sketch of an inspiring personality
Tutorial-2: Prepare an essay on "Charity begins at home."

Unit-II
Grammar & Vocabulary Development: Articles: Types of Articles and their usages; Tense and Aspect; Subject and Verb Agreement; Prepositions
Vocabulary Development: Synonyms and Antonyms; One-word substitutes; prefixes and suffixes; words often confused; idioms and phrases.

Speaking & Writing skills: Information transfer: verbal to graphical presentation and from graphical presentation to verbal. Public Speaking: Body Language, Presentation Skills and its Features.

Tutorial-3: Worksheet on the usage of Tenses, Articles and Prepositions
Tutorial-4: Exercises on vocabulary
Tutorial-5: Interpretation of data from different formats
Unit-III
1. Chapter Entitled The Connoisseur from "Enjoying Every day English", Published by Sangam   Books, Hyderabad
2. Chapter Entitled Sam Pitroda from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur.

Tutorial-5: Story Analysis
Tutorial-6: Present a person who bears risk taking ability to solve the problems of people/society
Tutorial-7: Describe a strange event that occurred in your life

Unit-IV
1. Chapter Entitled Bubbling Well Road from "Enjoying Every day English", Published by Sangam Books, Hyderabad
2. Chapter Entitled Amartya Kumar Sen from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Tutorial-9: Oral Presentation on "Does the quality of Unity in Diversity helped us to acquaint easily with the trends of globalization?"
Tutorial-10: Develop an essay "The ways to impart moral and ethical values amongst the students."
Unit-V
1. Chapter entitled The Cuddalore   Experience from "Enjoying Every day English", Published by Sangam Books, Hyderabad
2. Chapter Entitled Martin Luther King Jr. (I have a dream) from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur
Tutorial-11: Presentation on "The possible ways to educate students about Disaster Management."
Tutorial-12: Write or present "Is every present leader was a follower?"

Text Books
1. Enjoying Every day English by A. Rama Krishna Rao- Sangam Books
2. Inspiring Speeches and Lives by Dr.B. Yadava Raju, Dr.C. Muralikrishna, Maruthi Publications.

Reference Books
1. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
2. Effective Technical Communication, M. Ashraf Rizvi, Tata McGraw Hill.
3. Technical Communication, Meenakshi Raman, Sangeeta Sharma, Oxford higher Education.
4. English for Engineers Made Easy, Aeda Abidi, Ritu Chaudhry, CengageLearning.
5. Communicate or Collapse, Pushp Latha, Sanjay Kumar, PHI Learning Pvt.Ltd.
6. Communication Skills, Sanjay Kumar, Pushp Latha, Oxford HigherEducation.
7. A Hand Book for Engineers, Dr. P. Eliah, BS Publications

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER PROGRAMMING AND DATA STRUCTURES

Course Code: GR14A1011   L:2 T:1 P:0 C:3
I Year II Semester

Prerequisites: Knowledge of mathematics required

Course Objectives: The objective of this course is to provide
- Basic computer system concepts.
- Design of algorithms and draw flowcharts in a language independent manner.
- Concepts of C-programming language such as variables, operators, branching, looping, functions, arrays, pointers, structures and files.
- Functions available in C-library.
- Use of recursive functions and non-recursive functions
- Knowledge of manipulating files.
- To experiment searching, sorting techniques and basic operations of stacks and queues

Course Outcomes: At the end of the course, the student will be able to
- Describe the basic computer system concepts.
- Design algorithm, draw flowchart and write the program for a given scenario.
- Use the concepts of C-programming language and functions available in C-library to develop the programs.
- Examine the static memory allocation and dynamic memory allocation.
- Experiment   recursive and non-recursive functions
- Create and update files.
- Experiment on searching, sorting techniques and basic operations of stacks and queues.

Unit-I
Introduction to Computers: Computer Hardware and Software, System Software, Program Development Steps, Algorithms, Flowcharts.
Introduction to C: Structure of C-Program, Keywords, Identifiers, Data Types, Constants, Variables, Operators, Expressions, Precedence and Order of Evaluation, Type Conversions and Type Casting .
Managing I/O: Input-Output Statements, Formatted I/O.

Unit-II
Decision Making Statements: if, if-else, if-else-if, nested if, switch

Iterative Statements: while, do- while, for
Unconditional Statements: break, continue, go to.
Arrays: Introduction, One-dimensional Arrays, Declaring and Initializing Arrays, Multidimensional Arrays.
Strings: Introduction to Strings, String Handling Functions, Array of Strings.

Unit-III
Functions: Introduction, Function Definition, Function Declaration, Function Calls, Return Values and Their Types, Categories of Functions, Nested Functions, Recursion, Storage Classes, Passing Arrays to Functions.
Pointers: Pointers and Addresses, Pointer Expressions and Pointer Arithmetic, Pointers and Functions, Pointers and Arrays, Pointers and Strings, Array of Pointers, Pointer to Pointers.

Unit-IV
Structures: Basics of Structures, Nested Structures, Arrays of Structures, Arrays within Structures, Structures and Functions, Self Referential Structures, Unions.
Files: Introduction, Types of Files, File Access Functions, I/O on Files, Random Access to Files, Error Handling, Command Line Arguments.

Unit-V
Sorting: Bubble sort, Merge sort, Insertion sort, Selection Sort, Quick Sort.
Searching: Linear Search, Binary Search.
Introduction to Data Structures: Stack Operations using Arrays: Push and Pop,
Queue Operations using Arrays: Insert, Delete

Teaching Methodologies: White board and marker, power point presentation

Text Books
1. The C Programming Language, BRIANW. KERNIGHAN Dennis M.Ritchie, Second Edition, PHI.
2. Programming in C, Pradip Dey, Manas Ghosh, Second Edition, Oxford University Press.
3. Computer Programming and Data structures by EBalaguruswamy, published by Mc Graw Hill.

Reference Books
1. Data structures using C, A.K. Sharma,Pearson publication
2. Let Us C, Yashwanth Kanetkar, 10th Edition, BPB Publications.
3. C& Data structures, P.Padmanabham, B.S. Publications.
4. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
5. Programming with problem solving, J.A.Jones & K.Harrow, Dreamtech Press.
6. Programming in C, Stephen G.Kochan, III Edition, Pearson Education.
7. Data Structures and Program Designing, C,R.Kruse, C.L.Tondo, B P Leung, Shashi M, Second Edition, Pearson Education.
8. Programming in C, Ashok N Kamthane, 2nd edition, Pearson Publication.
9. Introduction to Data Structures in C, Ashok N Kamthane , Pearson Publication.

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ENGINEERING MECHANICS-DYNAMICS

Course Code: GR14A1020   L:3 T:1 P:0 C:4
I Year II Semester

Prerequisites: A good working knowledge of calculus, vector algebra, General Physics & Engineering Mechanics-statics is required.

Course Objectives: The objective of this course is to provide
- Basic principles describing the motion of particles and rigid bodies under accelerating conditions.
- Principles of dynamic behavior to practical problems
- Concept of D'Alembert's principles and related problems
- Concepts of impulse and momentum of particles and rigid bodies
- Concepts of vibrations to the problems associated with dynamic behaviour

Course Outcomes: At the end of the course, the student will be able to
- Define kinematics of a particle, rectilinear and curvilinear motion,kinetics of particles
- Apply Newton laws, work and energy method for kinematics of a rigid body in plane motion-
- Evaluate rotational motion about a fixed axis of rigid bodies.
- Evaluate kinetics of a rigid body in plane motion.
- Solve various cases of impulse momentum basic problems.
- Evaluate moving bodies using DAlembert's principle
- Analyze various cases for vibration in mechanical components

Unit-I
Kinematics of Particles- Rectilinear Motion: Introduction- Rectilinear motion of a particle, displacement, velocity and acceleration. Rectilinear motion along X-axis, Determination of motion of particle using methods of differentiation and integration. D'Alembert's Principle.

Uniformly accelerated motion: velocity-time, displacement-time & velocity-displacement relationship. Motion curves- graphical representation of motion of particles. Motion along vertical Y-axis. Motion of the particle projected horizontally in air.
Kinematics of Particles-curvilinear Motion: Introduction, curvilinear motion of a particle, rectangular components of velocity, acceleration components of particle-tangential & normal acceleration components, radial & transverse components of acceleration. Projectile motion, Projectile on Inclined Plane.

Unit-II
Kinetics of Particle: Introduction-Definitions of Matter, body, particle, mass, weight, inertia, momentum. Newton's law of motion. Relation Between force & mass. Motion of a particle in rectangular coordinates. Motion of Lift. Motion of body on an inclined plane. Motion of connected Bodies.

Work Energy method: law of conservation of Energy, Application of Work Energy Method to particle motion and connected system.

Unit-III
Impulse and Momentum: Introduction- Impact, Momentum, Impulse & Impulsive forces, Units. Law of conservation of Momentum, Newton's law of collision of elastic bodies- coefficient of Restitution. Recoil of Gun. Impulse Momentum Equation, Non-Impulsive Forces, Impact of jet on a stationary perpendicular flat plate, Impact of jet on a Moving Perpendicular Flat plate.

Unit-IV
Kinematics & Kinetics of Rigid Body: Kinematics of Rigid Bodies: Types of Rigid body motions- Motion of translation, Motion of Rotation, & General Plane Motion. Rotational motion about a fixed axis- Angular displacement, Angular Velocity, Angular acceleration. Equations of circular motion-Rotational motion with constant Angular Acceleration & angular Velocity. Relation between linear & angular acceleration.

Kinetics of Rigid Bodies: Defintions- Force & Translation, Moment of couple & rotation, Torque & rotation. Newton's Law of Rotation. Relation between torque & Moment of inertia. Motion of bodies tied to a string and passing over a pulley.

Unit-V
Mechanical Vibrations: Introduction-simple harmonic motion, Definitions. Equations of Simple Harmonic Motion, Motion of a body attached to a spring, springs in series & in parallel, Horizontal Motion of a block attached to a spring. Simple pendulum, seconds pendulum, gain & loss of oscillations due to change in gravity (g) & length (l) of a simple pendulum, compound pendulum, torsional pendulum.

Teaching Methodology
Power point Presentations, Working models, white board & marker.
Text Books
1. Engineering Mechanics by A. Nelson, Tata-McGrawhill
2. Engineering Mechanics-Timoshenko & Young, Tata-McGrawhill

Reference Books

1. Engineering Mechanics by Pakirappa, Durga publications.

2. Engineering Mechanics- R.S Khurmi, S Chand Publications

3. Engineering Mechanics- R.C. Hibbler, twelfth edition, Prentice hall.

4. Engineering Mechanics- A.K Tayal, Uma Publications.

5. Engineering Mechanics- Basudeb Bhattacharya, Oxford University Press

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ENGINEERING WORKSHOP

Course Code: GR14A1025   L:0 T:0 P:2 C:2
I Year II Semester

Prerequisites: Knowledge in dimensions and units, Usage of geometrical instruments and analytical ability

Course Objectives: The Objective of this course is to provide the student
- Introduction to general machining skills in the students
- Develop a skill in dignity of labour, precision, safety at work place, team working and development of right attitude
- To provide the students with hands on experience on different trades of engineering like Carpentry, Tinsmithy, Welding and Housewiring
- Production of simple models
- To perform different practical techniques

Course Outcomes: At the end of the course, students will be able to
- Design and model different prototypes in the Carpentry trade such as Cross lap joint, Dove tail joint
- Create various types in the trade of Fitting such as Straight fit, V-fit
- Construct various basic prototypes in the trade of tin smithy such as rectangular tray and open scoop etc.
- Analyze to make in the trade of Tin Smithy such as Rectangular tray and Open Cylinder
- Apply various House Wiring techniques such as Connecting one lamp with one switch,
- Develop various basic house wiring techniques such as two lamps with one switch, Connecting a Fluorescent tube, Series Wiring, Go down wiring
- Demonstrate to develop various basic prototypes in the trade of Welding such as Lap joint, Lap Tee joint, Butt joint and Corner joint

Unit-I
Carpentry Shop – 1:
1.1. Introduction to various types of wood such as Teak, Mango, Sheesham, etc. (Demonstration and their identification).
1.2. Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.
    Job I Marking, sawing, planning and chiselling & their practice
1.3. Introduction to various types of wooden joints, their relative advantages and uses.

Job II Preparation of half lap joint
Job III Preparation of Mortise and Tenon Joint
1.4. Safety precautions in carpentry shop.

Unit-II
Fitting Shop – 2:
2.1. Introduction to fitting shop tools, common materials used in fitting shop.
2.2. Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.
Job I   Marking of job, use of marking tools and measuring instruments.
Job II   Filing a dimensioned rectangular or square piece of an accuracy of + 0.5 mm
Job III   Filing practice (production of flat surfaces). Checking by straight edge.
Job IV Making a cutout from a square piece of MS Flat using hand hacksaw such as T-fit and V-fit
2.3. Care and maintenance of measuring tools like callipers, steel rule, try square.

Unit-III
House wiring – 3:
3.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, PVC Conduits.
3.2 Study of electrical safety measures and demonstration about use of protective devices such as fuses, and relays including earthing.
Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin plugs.
Job II Preparation of a house wiring circuit on wooden board using fuse, switches, socket, holder, ceiling rose etc. in PVC conduit and PVC casing and capping wiring system.
Job III Two lamps in series and parallel connection with one way switch
Job IV Two lamps in series and one lamp in parallel connection with one way switch.
Job V Stair case lamp connection with two way switch.

Unit-IV
Tin- smithy – 4:
4.1 Introduction to tin -smithy shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material and specifications.
4.2 Introduction and demonstration of hand tools used in tin -smithy shop.
4.3 Introduction and demonstration of various raw materials used in sheet

metal shop e.g. M.S. sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheets etc.

4.4. Preparation of a rectangle tray and open scoop/ funnel.

Reference books

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media   Promoters and Publishers Pvt. Ltd., Bombay

2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.

3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd.

4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd.,New Delhi

5. Workshop Technology by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi.

6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING PHYSICS LAB

Course Code: GR14A1029   L:0 T:0 P:2 C:2
I Year II Semester

Prerequisites: Fundamentals of Physics and Mathematics.

Course objectives: The objective of this course is to provide the student with
- Record and tabulate physical quantities like resistance, capacitance, a.c voltage and frequency by using digital multimeter and CRO.
- Classify the behavior and characteristics of dielectric and magnetic materials for its optimum utilization.
- Apply the theoretical concepts of optical fibers in practical applications.
- Analyze the behavior of semiconductors in various aspects.
- Revise the basic properties of light like interference, diffraction through hands on experience.

Course outcomes: At the end of the course, the student will be able to
- Identify the usage of CRO, digital multi meter to record various physicalquantities.
- Distinguish the characteristics and behavior of dielectric materials in a practical manner.
- Calculate losses in optical fiber and interpret them to the optical communication systems.
- Quantify the type of semiconductor and measurement of energy gap in a semiconductor.
- Investigate the properties of light like interference and diffraction through experimentation.
- Examine the behavior of magnetic materials with the help of graph.
- Analyze the characteristics of light emitting diodes for their optimum utilization.

List of Experiments
` 1. Determine the energy gap of a given semiconductor.
2. Calculate the energy loss in a given Ferro magnetic material by plotting B-H curve.
3. Calculate the Numerical Aperture of a given optical fiber.
4. Determine the Dielectric constant and Curie temperature of PZT material.
5. Calculate the Acceptance angle of a given optical fiber.
6. Draw V-I & L-I Characteristics of LASER diode.
7. Determine the bending losses in a given optical fibers.
8. Determine the Air-gap losses in a given optical fibers.
9. Determine the Hall Coefficient in Ge semiconductor by using Hall Experimental setup.
10. Determine the carrier concentration, mobility of charge carrier in Ge semiconductor.
11. Measure Ac voltage and frequency through CRO.
12. Measure Resistance and Capacitance by using digital multimeter.
13. Diffraction Grating.
14. Newtons Ring.

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COMPUTER PROGRAMMING AND DATA STRUCTURES LAB

Course Code: GR14A1028   L:0 T:0 P:2 C:2
I Year II Semester

Prerequisite: Basic operations of computer

Course Objectives: The objective of this course is to provide
- The fundamentals of C programming language and analyze the given problem.
- The proficiency in writing programs in procedure oriented language.
- The concepts of searching and sorting algorithms for solving real time problems.
- The functions available in C-library.
- Knowledge of manipulating files
- Operations on stacks and queues.
- Programs in recursive and non-recursive manner

Course Outcomes: At the end of the course, students will be able to
- Use the programming concepts and c-library functions for writing the programs.
- Write a program to a given problem.
- Analyze and debug the given program.
- Create and update files
- Differentiate static and dynamic memory allocation.
- Apply searching and sorting techniques for real time scenario.
- Experiment the basic operations of stacks and queues.

Task- I
a) The heights of three students are 165, 148, 154 cm. respectively. Write a c program to sort the heights of the students in descending order.
b) Write a C program to find the roots of a quadratic equation using if-else.
c) The program should request the user to input two numbers and display one of the following as per the desire of user.
   (a) sum of numbers
   (b) difference of numbers
   (c) product of the numbers
   (d) division of the numbers.

Write a C program using switch statement to accomplish the above task.

d) In a mathematical number sequence let the first and second term in the Sequence are 0 and 1. Subsequent terms are formed by adding the preceding terms in the sequence. Write a C program to generate the first 10 terms of the sequence.

Task-II
a) Write a C program to construct pyramid of numbers.
b) The reliability of an electronic component is given by reliability r=e-λt where λ is the component failure rate per hour and t is the time of operation in hours. Determine the reliability at various operating times from 0 to 3000 hours by plotting a graph using a C program. The failure rate λ is 0.001. Plot the graph with a special symbol.
c) Write a C program to accept the date of birth and the current date to find the age of the person . The output should specify the age of a person in terms of number of years, months and days.

Task-III
a) Write a C program to calculate the following Sum: Sum=1-x2/2!+x4/4!-x6/6!+x8/8!-x10/10!
b) For a certain electrical circuit with an induction (L) and Resistance (R) , the damped natural frequency is given by f=√ (1/LC – R2/ 4C2). Write a C program to calculate the frequency for different values of C starting from 0.01 to 0.1.
c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Task-I V
a) Write a C program to find both the largest and smallest number in a list of integers.
b) Write a C program to count the lines, words and characters in a given text.
c) Write a C program to sort the names of 5 students in the alphabetical order. Ex: Rita, Sneha, Priti, Briya, kitti as Briya , Kitti, Priti, Rita, Sneha

Task-V
a) Write a C program to print all the rotations of a given string.
Ex: Rotations of the string "NEWS" are NEWS
EWSN   WSNE   SNEW
b) Write a C program to perform the following operations:
    i)   To insert a sub-string in a given main string at a given position.
    Ii)   To delete n Characters from a given position in a given string.

Task-VI

a) Write a C program that uses functions to perform the following:
   i)   Transpose of a matrix
   ii) Addition of Two Matrices
   iii) Multiplication of two matrices

Task-VII

a) Write a C programs that use both recursive and non-recursive functions
   i) To find the factorial of a given integer.
   ii) To find the GCD (greatest common divisor) of two given integers.

Task-VIII

a) Using pointers, write a function that receives a character string and a character as argument and deletes all occurrences of this character in the string.

b) Write a function using pointer parameter that compares two integer arrays to see whether they are identical. The function returns 1 if they are identical, 0 otherwise.

Task-IX

a) Write a c program which accepts employee details like (outer structure : name, employid, salary and (inner structure : area, street number, houseno)).Display the employee names and id belonging to a particular area.

b) Write a C program that uses functions to perform the following operations:
   i) Addition of two complex numbers
   ii) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Task-X

a) Write a C Program to display the contents of a file.
b) Write a C Program merging of two files in a single file.
c) Write a C Program to append data into a file.
d) Write a C program to reverse the first n characters in a file.

(Note : The file name and n are specified on the command line.)

Task-XI

a) Write a C Program to Search for a given element using Linear & Binary Search Techniques.

b) Write a C Program to Sort a given list of integers using Bubble Sort Technique.

Task-XII
- a) Write a C Program to Sort a given list of integers using Merge Sort Technique.
- b) Write a C Program to Sort a given list of integers using Insertion Sort Technique.

Task-XIII
A) Write a C Program to Sort a given list of integers using Quick Sort Technique.
 b) Write a C Program to Sort a given list of integers using Selection Sort Technique.

Task-XIV
- a) Write a C program to implement the following using arrays.
    - i) Push and pop operations of a stack
    - ii) Insert and delete operations of a queue

Text Books
1. The C Programming Language, BRIANW. KERNIGHAN Dennis M.Ritchie, Second Edition, PHI.
2. Programming in C, Pradip Dey, Manas Ghosh, Second Edition, Oxford University Press.
3. Computer Programming and Data structures by EBalaguruswamy, published by Mc Graw Hill.

Reference Books
1. Data structures using C, A.K. Sharma,Pearson publication
2. Let Us C, Yashwanth Kanetkar, 10th Edition, BPB Publications.
3. C& Data structures, P.Padmanabham, B.S. Publications.
4. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
5. Programming with problem solving, J.A.Jones & K.Harrow, Dreamtech Press.
6. Programming in C, Stephen G.Kochan, III Edition, Pearson Education.
7. Data Structures and Program Designing, C,R.Kruse, C.L.Tondo, B P Leung, Shashi M, Second Edition, Pearson Education.
8. Programming in C, Ashok N Kamthane, 2nd edition, Pearson Publication.
9. Introduction to Data Structures in C, Ashok N Kamthane , Pearson Publication.

II-Year

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUILDING MATERIALS AND CONSTRUCTION PLANNING

Course Code: GR14A2003   L:3 T:1 P:0 C:4
II Year I Semester

Prerequisites
- Knowledge of Building Materials
- Knowledge of Engineering Drawing

Course Objectives: The objective of this course is to provide the student
- Introduction to techniques of construction planning
- Understanding the significance of properties of building materials.
- Skill to choose suitable material and construction process for given situation
- Visualization of different types of masonry construction.
- Knowledge of the various building and general construction products and their associated quality, durability, warrantees and availability.

Course Outcomes: At the end of course, the student will be able to
- Apply knowledge of science and engineering for eco friendlyconstruction.
- Recognize the methods to control cost of construction.
- Create awareness about green building practice
- Develop a team environment to analyze existing building types, develop a list of programmatic requirements, sketch a schematic design, and use this information to develop drawings and models sufficient to present a competent architectural design solution.
- Express the fundamental knowledge of the systems and processes used to construct the built environment, including an understanding of industry terminology.
- Generalize the various quality control aspects of civil engineering materials
- Describe the properties, uses and variety of materials important in construction.

Unit-I
Building Stones, Bricks, Tiles: Stone- Building stones, classification of building stones, quarrying procedures, structural Requirement, dressing, and tools for dressing of stones. BRICKS-Composition of brick earth, manufacturing of brick, structural requirements, field and lab test. TILES - Types of tiles, manufacturing of tiles, structural requirements of tiles.

Unit-II

Cement, Lime, Admixtues: Ingredients of cement, manufacturing of cement, field and lab tests. ADMIXTURES - Mineral admixtures, chemical admixtures. LIME-Various ingredients of lime, constituents of limestone and classification of lime, manufacturing of lime.

Unit-III

WOOD, GLASS, PAINTS: WOOD-Structure, types of wood, properties of wood, seasoning, defects, alternative material for wood. GLASS-Types of glasses, manufacturing of glass. PAINTS- Constituents of paints, types of paints. BUILDINGCOMPONENTS-Lintel, arches, staircase, floors, roofs, foundation, dcp. JOINARYS-Doors, windows, materials and types.

Unit-IV

Masonarys and Finishing, Form Works

BRICK MASONRY- Types, bonds. STONE MASONRY- Types, composite masonry, concrete reinforced bricks, and glass reinforced brick. FINISHING SLOPE- plastering, pointing, and cladding- Types of ACP (Aluminum composite panel). FOAM WORKS - requirements, standards, staff holding, shoring, under pinning.

Unit-V

Building Services and Building Planning

BUILDING SERVICES- Plumbing services, water distribution, sanitary lines and fittings, ventilators, functional requirements, systems of ventilators, air conditioning essentials and types, acoustics. CHARACTERISTICS- Absorption, fire protections, fire hazards, classification of fire resistance materials and construction. BUILDING PLANNING - Principles of building planning, classification of building and building by-laws.

Teaching Methodologies

1. White board marker
2. PPT

Text Books

1. SK Duggal, Building Materials, New Age Publications 4th Edition, April, 2014.

2. B C Punmia, Ashok Kumar Jain and Arun Kumar Jain, Building Construction, Laxmi Publications (P) Ltd., New Delhi, 10th Edition, 2013.

3. P C Varghese, Building Construction, Prentice hall of India Private Ltd., New Delhi, 2nd Edition, 2007.

Reference Books

1. R. Choudly "Construction Technology" Vol. – 1 & 2, 2nd Edition, Longman, UK, 1987.

2. P C Varghese, Building Construction, Prentice Hall of India Private Ltd., New Delhi, 2nd Edition, 2007.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL TECHNOLOGY

Course Code: GR14A2004   L:2 T:1 P:0 C:3
II Year I Semester

Course objectives: On completing this course student will be able to
- Learn the basic principles of electricity and terminology.
- Understand and apply fundamental electrical theory and laws in basic series and parallel dc circuits including ohm's law, power, application of ohm's law & Kirchhoff's laws.
- Learn the principle, working operations of various DC and AC machines.
- Measure the fundamental electrical quantities using digital and analog multi-meters and an oscilloscope.
- Learn the basic semiconductor switching devices and its characteristics.
- Learn how to use a single generator to obtain a desired voltage or frequency.
- Learn the rectification (AC to DC) by using diodes.

Course outcomes: At the end of the course, the student will be able to
- Analyse circuit models for elementary electronic components.
- Know the application of ohms law & Kirchhoff's laws.
- Familiar with ac and dc circuits solving.
- Find role of electrical machinery in simple & complex applications.
- Demonstrate the designing and conducting experiments, to analyze and interpret data, and also provides the ability to visualize and work on laboratory and multidisciplinary tasks.
- Measure the fundamental electrical quantities using oscilloscope.
- Know about fundamental principles of electrical machines.

Unit-I
Electrical Circuits: Basic definitions, Types of elements, Ohm's Law, Resistive networks, Kirchhoff's Laws, Inductive networks, Capacitive networks, Series, Parallel circuits and Star-delta and delta star transformations.

Unit-II
DC Machines and Ac Machines: Principle of operation of DC Generator – emf equation - types – DC motor types – torque equation – applications – three point starter. Principle of operation of alternators – regulation by synchronous impedance method – Principle of operation of induction motor – slip – torque characteristics – applications.

Unit-III
Transformers and Instruments: Principle of operation of single phase transformers – EMF equation – losses – efficiency and regulation.
Basic Principle of indicating instruments – permanent magnet moving coil and moving iron instruments.

Cathode Ray Oscilloscope: Principles of CRT (Cathode Ray Tube), Deflection, Sensitivity, Electrostatic and Magnetic deflection, Applications of CRO - Voltage, Current and frequency measurements.

Unit-IV
Diode and it's Characteristics: P-N junction diode, symbol, V-I Characteristics, Diode Applications, Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems).

Unit-V
Transistors: P-N-P and N-P-N Junction transistor, Transistor as an amplifier, SCR characteristics and applications.

Teaching Methodologies
1. ET PPTs
2. Assignments uploaded in website

Text Books
1. David V. Kerns, JR. J. David Irwin, Essentials of Electrical and Computer Engineering.
2. V. K. Mehta, S. Chand & Co, Principles of Electrical and Electronics Engineering.

Reference Books
1. M.S Naidu and S. Kamakshaiah , Introduction to Electrical Engineering, TMH Publications.
2. Kothari and Nagarath, Basic Electrical Engineering, TMH Publications, 2nd Edition.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRENGTH OF MATERIALS-I

Course Code: GR14A2005   L:3 T:1 P:0 C:4
II Year I Semester

Prerequisites
- Fundamentals of Engineering Mathematics
- Knowledge of Engineering Mechanics

Course objectives: The objective of this course is to provide the student
- Knowledge of stresses, strains and elastic constants of different material and the concept of strain energy.
- Skill to determine the Principal stresses and strains under different loading using Mohr's Circle method.
- Understanding of the shear force and bending moment for different types of beams such as cantilever, simple supports and fixed beams etc.
- Ability to evaluate the flexural and shear stress concepts for the different materials and shapes of the structure.
- Knowledge on deflection of beam for different materials under various loading conditions by moment area, double integration & Macaulay's method.

Course outcomes: At the end of course, the student will be able to
- Determine the stresses, strains, elastic constants such as modulus of elasticity, modulus of rigidity, Poisson's ratio and bulk density. And also to determine the strain energy for various types of loading.
- Determine the shear force, bending moment diagrams and identify the point of contra flexure for different types of beams such as cantilever, simple supports and fixed beams etc. with different loading.
- Formulate the bending equation and shear equation to calculate the bending stresses and shear stresses for the different sections of the structural members.
- Evaluate the slope and deflection of different beams for the different end conditions and loading by using different methods such as double integration and moment area method etc.
- Analyze the principal and tangential stresses in the different planes by using analytical and graphical methods.
- Utilize appropriate materials in design considering engineering properties, sustainability.
- Perform engineering work in accordance with ethical and economic constraints related to the design of structures.

Unit-I
Simple Stresses and Strains: Elasticity and plasticity-Types of stresses and strains-Hooke's law-Elastic constant and the relationship between them. Stress-strain diagram for mild steel-Lateral strain, poisson's ratio and volumetric strain-Bars of varying section-composite bars-Temperature stresses**,** Working stress, factor of safety.
Strain Energy: Resilience-Gradual, sudden, impact and shock loadings-simple applications.

Unit-II
Shear Force and Bending Moment: Definition of beam-Types of beams, loading and support conditions-concept of shear force and bending moment-S.F and B.M diagrams for various types of statically determinate beams like cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads and applied moments and combination of these loads-point of contra flexure-Relation between S.F, B.M and rate of loading at a section of a beam

Unit-III
Stresses in Beams Flexural Stresses: Theory of simple bending-Assumptions-Derivation of pure bending equation: $M/I=f/y=E/R$-Neutral axis-Determination of bending stresses-section modulus of rectangular and circular sections (solid and hollow), I-Section, T-Section, Angle and Channel sections-Design of simple beam sections & flitched beams.
Shear Stresses: Derivation of formula-Shear stress distribution across various beam sections like rectangular, circular, triangular, I-Section, T-Section and angle sections.

Unit-IV
Deflection of Beams: Bending into a circular arc-slope, deflection and radius of curvature-Differential equation for the elastic line of a beam-Double integration and Macaulay's methods- Determination of slope and deflection for cantilever and simply supported beams, subjected to point loads, U.D.L, Uniformly varying loads-Mohr's theorems-moment area method-application to simple cases including overhanging beams.

Unit-V
Principal Stresses and Strains: Introduction-stresses on an inclined section of a bar under axial loading-compound stresses-Normal and Tangential stresses on an inclined plane for biaxial stresses-two perpendicular normal stresses accompanied by a state of simple shear- Mohr's circle of stresses-principal stresses and strains-Analytical and graphical solutions-Various theories of failures like Maximum Principal stress theory-Maximum shear stress theory-Maximum strain energy theory-Maximum shear strain energy theory.

Teaching Methodologies
1. White board and markers

Text Books
1. Dr. B. C. Punmia, Mechanics of Materials, Laxmi publications, 10th Edition, 2013.
2. B. S. Basavarajaiah, Strength of Materials, University Press, Hyderabad, 3rd Edition, 2010.
3. Dr. R. K. Bansal, Strength of material, Laxmi Pulications, New Delhi, 5th Edition, 2012.

Reference Books
1. Ferdinand Beer and others, Mechanics of Solid, Tata Mc. Graw Hill publications, 6th Edition, 2000.
2. Schaum's out line series, Strength of materials, Mc. Graw Hill International Editions, 6th Edition, 2011.
3. R. K. Rajput, Strength of materials, S. Chand & Co, New Delhi, 5th Edition, 2010.
4. A.R.Basu, Dhanpat Rai & Co, Strength of materials, Nai Sarah, New Delhi, 2nd Edition, 2010.
5. Bhavi Katti, Strength of materials, New Age Publications, 3rd Edition, 2008, Re-print 2009.
6. Strength of materials by R. Subramanian, Oxford University Press, New Delhi, 2rd Edition, 2010.
7. Strength of material- S. Ramamrutham, Dhanpat Rai Publishing Company, New Delhi, 15th Edition, 2007.
8. Strength of material- R.S. Khurmi, S. Chand & Company Ltd., New Delhi, 2010 Re-print.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

SURVEYING

Course Code: GR14A2006   L:3 T:1 P:0 C:4
II Year I Semester

Prerequisites
- Knowledge of Mathematics

Course Objectives: The objective of this course is to provide the student
- Knowledge to take the measurements between two points which is useful for determining the area or volume of a land
- Skill of determining the elevations using available survey instruments
- Scope for the application of basic knowledge of maths, science as well as civil engineering into surveying
- Introduction to advanced surveying tools like G.P.S and G.I.S
- Knowledge of recording the field data directly into computer
- Understanding the importance of professional licensure to protect the public in the practice of land surveying
- Gaining an appreciation of the need for lifelong learning

Course Outcomes: At the end of course, the student will be able to
- Interpret a plan and setting out the frame work in the field
- Function as a member of a survey party in completing the assigned field work
- Illustrate the need for licensed surveyors to establish positioning information for property and structures
- Illustrate the need for accurate and thorough note taking in field work to serve as a legal record
- Classify the difference between plane surveying and geodetic surveying
- Utilize vertical angle measurement devices to solve complex distance measurements.
- Apply advanced survey software tools like G.P.S Q-GIS and arch-GIS

Unit-I
Introduction: Definition-Objectives, principals and classification of plane surveying (chain, compass and plane table), types of Compass, Compass survey-meridian, Azimuthal and bearing, declination, computation of angles. Chain-uses of chain and tape, types, testing on chain, chain correction problems, Ranging, Instruments used in Chain Surveying, ODM, Plane table-methods of plane table, principles, errors and precautions.

Unit-II
Leveling : Concepts and technology, Basic Definitions in leveling, temporary and permanent adjustments , calculations of reduced level , problem on radius of curvature, refraction ,HI, reciprocal.
Contouring: Definition, characteristics, methods of contouring and plotting.

Unit-III
Computation of Areas and Volumes: Areas of field notes, computations of areas along irregular boundaries and regular boundaries, embankments and cutting for level section and two level section with and without out transverse slope, volume of borrow pit.
Theodolite survey: Components and their description, uses and adjustments (temporary and permanent), measurement of vertical and horizontal angles, principles of Electronic Digital Theodolite, trigonometric leveling.

Unit-IV
Tacheometric Surveying and Curves: Stadia and tangential methods of tachometry, distance and elevation formulae for staff vertical position.
CURVES- Types of curves, design and setting out simple and compound curves

Unit-V
Advances in Surveying Total Station: Components, Principles and working of Total Station, operational procedure of Total Station, Global Positioning System and introduction to Geographical Information System, applications of G.P.S and Geographical Information System.

Text Books
1. B.C Punmia, Ashok Kumar Jain and Arun Kumar Jain, Surveying (Vol – 1, 2&3), B Laxmi Publications(P) Ltd., New Delhi, 16th Edition 2005.
2. Duggal S K Surveying (Vol – 1&2) Tata Mc. Graw Hill Pvt.Ltd., New Delhi, 4th Edition June 2013.
3. R Subramanian, Surveying and leveling, Oxford University Press, New Delhi, 2nd Edition, Dec 2007.

Reference Books
1. Aryhur R Benton and Philip J Taety, Element of plane surveying Tata Mc. Graw Hill Pvt. Ltd., New Delhi 2000.
2. Arror KR Surveying (Vol – 1, 2&3) standard book house, New Delhi 2004.
3. Chandra AM, "Plane Surveying" New Age International Publications Pvt. Ltd., New Delhi 2002.
4. Chandra AM, "Higher Surveying" New Age International Publications Pvt. Ltd., New Delhi 2002.

GOKARAJU RANGARAJU
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FLUID MECHANICS

Course Code: GR14A2007   L:3 T:1 P:0 C:4
II Year I Semester

Prerequisites
- Concepts about behavior of Fluid flows
- Knowledge of Mathematics

Course Objectives: The objective of this course is to provide the student
- Introduction to fluid properties,fluid statics and types of manometers
- knowledge about hydrostatic forces on submerged planes
- To understand the fluid Dynamics and fluid kinematics
- Visualisation of Boundary layer characteristics over solid bodies
- Knowledge of head losses in pipe flows and skill seeing of measurement of flows.

Course Outcomes: At the end of course, the student will beable to
- Comprehend the various fluid properties and fluid path lines.
- Analyze the concept of hydrostatic forces on Inclined, Horizontal and curved planes
- Identify the path line, stream line and streak line, uniform and various types of flows.
- Compute Boundary Layer thickness and Drag and lift forces.
- Distinguish Laminar and Turbulent flows in pipes and calculate the shear and velocity values.
- Estimate the major and minor head losses in pipe flows
- Predict the different discharge measurement using irrigation and water resources fields.

Unit-I
Introduction: Dimensions and units-Physical properties of fluids specific gravity, Viscosity, surface tension, vapor pressure and their influences on fluid motion pressure at a point, Pascal's law, Hydrostatic law-atmospheric, gauge and vacuum pressure measurement of pressure. Pressure gauges, Manometers: differential and Micro Manometers.

Unit-II
Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces-Center of pressure. Derivations and problems.

Unit-III

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non uniform, laminar, turbulent, rotational and Irrotational flows - Equation of continuity for one, two , three dimensional flows stream and velocity potential functions, flow net analysis.

Fluid Dynamics: Surface and body forces- Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, (Navier - stokes equations (Explanatary) Momentum equation and its application -forces on pipe bend.

Unit-IV

Boundary layer Theory Approximate Solutions of Navier Stoke's Equations, Boundary layer concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarman momentum integral equation, laminar and turbulent Boundary layers (no derivations), BL in transition, separation of BL, control of BL, flow around submerged objects-Drag and Lift- Magnus effect.

Laminar & Turbulent Flows: Reynolds experiment - Characteristics of Laminar & Turbulent flows. Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

Unit-V

Closed Conduit Flow: Laws of Fluid friction -Darcys equation, Minor losses _ pipes in series -pipes in parallel - Total energy line and hydraulic gradient line. Pipe network problems, variation of friction factor with Reynolds number -Moodys Chart.

Measurement of Flow: Pitot tube, Venturimeter and orifice meter –classification of orifices, flow over rectangular, triangular and trapezoidal and Stepped notches -Broad crested weirs.

Text Books
1. Modi and Seth, Fluid Mechanics, Standard book house, 19th Edition, 2011.
2. S. K. Som & G. Biswas, Introduction to Fluid Machines, Tata Mc. Graw Hill publishers, Pvt. Ltd., 3rd Edition, 2012.
3. Edward J. Shaughnessy, M. Katz and James P. Schaffer, Introduction to Fluid Machines, Oxford University Press, New Delhi, 1st Edition, 2005.

Reference Books
1. J. F. Douglas, J.M. Gaserek and J. A. Swaffirld (Longman), Fluid Mechanics, 5th Edition, 2005.
2. Frank. M. White, Fluid Mechanics, Tata Mc. Graw Hill Pvt. Ltd, 4th Edition, 2013.
3. A.K. Mohanty, Fluid Mehanics, Prentice Hall of India Pvt. Ltd., New Delhi, 2nd Edition, 1994.
4. Dr. R.K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) ltd., New Delhi, 9th Edition, 2012.

GOKARAJU RANGARAJU
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FLUID MECHANICS LAB

Course Code: GR14A2008   L:0 T:0 P:2 C:2
II Year I Semester

Prerequisites
- Knowledge of Fluid Mechanics

Course Objectives: The objective of this course is to provide the student
- Understanding of discharge coefficients of discharge measuring equipments.
- Skill of determing different head losses in pipes.
- Visualization of the types of flows in pipes.
- Demonstration of the discharge through notches and orifices.

Course Outcomes: At the end of course the student will be able to:
- Estimate the coefficient of discharge through venturimeter, orificemeter.
- Distinguish between losses of head due to contraction and enlargement.
- Predict the major losses in pipes.
- Differentiate the laminar, turbulent and trasitional flows.
- Calculate the discharge through orifice, mouthpiece and wiers.
- Estimate the energy heads.
- Apply knowledge in Irrigation and water distribution systems.

Contents
1. Calibration of Venturimeter.
2. Calibration of Orifice meter.
3. Determination of hydraulic Coefficient of orifice.
4. Determination of mouth piece.
5. Calibration of Rectangular Notch .
6. Calibration of Triangular Notch.
7. Determination of friction factor in pipes.
8. Determination of minor losses in pipes due to sudden enlargement.
9. Determination minor losses in pipes due to sudden contraction.
10. Verification of Bernoulli's equation.
11. Reynolds Experiment.

GOKARAJU RANGARAJU
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SURVEYING LAB-I

Course Code: GR14A2009   L:0 T:0 P:2 C:2
II Year I Semester

Prerequisites
- Fundamentals of Engineering Mathematics
- Fundamentals of Surveying and Leveling

Course Objectives: The objective of this course is to provide
- Introduction to the applicability of basic survey instruments.
- Skill of determining relative positions in land surveying.
- Visualization of elevations, areas and volumes.
- Skill of plotting existing geographical surface information.
- Knowledge to judge the compatibility of instruments.

Course Outcomes: At the end of the course, the student will be able to
- Define the characteristics and applications of basic survey instruments.
- Generalise the methods of obtaining geographical information.
- Apply knowledge of mathematics, science and engineering in land measurement techniques.
- Calculate distances, inclinations, elevations, areas and volumes.
- Generate maps of earth surfaces
- Analyse data from existing maps and transfer relevant points onto ground.
- Evaluate the compatibility of instruments.

Contents
1. Introduction to different survey Instruments.
2. Measurement of an area by Chain Survey.
3. Chaining across obstacles(Three Exercises).
4. Measurement of an area by compass survey.
5. Determination of distance between two inaccessible points with compass.
6. Plane Table Survey. (Radiation & traversing and intersection methods).
7. Two point and three point problem in P.T.S.
8. Simple, fly, Differential Leveling.
9. Exercise of L.S and C.S and plotting.
10. Two exercises on Contouring.

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CAD LAB

Course Code: GR14A2010   L:0   T:0   P:2   C:2
II Year I Semester

Prerequisites
- Basic Knowledge of Building Drawing and Planning.

Course Objectives: The Objective of this course is to provide the student:
- Introduction of CAD Software and describe its applications in different fields.
- Understanding of the basic analytical fundamentals that are used to create and manipulate geometric models by CAD System.
- Knowledge of advanced capabilities of CAD and how they can be used to increase productivity.
- Visualize the Real time Components of Building Drawings.
- Skill of Design to create Real time Building Drawings.

Course Outcomes: At the end of the course, the student will be able to:
- Comprehend the fundamentals of Building Drawings.
- Analyse the Concept of Design Problems with Field Orientation.
- Demonstrate common drafting techniques and shortcuts used by professionals.
- Demonstrates a readiness to take action to perform the task or objective in field.
- Compare different values, and resolve conflicts between them to form an internally consistent system of values in Drawings.
- Adopts a long-term value system that is "pervasive, consistent, and predictable" throughout the Draftsman's Career.
- Apply full-scale CAD software system for geometric modelling.

Contents
1. Introduction to CAD (Computer Aided Drafting).
2. General commands and their practices.
3. Software for CAD and Introduction to different software.
4. Practice exercise on CAD software. (Not to Scale figure).
5. Draw a plan to single storied building (1BHK, 2BHK, 3BHK).
6. Draw a plan for multi storied building (1BHK, 2BHK, 3BHK).
7. Development of sections and elevations for single and multi-storied buildings.
8. Development components of buildings
    I. Doors.
    II. Windows.
    III. Trusses.

GOKARAJU RANGARAJU
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VALUE EDUCATION AND ETHICS

Course Code: GR142002   L:4 T:0 P:0 C:0
II Year I Semester

Prerequisites: General awareness on Moral Science

Course Objectives: The objective of this course is to provide
- Define and classify values, ethics
- Explain about self analysis, importance of values
- Organise constructive thinking and team work to create mutual happiness and prosperity
- Elaborate on ethics and professional ethics using case studies.
- Importance of continuous learning, choosing right work and career.

Course Outcomes: At the end of the course, the student will be able to
- Choose the right value system by self analysis and right understanding
- Make use of positive thinking, dignity of labour for building harmony and peace in self, family and society
- Analysing the importance of personality on effective behavior
- Identify and solve ethical dilemmas by finding value based and sustainable solutions in professional life.
- Find sustainable technological solutions for saving environment
- Compile value and ethical systems for continuous happiness and prosperity
- Take part in effective team work bringing out win-win solutions for complex problems

Unit-I
Values and self development: social values and individual attitudes, Work ethics, Indian vision of, Moral and non-moral valuation, Standards and principles, Value judgments. Importance of cultivation of values, Sense of duty, Devotion, Self reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.

Unit-II
Personality and Behavior Development: Soul and scientific attitude, God and scientific attitude, Positive thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoiding fault finding, Free from anger, Dignity of labor, Universal

Unit-IV
Professional consciousness Ethics: Ethical Human conduct, Development of human consciousness, Implications of value based living, Holistic technologies, Production systems, Universal human order, Code of conduct.

Unit-V
Legislative procedures: Rights and Rules. Human Rights, Valuable groups, Copy rights, IPR, RTI Act, Lokpal, Ombudsman.

Text Books
1. Chakraborty,S.K., Values and Ethics for Originations Theory and Practice, Oxford University Press, New Delhi, 2001
2. R R Gaur, R Saugal, G P Bagaria, "A foundation course in Human values and Professional Ethics", Excel books, New Delhi, 2010.

Reference Books
1. Frankena, W.K., Ethics, Prentice Hall of India, New Delhi, 1990.
2. Kapoor, S.K., Human rights under International Law and Indian Law, Prentice Hall of India, New Delhi, 2002.

GOKARAJU RANGARAJU
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PROBABILITY AND STATISTICS

Course Code: GR14A2011   L:2 T:1 P:0 C:3
II Year II Semester

Prerequisites: Fundamentals in Basic Mathematics.

Course Objectives: The objective of this course is to provide
- State the fundamentals of Probability and Statistics.
- Describe the properties of random variables and distributions.
- Apply the tests of hypothesis.
- Distinguish between explanatory and response variables and analyse multi variable data using correlation and regression.
- Evaluate random processes.

Course Outcomes: At the end of the course, the student will be able to
- Estimate the chance of occurrence of various uncertain events in different random experiments with strong basics of probability.
- Evaluate random processes which occur in engineering applications governed by the Binomial, Poisson, Exponential, Normal and Uniform distributions.
- Apply various sampling techniques.
- Forecast the models using Regression Analysis.
- Estimate the system performance measures in different queueing processes.
- Apply Inferential Statistics to make predictions or judgments about the population from which the sample data is drawn.
- Develop models for Stochastic Processes.

Unit-I
Probability: Basic concepts in Probability - Conditional probability–Addition and Multiplication theorems for two events, (Concepts without derivations)- Bayes theorem.
Random variables: Definition of random variable, discrete and continuous random variables –Distribution function and statement of its properties. Probability mass function, probability density function with illustrations -Joint, marginal and conditional distributions with illustrations - Mathematical expectation and variance of a r.v with examples and statement of their properties.

Unit-II
Distributions: Binomial, Poisson, Uniform, Normal and Exponential distributions (definition, real life examples, Statements of their Mean, Mode and Variance and problems).fitting of Binomial and Poisson distributions. Sampling distribution: Definition of Population and sample, Overview of types of sampling(Purposive, Random, SRS with and without replacement cases, Stratified and Systematic random samplings) - Sampling

distribution, standard error, statements of sampling distribution of mean(s) (Population variance(s)known and unknown) and proportion(s) (Population proportion(s)known and unknown) with examples.

Unit-III

Estimation &Testing of Hypothesis: Definitions of Point and Interval estimation. Confidence intervals for single mean, difference of two means, single proportion and difference of two proportions. Concepts of Null and Alternative hypotheses, Critical region, Type I and Type II errors, one tail and two-tail tests, Level of significance and power of a test.

Large Samples Tests: Tests of hypothesis for mean(s) (single and difference between means), Tests of hypothesis for proportion(s) (single and difference between proportions), Chi-square test for testing goodness of fit, independence of attributes and single population variance.

Unit-IV

Small samples: Student's t-test for testing the significance of single mean, difference of means (independent samples and paired samples), F-test for equality of variances (Concepts and problem solving). Correlation & Regression: Product moment correlation coefficient, Spearman's rank correlation coefficient and Statements of their properties – Simple linear regression, Lines of Regression, Regression coefficients and Statements of their properties, Multiple regression for three variables only.

Unit-V

Stochastic Process: Definitions of stochastic process, parameter space and state space. Classification of stochastic processes and stochastic matrices. Definitions of a Markov chain, transition probability matrix, initial probability distribution, joint distribution and n-step TPM. Classification of states in a Markov chain and limiting distribution.

Queuing theory: Queue description, characteristics of a queuing model, Poisson process, concept of Birth and death process, steady state solutions of (M/M/1: ∞ /FIFO) and (M/M/1: N/FIFO), (Concepts and problem solving).

Teaching Methodologies
1. Chalk &Talk
2. ppts

Text Books
1. Probability and statistics for engineers (ErwinMiller and John E.Freund), R.A Johnson and C.B.Gupta, Pearson education.
2. Fundamentals of Stochastic process-Medhi (for Unit-V), New age international publications.
3. Probability and Statistics, Dr. T. K. V. Iyengar, Dr. B. Krishna Gandhi et.al, S. Chand.

Reference Books
1. Fundamentals of Mathematical Statistics, S. C. Gupta, V. K. Kapoor, S. Chand.
2. Probability, Statistics and Queuing Theory with computer applications-Arnold O. Allen, Academic press.
3. Introduction to Probability and Statistics, 12th edition, W. Mendenhall, R. J. Beaverand, B. M. Beaver, Thomson. (Indian edition)
4. Probability, Statistics and Queuing Theory, 2nd Edition, Trivedi, John Wiley and Sons.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRENGTH OF MATERIALS-II

Course Code: GR14A2012   L:3 T:1 P:0 C:4
II Year II Semester

Prerequisites
- Basic concepts of Mechanics of Solids
- Basic Knowledge on Structural Stability

Course Objectives: The objective of this course is to provide the student
- Knowledge of internal and external pressure acting in pressure vessels.
- Introduction about springs and their various types of combination connections.
- Knowledge of columns and struts with different end conditions and awareness about laterally loaded struts.
- Visualise direct and bending stresses in concrete structures like retaining wall, chimney and dams.
- Understanding of unsymmetrical bending and beams curved in plan.

Course Outcomes: At the end of course, the student will be able to
- Define stresses in thin and thick cylinders under pressure, show stress distribution diagrams.
- List the various stresses in cylinders, and define Lame's theorems
- Differentiate between closed and open coiled helical springs
- Evaluate the buckling/failure load for axially loaded and eccentrically loaded columns.
- Identify function of slenderness ratio in axially loaded columns.
- Explain the effect of equivalent length in long columns for various end conditions.
- Analyze the torsional strength of structural members

Unit-I
Thin and Thick Cylinders: Derivation of formula for longitudinal and circumferential stresses (hoop), longitudinal and volumetric strains, changes in diameter, volume of thin cylinders and thin spherical shells.
Introduction-Lame's theory for thick cylinders-Derivation of Lame's formulae, distribution of hoop radial stresses across thickness due to internal pressure, design of thick cylinders and thick spherical shells

Unit-II
Torision Of Circular Shafts: Theory of pure torsion-derivation equations:

T/J=q/r=N/L. Assumptions made in the theory of pure torsion, torsional moment of resistance, polar section modulus, power transmitted by shafts. Combined bending, torsion and end thrust. Design of shafts according to theories of failure.
Springs Introduction, types of springs, deflection of close and open coiled helical springs under axial pull and axial couple. Springs in series and parallel – carriage or leaf springs.

Unit-III
Columns and Struts: Introduction –Types of columns – short, medium and long columns**.** Axially loaded compression members, crushing load. Euler's theorem for long columns, assumptions, derivation of Euler's critical load formulae for various end conditions. Effective length of a column, slenderness ratio, euler's critical stress. Limitations of Euler's theory. Rankine's formula, Gordon formula. Long columns subjected to eccentric loading. Secant formula, Empirical formulae. Straight line formula.
BEAM COLUMNS Laterally loaded struts subjected to uniformly distributed concentrated loads, Maximum B.M and stress due to transverse and laterally loading.

Unit-IV
Direct And Bending Stresses: Stresses under the action of direct loading and bending moment, core of a section**.** Determination of stresses in the case of chimneys, retaining walls and dams. Conditions for stability of dame. Stresses due to direct loading and bending moment about both axis.

Unit-V
Unsymmetrical Bending: Introduction – Centroidal principal axes of section – Graphical method for locating principal axes –Moment of inertia referred to any set of rectangular axes. Stresses in beams subjected to unsymmetrical bending. Principal axes- Resolution of bending moment into two rectangular axes through the centroid - Location of neutral axis. Deflection of beams under unsymmetrical bending .
Beams Curved in Plan: Introduction – Circular beams loaded uniformly and supported on symmetrically placed columns and Semi circular beams simply supported on three equally spaced supports.

Text Books
1. R.K Bansal, A text book of Strength of materials, Laxmi Publications(P) Ltd., New Delhi, 5th Edition, 2012.
2. Basavrajaiah and Mahadevappa, Strength of materials, University Press, Hyderabad, 3rd Edition, 2010.
3. Bhavikatti, Strength of materials, Vikas Publications, 3rd Edition, 2008.

Reference Books
1. Ferdinand Beer and others, Mechanics of solid, Tata Mc. Graw Hill Publications, 6th Edition.
2. S. Ramakrishna and R. Narayan, Strength of materials, Dhanpat Rai Publications.
3. R. K. Rajput, Strength of materials, S. Chand & Co, New Delhi, 5th   Edition, 2010.
4. A. R. Basu, Strength of materials, Dhanpat Rai & Co, Nai Sarah, New Delhi, first revised on 2005, Re-print 2009.
5. L. S. Srinath et al., Strength of materials, Mac millian India Ltd.

GOKARAJU RANGARAJU
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HYDRAULICS AND HYDRAULIC MACHINERY

Course Code: GR14A2013　　　　　　　　　　　　　　L:3 T:1 P:0 C:4
II Year II Semester

Prerequisites
- Knowledge of Fluid Behavior
- Fundamentals of Engineering Mathematics

Course Objectives: The objective of this course is to provide the student
- Introduction to different types of channel flows and types of channels
- Skill of designing the most economical channel section
- Visualization of type of channel surface profiles and channel bed slopes.
- Knowledge of types of models and correlating with prototypes and force exerted by jets.
- Knowledge of Hydraulic machines and hydraulic pumps and type of hydropower plants.

Course Outcomes: At the end of course, the student will be able to
- Express the properties of different types of channel flows and types of channel sections.
- Identify the efficient channel geometrical section
- Compute the specific energy and hydraulic jump energy losses in open channel flow.
- Analyze the dimensions of models and prototypes of irrigation structure and force of Jet.
- Estimate the efficiency, heads and design of Pelton wheel, Francis and Kaplan turbine.
- Compute the efficiency, heads and design of centrifugal pumps.
- Calculate the capacity of pumps connecting in parallel and series and types of hydropower plants.

Unit-I
Open Channel Flow-I: Types of flows - Type of channels Velocity distribution Energy and momentum correction factors Chezy's, Manning's; and Bazin's formulae for uniform flow Most Economical sections. Critical flow: Specific energy-critical depth computation of critical depth critical subcritical and super critical flows.

Unit-II
Open Channel Flow-II: Non uniform flow-Dynamic equation for G.V.F., Mild,

Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

Unit-III
Hydraulic Similitude: Dimensional model analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models Geometric, kinematic and Dynamic similarities-dimensionless numbers model and prototype relations.
BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle, Applications to radial flow turbines.

Unit-IV
Hydraulic Turbines-I: Layout of a typical Hydropower installation Heads and Efficiencies-classification of turbines-pelton wheel, Francis turbine, Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube theory and function efficiency.
Hydraulic Turbines-II: Governing of turbines-surge tanks-unit and specific turbines-unit power-specific speed performance characteristics geometric similarity-cavitations.

Unit-V
Centrifugal Pumps: Pump installation details-classification-work done-Manometric head-minimum starting speed-losses and efficiencies-specific speed multistage pumps-pumps in parallel- performance of pumps-characteristic curves- NPSH-cavitations.
Hydropower Engineering: Classification of Hydropower plants Definition of terms Load factor, utilization factor, capacity factor, estimation of hydropower potential.

Teaching Methodologies
1. White board marker
Text Books
1. K. Subramanya, Open Channel flow, Tata Mc. Graw Hill Publishers (2006).
2. Dr. R.K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi, 19th Edition, 2011.
3. D.S. Kumar Kataria & Sons, Fluid Mechanics & Fluid Power Engineering, 7th Edition, 2008-09.
Reference Books
1. Modi & Seth, Fluid Mechanics, Hydraulic and Hydraulic Machines, Standard book house, 19th Edition, 2011.
2. Ranga Raju, Elements of Open channel flow, Tata McGraw Hill, Publications.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING GEOLOGY

Course Code: GR14A2014   L:3 T:1 P:0 C:4
II Year II Semester

Prerequisites: Knowledge of minerals, their formation & chemical composition

Course objectives: The objectives of this course is to make the student to
- Identify the importance of study of Engineering Geology for the construction of any Civil Engineering structure.
- Express knowledge on the structure of earth, formation of various types of rocks and minerals and their study.
- Find and analyse various geological structures like faults, folds, effect on civil engineering structures and precautions to be taken.
- Identify various surface and subsurface flows like Rivers, Canals, Lakes and Ground water studies etc.
- Recognize the failures of tunnels, dams and reservoirs due to geological reasons.

Course outcomes: At the end of the course, the student will be able to
- Recognize the importance of geology from civil engineering point of view.
- Find the physical properties of minerals and their role for common rock forming.
- Distinguish features of igneous, sedimentary and metamorphic rocks.
- Distinguish various geological structures.
- Analyse the failures of dams, reservoirs and tunnels due to geological reasons.
- Indicate importance of ground water, earthquakes and landslides.
- Discuss about the rocks, minerals and geological structures from Civil Engineering point of view.

Unit-I
Introduction: Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology.
Weathering of rocks: Its effect over the properties of rocks importance of weathering with REFERENCE to dams, reservoirs and tunnels**.** Weathering of common rock like "Granite".
Unit-II
Mineralogy: Definition of mineral, Importance of study of minerals, Different

methods of study of minerals. Advantages of study of minerals by physical properties.Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar , Quartz , Flint , Jasper, Olivine , Augite , Hornblende, Muscovite , Biotite , Asbestos, Chlorite , Kyanite , Garnet, Talc , Calcite. Study of other common economics minerals such as Pyrite, Hematite , Magnetite, Chromite , Galena , Pyrolusite, Graphite, Magnesite, and Bauxite.

Petrology: Definition of rock: Geological classification of rocks into Igneous, Sedimentary and Metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks and their distinguishing features. Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

Unit-III

Structural geology: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types and importance**.** Common types of soils, their origin and occurrence in India, stabilisation of soils.

Unit-IV

Ground water, water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration. Earth quakes, their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Land-slides, their causes and effect; measures to be taken to prevent their occurrence. Importance of study of ground water, earth quakes and land-slides.

Geology of dams and reservoirs: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factor's Contributing to the success of a reservoir. Geological factors influencing water tightness and life of reservoirs.

Unit -V

Tunnels: Purposes of tunneling, effects of tunneling on the ground. Role of geological considerations (Lithological, structural and ground water) in tunneling over break and lining in tunnels.

Teaching Methodologies
1. Power Point presentations
2. Tutorial Sheets
3. White Board

Text Books
1. K.V.G.K. Gokhale, Principles of Engineering Geology, B.S publications
2. N. Chennkesavulu, Mc-Millan, Engineering Geology, India Ltd. 2005.

Reference Books
1. F.G. Bell, Fundamental of Engineering Geology, Butterworths, Publications, New Delhi, 1992.
2. Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRUCTURAL ANALYSIS

Course Code: GR14A2015   L:3 T:1 P:0 C:4
II Year II Semester

Prerequisites
- Knowledge of Engineering Mechanics
- Knowledge of Mechanics of Solids/Strength of Materials

Course Objectives: The objective of this course is to provide the student
- Skill to Estimate the deflections of simple beams and pin-jointed trusses using energy theorems.
- Ability to Analyze three and two hinged, circular and parabolic arches.
- Knowledge to Analyze statically in-determinate structures using force and displacement methods.
- To understand the effect of moving loads and analyze indeterminate beams and trusses
- To understand the effect using influence diagrams in analysis of beams and trusses

Course Outcomes: At the end of course, the student will be able to
- Determine deflections of beams and trusses using energy methods.
- Analyze three and two hinged, circular and parabolic arches.
- Analyze indeterminate beams of 1st degree statical indeterminacy using force method for Propped cantilever beams.
- Analyze 2nd and 3rd degree statically indeterminate beams using Clappeyorn's three moment theorem.
- Apply Slope deflection, Moment distribution and Kani's methods to analyze statically indeterminate structures.
- Analyze statically determinate and indeterminate structures using rolling load method.
- Analyze statically determinate and indeterminate structures using influence line method.

Unit-I
Energy Theorems: Introduction – strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castiglione's first theorem – Deflections of simple beams and pin jointed trusses.
Unit-II
Arches: Types of arches- three and two hinged arches – Circular and parabolic arches – yielding of supports –Effect of shortening of rib-Effect of temperature changes –Tied and linear arch.

Unit-III
Indeterminate Beams (Force method):
   a. Propped cantilever's
   b. Fixed beams
   c. Continuous Beams (By Clapeyorn's theorem of three moments)

Unit-IV
Analysis of Indetermiate Structures for Beams:
   a. Slope Deflection
   b. Moment Distribution
   c. Kani's Method

Unit-V
Moving Loads and Influence Diagrams: Introduction maximum SF and BM at a given section and absolute maximum S.F and B.M due to single concentrated load U.D load longer than the span, U.D load shorter than the span, two point loads with fixed distance between them and several point loads – Equivalent uniformly distributed load – focal length.

Definition of influence line for SF, Influence line for B.M- load position for maximum SF at a section –Load positions for maximum BM at a section – Point loads , UDL longer than the span, UDL shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

Teaching Methodologies
   1. White Board and marker
   2. Assignments
   3. Tutorials

Text Books
   1. V. N. Vazirani & M. M. Ratwani, Analysis of structures – Vol. & Vol. II, Khanna Publications, New Delhi.
   2. T.S. Thandavamoorthy, Analysis of structures, Oxford University Press, New Delhi
   3. S.S Bhavikatti, Structural Analysis, Vikas Publishing House

Reference Books
   1. S.B. Junnakar, Mechanics of structures, Charotar Publishing House, Anand, Gujarat.
   2. Pandit & Gupta, Theory of structures, Tata Mc. Graw Hill Publishing Co. Ltd., New Delhi.
   3. R. S. Khurmi, Theory of structures, S. Chand Publishers.
   4. B. C. Punmia, Strength of materials and Mechanics of Structures, Khanna Publications, New Delhi
   5. B.D. Nautiyal, Introduction to structural analysis, New age international publishers, New Delhi.

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STRENGTH OF MATERIALS LAB

Course Code: GR14A2016   L:0 T:0 P:2 C:2
II Year II Semester

Prerequisites
- Knowledge of Mechanics of Solids
- Knowledge on Properties of civil engineering materials

Course Objectives: The objective of this course is to provide the student
- Understanding the effect of tension in mild steel bars under tensile loading.
- Skill to examine the resistance of various materials using hardness test and impact test
- Find the modulus of rigidity in springs using spring test.
- An idea on the compressive stress of concrete, wood etc.
- Knowledge of pure bending theory and evaluate the Young's modulus of materials.
- Visualizations of the importance of Maxwell's reciprocal theorem.

Course Outcomes: At the end of course, the student will be able to
- Determine the important mechanical properties of materials
- Identify the stiffness of an elastic isotropic material
- Evaluate the Reciprocal theorem
- Measure any substance's resistance to uniform compression.
- Resistance of various materials against abrasion.
- Assess the quality of materials
- Identify the resistance of materials against impact loads

Contents
1. Tension test on metals.
2. Torsion test on metals.
3. Hardness test on metals.
4. Spring test on metals.
5. Compression test on wood or concrete or brick or block.
6. Impact test on metals.
7. Shear test on metals.
8. Use of electrical resistance strain gauges.
9. Deflection test on continuous beam.
10. Deflection test on cantilever beam.
11. Deflection test on simply supported beam.
12. Verification of Maxwell's Reciprocal theorem on beams.

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HYDRAULICS AND HYDRAULIC MACHINERY LAB

Course Code: GR14A2017   L:0 T:0 P:2 C:2
II Year II Semester

Prerequisites
- Knowledge of Fluid Mechanics and Hydraulics Machinery

Course objectives: The objective of this course is to provide the student
- Knowledge of estimation of force exerted by the jet on different surfaces.
- Skill to predict the efficiency and the Impulse the Turbines and reaction turbine
- Understanding of the type of pumps
- Visualization of the types of flows in open channel flows
- Skill to determine the efficiency of hydraulic machines in civil engineering field

Course outcomes: At the end of the course the student will be able to
- Calculate the impact factor and force exerted on flat and curved vanes
- Determine the efficiency of Peltonwheel turbine
- Predict The efficiency of Francis turbine
- Compute the efficiency of centrifugal pumps
- Compute the efficiency of reciprocating pumps
- Estimate the input and output efficiency of hydraulic turbine
- Compute the energy dissipation in open channel flows

Contents
1. Impact of jet on vanes.
2. Study of Hydraulic jump.
3. Performance test on Pelton wheel turbine .
4. Performance test on Francis turbine.
5. Efficiency test on Single Stage Centrifugal Pump.
6. Efficiency test on Multi Stage Centrifugal Pump.
7. Efficiency test on Single acting Reciprocating Pump.
8. Efficiency test on Double acting Reciprocating Pump.

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SURVEYING LAB-II

Course Code: GR14A2018   L:0 T:0 P:2 C:2
II Year II Semester

Prerequisites
- Knowledge of Engineering Mathematics
- Knowledge of Surveying and Leveling

Course Objectives: The objective of this course is to provide the student:
- Introduction to the applicability of modern survey equipment.
- Skill of determining relative positions in land surveying.
- Visualization of elevations, areas and volumes.
- Skill of plotting existing geographical surface information.
- Knowledge to judge the compatibility of instruments.

Course Outcomes: At the end of the course, the student will be able to,
- Define the characteristics and applications of modern survey equipment.
- Generalise the advanced methods of obtaining geographical information.
- Apply knowledge of mathematics, science and engineering in land measurement techniques.
- Calculate distances, inclinations, elevations, areas and volumes using Theodolite & Total station.
- Generate maps of earth surfaces
- Analyse data from existing maps and transfer relevant points onto ground.
- Evaluate the compatibility of instruments.

Contents
1. STUDY OF THEODOLIE- Measurement of horizontal and vertical angles-(Repetition and Reiteration method).
2. TRIGONOMETRIC LEVELLING- Heights and distances problems.
3. Calculation of R.L and distance using tacheometric survey.
4. Curve setting by any two methods.
5. Introduction to total station and operational procedure.
6. Determine the area of the traverse using total station.
7. Column and foundation marking using Total Station.
8. Distance, gradient, differential height between two inaccessible points using Total Station.

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ENVIRONMENTAL SCIENCE

Course Code: GR14A2001   L:4 T:0 P:0 C:0
II Year II Semester

Prerequisites: Basic knowledge on basic sciences and natural resources
Course Objectives: The Objectives of this course is to provide
- Critically evaluate information on human/environmental system
- Integrate human ecology and science of environmental problems.
- Articulate issues of social construction of science
- To develop an understanding of systems and cycles on the earth: of how individual organisms
- Live on the earth
- How different organisms live together in complex communication
- The agricultural use of soil and pesticides
- The description of moving water on and in the earth, and its influence on humans
- The effect of human activities on atmospheric pollution and that effect on us.
- Use of fossil fuels and the effect on climate
- Alternate energy sources
- An understanding of human activities that influence the ocean.

Course Outcomes: At the end of the course, the Student will be able to
- Importance of environment, its purpose, design and perspectives
- Environmental issues related to the exploitation of natural resources and development of the mankind
- Role of professionals in protecting the environment from degradation
- The solutions for environmental problems created by local, national and global
  Developmental activities.
- Critically evaluate literature on environmental problems;
- Develop relevant research questions for environmental investigation
- Use methods and tools of environmental research, including statistical analysis, GIS, and other techniques;

Unit-I
Introduction to Environment, Ecology and Ecosystems: Definition, Importance and Scope of Environmental Studies, Public Awareness and Participation. Ecology, Concept of Ecosystem, Classification of Ecosystem, Structure, Components and Function of Ecosystem. Typical Ecosystem, Food Chain, Food Web. Biodiversity- Types and values.

Unit–II

Natural Resources: Definition, Occurrence, Classification of resources, Important natural resources for human society, Utilization-positive and negative effects of Water resources, Mineral resources, Forest resources, Energy resources, Land resources. Role of individuals in conservation of important natural resources.

Unit-III

Environmental Pollution: Definition, Classification of Pollution, Types of Pollution and Pollutants. Causes, effects and control of – Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution and Nuclear Pollution.

Unit–IV

Environmental Problems and Management Policies: Natural Disasters-Types, causes and effects; Global warming, Climate change-El Nino-La Nina, Ozone layer- location, role and degradation; Deforestation and desertification. Management: Technological solutions, Preventive methods, control techniques; Green Belt development, Rainwater harvesting, Renewable and alternate resources.

Unit-V

National Policy on Environment Protection and Sustainability: Air (Pollution and prevention) act 1981; Water (Pollution and prevention) Act 1974; Pollution Act 1977; Forest Conservation Act; Wildlife Protection Act; Municipal solid waste management and handling Act; Biomedical waste management and handling Act; Hazardous waste management and handling rules. Role of IT in environment, environmental ethics, environmental economics.

Sustainable development: Cause and Threats to sustainability; Strategies for achieving sustainable development; Concept of Green buildings and Clean Development Mechanism (CDM).

Teaching Methodology
1. White board and marker
2. OHP and Field visit

Text Books
1. Text Book of Environmental Studies, ErachBarucha. University Press
2. Text book of Environmental Science and Technology by M.Anji Reddy 2007

Reference Books
1. Biotechnology & Environmental Chemistry. Surinder Jeswal& Anupama Deswal, DhanpatRai & Co Pvt. Ltd.
2. A Text Book of Environmental Science. Aravind Kumar. APH Publishing Corporation.
3. Glimpses of Environment. Dr. KVSG. Murali Krishna. Environmental Protection Society

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GENDER SENSITIZATION

Course Code: GR15A2106   L:0 T:0 P:3 C:2

Course Objectives
- To develop students sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes: At the end of the course, the student will be able to
- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

Unit-I
UNDERSTANDING GENDER: Gender: Why should we study it? (Towards a world of Equals: Unit – 1) Socialization: Making women, making men (Towards a World of Equals: Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities. Just Relationships: Being Together and Equals (Towards a World of Equals: Unit – 12) Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Further Reading: Rosa Parks – The Brave Heart.

Unit-II
GENDER AND BIOLOGY: Missing Women: Sex Selection and its Consequences (Towards a World of Equals: Unit – 4) Declining Sex Ratio. Demographic Consequences. Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit – 10) Two or Many? Struggles with Discrimination.Additional Reading: Our Bodies, Our Health (Towards a World of Equals: Unit – 13)

Unit-III
GENDER AND LABOUR: Housework: the Invisible Labour(Towards a World of Equals: Unit – 3) "My Mother doesn`t Work". "Share the Load". Women`s Work: Its Politics and Economics (Towards a World of Equals: Unit – 7) Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

Unit-IV
ISSUES OF VIOLENCE: Sexual Harassment: Say No! (Towards a World of Equals: Unit – 6) Sexual Harassment, not Eve – teasing – Coping with Everyday Harassment – Further Reading: "Chupulu" Domestic Violence: Speaking Out (Towards a World of Equals: Unit – 8) Is Home a Safe Place? – When Women Unite [Film]. Rebuilding Lives. Further Reading. New Forums for justice. Thinking about Sexual Violence (Towards a World of Equals: Unit – 11) Blaming the Victim – "! Fought for my Life ……" – Further Reading. The Caste Face of Violence.

Unit-V
GENDER STUDIES: Knowledge: Through the Lens of Gender (Towards a World of Equals: Unit – 5) Point of View. Gender and the Structure of Knowledge. Further Reading. Unacknowledged Women Artists of Telangana.Whose History? Questions for Historians and Others (Towards a World of Equals: Unit – 9) Reclaiming a Past. Writing other Histories. Fur**,** her Reading. Missing Pages from Telangana History.

Text Books
1. Towards a World of Equals: A Bilingual Textbook on Gender" Telugu Akademi, Hyderabad Written by A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu.

Reference Books
1. Sen, Amartya. "More than Once Million Women are Missing". New York Review of Books 37.20 (20 December 1990). Print. `We Were Making History……' Life Stories of Women in the Telangana People`s Struggle. New Delhi : Kali for Women, 1989.
2. TriptiLahiri. "By the Numbers: Where India Women Work." Women`s Studies Journal (14 November 2012) Available online at: http://blogs. Wsj.com/India real time/2012/11/14/by – the –numbers – where- Indian- women-works
3. K. Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada http://harpercollints.co.in/BookDetail.asp?Book Code=3732

4. Vimala "Vantilu (The Kitchen)". Omen Writing in India: 600BC to the Present, Volume II The 20th Century. Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 599-601.

5. Shatrughna, Veena et al. Women`s Work and its Impact on Child Health and Nutrition, Hyderabad, National Institute of Nutrition, India Council of Medcial Research 1993. B.Tech (ANE) R-15 Malla Reddy College of Engineering and Technology (MRCET) 113

6. Stress Shakti Sanghatana. "We Were Making History….'Life Stories of Women in the Telangana People`s Struggle. New Delhi:Kali of Women, 1989.

7. Menon, Nivedita. Seeing Like a Feminist. New Delhi. Zubaan-Penguin Books, 2012.

8. Jayaprabha, A. "Chupulu (Stares)". Women Writing in India: 600BC to the Present. Volume II: The 20th Century Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 596-597.

9. Javeed, Shayam and AnupamManuhaar. "Women and Wage Discrimination in India: A Critical Analysis". International Journal of Humanilities and Social Science Invention 2, 4(2013).

10. Gautam, Liela and Gita Ramaswamy. "A 'Conversation' between a Daughter and Mother". Broadsheel on Contemporany Politics. Special Issue on Sexuality and Harassment: Gender Politics on Campus Today. Ed.Madhumeeta Sinha and Asma Rasheed. Hydrabad: Anveshi research Center for Women`s Studies, 2014.

11. Abdulali Sohaila. " I Fought For My Life…and Won." Available online at: http://www.thealternative. In/lifestyle/i-fought-for-my lifeand-won-sohaila-abdulal/

12. Jeganathan Pradeep, Partha Chatterjee (Ed). "Community, Gender and Violence Subaltern Studies XI". Permanent Block and Ravi Dayal Publishers, New Delhi, 2000

13. K. Kapadia. The Violence of Development: The Politics of Identity, Gender and Social Inequalities in India. London: Zed Books, 2002.

14. S. Benhabib. Situating the self: Gender, Community, and Postmodernism in Contemporary Ethics, London: Routledge, 1992.

15. Virginia Woolf A Room of One`s Oxford: Black Swan. 1992.

16. T. Banuri and M. Mahmood, Just Development: Beyond Adjustment with a Human Face

III-Year

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONCRETE TECHNOLOGY

Course Code: GR14A3001   L:3 T:1 P:0 C:4
III Year I Semester

Course Objectives: On completion of this Course the student shall be able to:
- Identify the physical and chemical properties of cement and admixtures.
- Distinguish the properties of aggregates and able to conduct the tests on aggregates.
- Comprehend the workability of concrete, manufacturing processes of concrete and the behavior of the hardened concrete.
- Gain the knowledge about destructive and NDT methods and how to conduct the tests on hardened concrete.
- Acquire the practical knowledge on mix design principles, concepts and methods.And also get an adequate knowledge about the special concretes and their applications in the diverse construction field.

Course Outcomes: The expected outcomes of the Course are:
- List the grades of cement, the types of cement and the types of different admixtures.
- Classify the types and the physical properties of aggregates.
- Clarify the physical properties of fresh and hardened concrete and also about the manufacturing of concrete.
- Estimate the creep and shrinkage of concrete and how to conduct the different tests such as compression and tension etc. on hardened concrete.
- Design the mix proportions for the specific work for required strength and workability with available materials at work place.
- Distinguish the special concretes like Self compacting concrete, Fibre reinforced concrete, Polymer concrete and light weight concrete etc.
- Research on how to develop high strength and high performance concrete.

UNIT I
Cements & Admixtures: Portland cement – Chemical composition – Hydration, setting of cement – Structure of hydrated cement – Tests on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.

UNIT II
Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, bulk

density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum size of aggregate.

UNIT-III
Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration ofconcrete – Steps in manufacture of concrete – Quality of mixing water.
Hardened Concrete : Water / Cement ratio – Abram's Law – Gelspaoe ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

UNIT-IV
Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods – codal provisions for NDT.
Elasticity, Creep &Shrinkage: Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – Types of shrinkage.

UNIT-V
Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.
Special concretes: Light weight aggregates – Light weight aggregate concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Different types of fibres – Factors affecting properties & Applications of F.R.C – Polymer concrete – Types of Polymer concrete – Properties of polymer concrete & Applications – High performance concrete – Self consolidating concrete – SIFCON.

TEXT BOOKS
1. Concrete Technology by M.S.Shetty. – S.Chand& Co. ; 2004
2. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition

REFERENCE BOOKS
1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
2. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN OF REINFORCED CONCRETE STRUCTURES

Course Code: GR14A3002   L:3 T:1 P:0 C:4
III Year I Semester

COURSE OBJECTIVES: On completion of this Subject/Course the student shall be able to:
- Understand the importance of Limit state design in Design of Reinforced Concrete Structures.
- Analyze and design beams.
- Design slabs, stair case and canopy.
- Design columns and footings.
- Design beams and slabs for Limit state of serviceability.

COURSE OUTCOMES: On completion of this Subject/Course the student should be able to:
- Understand the importance of Limit state design in Design of Reinforced Concrete Structures.
- Analyze and design beams.
- Design one way and two way slabs.
- Design stairs and canopy.
- Design short and long columns.
- Design different types of footings.
- Design beams and slabs for Limit state of serviceability.

UNIT-I
Concepts of R.C design: Limit state method-material stress, strain curves, safety factors, characteristic values. Stress block parameters. IS-456-2000-Working stress method.

UNIT-II
Analysis and design of beams: Design of beams for flexure- Limit state analysis and design of singly reinforced, doubly reinforced, T and L beam sections. Design of beams for shear, torsion and bond: Limit state analysis and design of section for shear and torsion- Concepts of bond- anchorage and development length-I.S. code provisions-design examples in simply supported and continuous beams and detailing.

UNIT III
Design of slabs: Design of Two-way slab, one way slab, continuous slab using

I S coefficients. Design of stair case and canopy: Design of stair case and Design of canopy (portico).

UNIT-IV
Design of columns: Design of columns subjected to axial loads, combined axial load &uniaxial bending, combined axial load and biaxial bending- I S code provisions.
Design of footings: Different types of footings, design of isolated, square, rectangle, circular footings and combined footings.

UNIT-V
Limit state design of serviceability:Limit state design of serviceability for deflection, cracking and codal provisions.

TEXT BOOKS
1. Limit state Design of reinforced concrete - P.C.Varghese, Prentice hall of India, New Delhi.
2. Reinforced concrete design by N.Krishna Raju and R.N. Pranesh, New age InternationalPulishers, New Delhi.
3. Reinforced concrete design by S.Unnikrishna Pillai &Devdas Menon, Tata Mc.Graw Hill, New Delhi.
4. Fundamentals of reinforced concrete by N.C. Sinha and S.K.Roy, S.Chand publishers.

REFERENCE BOOK
1. Fundamentals of reinforced concrete design by M.L.Gambhir, Prentice Hall of India Private Ltd., New Delhi.
2. Reinforced concrete structural elements-behavior, analysis and design by Purushotam, Tata Mc.Graw Hill, New Delhi.
3. Limit State design by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jai, Laxmi publication Pvt. Ltd., New Delhi.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Code: GR14A2104   L:2 T:1 P:0 C:3
III Year I Semester

Course Objectives: To provide the student with a clear understanding of demand analysis, elasticity of demand and demand forecasting; production functionandcost analysis necessary to decide the levels of production and cost of production of the products or services; different types of markets and competition, different forms of organisation and different methods of pricing; the capital and capital budgeting, and fundamentals of accounting and financial analysis.

Course Outcomes: After studying this course the engineering students - the prospective technocrats or techno-managers - will be in a position to scan the economic environment; understand the markets, competition, demand and production functions; will be able to choose an appropriate form of organisation; will be in a position to know the cost and decide the price of the products and/or services produced, and will be able to understand the financial statements and make financial analysis.

UNIT-I
Introduction & Demand Analysis: Definition and Scope: Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

UNIT-II
Production & Cost Analysis: Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

UNIT-III
Markets & New Economic Environment: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Pricing: Objectives and Policies of Pricing. Methods of Pricing. Business:Features and evaluation of different forms of Business Organisation: Sole Proprietorship,

Partnership, Joint Stock Company, Public Enterprises and their types. New Economic Environment: Changing Business Environment in Post-liberalization scenario.

UNIT-IV
Capital Budgeting: Capital: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method and Internal Rate of Return (IRR) (simple problems).

UNIT-V
Introduction to Financial Accounting & Financial Analysis: Accounting Concepts and Conventions - Double-Entry Book Keeping. Accounting Cycle: Journal, Ledger, Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, Capital structure Ratios and Profitability ratios. Du Pont Chart.

TEACHING METHODOLOGIES
- Lectures
- Power Point presentations
- Seminars
- Working out problems on black/white boards,
- Conducting tutorials
- Giving homework and/or assignments etc.

TEXT BOOKS
1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.
2. Atmanand: Managerial Economics, Excel, 2008.

REFERENCE BOOKS
1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2009
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 2009
3. Lipsey&Chrystel, Economics, Oxford University Press, 2009

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

WATER RESOURCES ENGINEERING-I

Course Code: GR14A3003   L:3 T:1 P:0 C:4
III Year I Semester

COURSE OBJECTIVES
- To describe the applications of Hydrology for Rainfall Measurement and Analysis ,Runoff measurement   and analysis ,Evaporation and Evapotranspiration measurement and estimation
- To explain the Hydrographic Analysis of Runoff
- To explain the processes of groundwater occurrence
- To explain the types andmethods of application of irrigation water and Standards for quality .To explain the soil-water –plant relationship.
- To explain the various methods of design of irrigation canals and design discharge over a catchment.

COURSE OUTCOMES: To develop in the student will be able to
- Estimate and process rainfall data, runoff data, evaporation data, evapotranspiration data and infiltration data
- Designa model in a region, direct runoff hydrograph, unit hydrograph, S-Curve hydrograph and synthetic unit hydrograph.
- Calculate the discharge of radial flow to wells in a region of confined and unconfined aquifers by determining the aquifer parameters by field tests and pumping tests.
- Design a suitable irrigation method depending on soil, water and plant conditions on the field
- Present irrigation schedules and irrigation efficiencies for farmers on the field.
- Design irrigation canals by Kennedy's theory, Lacey's theory and IS standards.
- Estimate design discharge by SCS Curve Number Method and analyze the regional flood frequency, Measure and estimate stream flow by methods of stream gauging in a watershed

UNIT-I
Introduction to Engineering Hydrology and its applications: Hydrologic Cycle, types and forms of precipitation, rainfall measurement, types ofRain gauges, computation of average rainfall over a basin, processing of rainfall data-adjustment of record-Rainfall Double Mass Curve.Runoff-Factors affecting Runoff over a Catchment- Empirical and Rational Formulae.

Abstraction from rainfall: Evaporation, factors effecting Evaporation, Measurement of evaporation- Evapotranspiration- Penman and Blaney&Criddle Methods -Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices'.

UNIT-II
Distribution of Runoff: Hydrograph Analysis; Flood Hydrograph – EffectiveRainfall - Base Flow- Base Flow Separation - Direct Runoff Hydrograph– Unit Hydrograph, definition and limitations of application of Unit hydrograph, Derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa S- hydrograph, Synthetic Unit Hydrograph.

UNIT-III
Ground water Occurrence: Types of aquifers, aquifer parameters,' porosity' Specific yield, permeability, transmissivity and storage coefficient, Darcy'slaw, radial flow to wells in confined and unconfined aquifers, Types ofwells, Well Construction - Well Development.

UNIT-IV
Necessity and importance of irrigation: Advantages and ill-effects of irrigation, Types of irrigation, Methods of application of irrigation water, Indian Agriculture soils, Methods of improving soil fertility-Crop rotation, preparation land for irrigation, Standards of quality for irrigation water.
Soil-water-plant relationship: Vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Duty and delta, factors Affecting duty- design discharge for a water course. The depth and frequency of Irrigation, Irrigation efficiencies-Water Logging.

UNIT-V
Classification of canals: Design of Irrigation canals by Kennedy's and Laceys theories, balancing depth of cutting,IS standards for canal design canal lining.

Design discharge over a catchment: completion of design discharge–rational formula,SCS curve number method, flood frequency analysisIntroductory part only.Stream gauging-measurement and estimation of stream flow.

TEXT BOOKS
1. A text book of hydrology by P. Jaya Rami Reddy, Laxmi publications pvt limited
2. Irrigation and water power engineering- B.C.Punmia, PandeB.B.Lal, Ashok Kumar Jain, Arunkumarjain- Laxmi publications 16th edition

REFERENCES:

1. Elementary hydrology by V. P. Singh, PHI publications
2. Irrigation and Water- Resources &Water Power by P. N. Modi, Standard Book House.
3. Irrigation Water Management by D.K.Majundar Prentice Hall ofIndia.
4. Irrigation and Hydraulic structures by S.K.Garg
5. Applied Hydrology by VenTe Chow, David R Maidment, Larry WMays, TataMc. GrawHill
6. Introduction to Hydrology by Warren Viessman, Jr.Garyl Lewis

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED STRUCTURAL ANALYSIS

Course Code: GR14A3004   L:3 T:1 P:0 C:4
III Year I Semester

COURSE OBJECTIVES: By the end of this course student shall be able to
- Apply the concepts of Structural analysis (determinate structures to indeterminatestructures) and toevaluate the static and kinematic indeterminacies of various structures along with the applications of Castigliano's theorems.
- Analyze continuous beams and frames using slope –deflection, moment distribution and Kani's methods.
- Apply stiffness and flexibility matrix methods for the analysis of simple beams and frames.
- Introduced to various mechanisms of plastic analysis for beams and frames.
- Comprehend the importance of various approximate methods for analysis of frames.

COURSE OUTCOMES
- Evaluate the degree of static and kinematic indeterminacies of structuressuch as beams, truss and frames and apply Castigliano's theorems for the analysis.
- Analyze indeterminate continuous beams and simple frames using Slope deflection, Moment distribution and Kani's methods of analysis
- Apply Slope deflection, Moment distribution and Kani's methods of analysis to Gable frames and to Portal frames with sway
- Analyze the beams, trusses and frames using stiffness matrix method.
- Analyze the beams, trusses and frames using flexibility matrix method.
- Estimate the collapse load and plastic moment capacity of beams, trusses and frames
- Apply approximate methods of analysis to various frames subjected to vertical and horizontal loads.

UNIT-I
Indeterminate structural analysis: Determinate structural analysis,indeterminate structural analysis- static and kinematic indeterminacies-Solution of trusses with up to two degrees of internal and external indeterminacies-Castigliano's theorem applications.

UNIT-II
Indeterminate structural analysis for rigid frames: Slope Deflection and Moment Distribution Methods of analysis to simple portal frames without and with sway - frames with inclined legs -Gable frames. Kani's Method of analysis to continuous beams, Portal frames (up to single bay two storages).

UNIT-III
Approximate analysis of building frames:
   a) Substitute frame method
   b) Portal method
   c) Cantilever method

UNIT-IV
Matrix method of analysis: Different approaches to matrix methods- analysis using flexibility and stiffness matrix methods for beams and frames.

UNIT-V
Plastic analysis: Ductility-Ultimate load-Plastic hinges- mechanism- -Shape factors- Moment curvature relations- upper and lower bound theorem- Plastic analysis for beam- Portal frames- Portal survey mechanics.

TEXT BOOKS
   1. Theory of structures -B.C.Punmia, Jain, Ashok Kumar Jain &Arun Kumar Jain, Laxmi publications
   2. Indeterminate Structural Analysis - K.U. Muthu, H. Narendra, Maganti Janardhana, M. Vijayanand – I K International Publishing House Pvt. Ltd.

REFERENCE BOOKS
   1. Analysis of structures by T.S.Thandava Murthy, Oxford University Press.
   2. Advanced Structural Analysis" By Devdas Menon. Narosa Publishers

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONCRETE TECHNOLOGY LAB

Course Code: GR14A3005   L:0 T:0 P:2 C:2
III Year I Semester

COURSE OBJECTIVES: By the end of this course student will be able to
- Familiarize the students with physical and mechanical properties of cement concrete constituents.
- Provide practical knowledge and understanding towards the materials used for concrete.
- Provide exposure about the fresh and hardened concrete.
- Acquire practical skills in the area of cement, fresh and hardened concrete testing.
- Understanding the need of water to be added to cement for various purposes.

COURSE OUTCOMES: At the end of this course student should be able to
- Identify the suitable materials used for concrete for particular purpose
- Gauge the quality control of concrete
- Identify the main laboratory tests relevant to the use of concrete on site.
- Recognise the theoretical concepts learned in the courses concrete technology and building materials and construction planning.
- Design normal concrete mixes.
- Predict properties of different materials used for the construction
- Interpret the properties in tern to design or invent the new materials

List of experiments:
1. Normal consistency test on cement
2. Initial setting time and final setting time of cement
3. Fineness test of cement
4. Specific gravity of cement
5. Soundness test of cement
6. Compressive strength of cement
7. Sieve analysis of coarse and fine aggregates
8. Workability test on concrete by compaction factor, slump and Vee-Bee consistometer
9. Young's modulus and compressive strength of concrete
10. Bulking of sand (Field test & Laboratory test)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING GEOLOGY LAB

Course Code: GR14A3006   L:0 T:0 P:2 C:2
III Year I Semester

COURSE OBJECTIVES
- To enable the students to identify various Rocks and Minerals their physical properties and use in industry.
- To provide knowledge for understand macroscopic description of few Rocks and Minerals.
- To let them interpret various Geological maps showing structures like faults, folds, beds and unconformities etc
- To illustrate the methods of identifying existing geological structures
- To educate the students about the varieties of rocks and minerals that are being used in industries

COURSE OUTCOMES: Graduates of this program have the ability to
- Identify various minerals and their properties
- Identify various rocks and their properties.
- Prepare and interpret various maps of geological structures like faults, folds, beds and unconformities
- Resolve some simple structural Geology
- Understand the importance of geological structure for any constructions
- Demonstrate the effect of water tables under any civil structures
- Understand various rocks and minerals used in the industries

1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic description and identification of rocks referred under theory.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.
4. Simple Structural Geology problems.

LAB EXAMINATION PATTERN:
1. Description and identification of SIX minerals
2. Description and identification of Six (including igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section. 4. Simple strike and Dip problems.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

Course Code: GR14A3100   L:0 T:0 P:2 C:2
III Year I Semester

This lab mainly focuses on training the students to speak fluent, intelligible, appropriate and functional English through classroom activities. The chapters prescribed provide tips to improve the basic language skills required to participate in variousformal activities. It also helps the   students to appear for professional competitive exams like GRE, TOEFL, IELTS etc. It includes a three tier evaluation – self-evaluation, peer group evaluation and teacher evaluation. The topics are dealt in a task based and skill oriented manner. The lab cum record work shallenable the student to develop the required skills in order to fit in apt into the existing market trends. This lab session also gives him an idea about the various ways and means to face the admission tests for the higher education.

Objectives
- To improve fluency in English
- To communicate ideas relevantly and coherently in writing.

Outcomes
- Develop the ability to read and comprehend a wide range of text and understand the importance of lifelong learning.
- Express ideas fluently and appropriately in social and professional fields and strengthen social etiquette.
- Improve English language proficiency with an emphasis on LSRW skills.
- Interpret academic subjects with better understanding.
- Rebuild English language skills to meet the industry needs.
- Ability to present themselves in various formal social and professional situations.
- Improve literary sense through wide range of selections from various

UNIT-I
Functional English: Starting a conversation, responding appropriately and relevantly. Body Language, Role play in different situations Vocabulary Synonyms & Antonyms, Word Roots, One word substitutes, Prefixes & Suffixes, Study of word origin, Idioms and Phrases, Analogy.

UNIT-II
Vocabulary: Synonyms & Antonyms, Word Roots, One word substitutes, Prefixes & Suffixes, Study of word origin, Idioms and Phrases, Analogy.

UNIT- III

Group Discussion: Introduction to Group Discussion its features and qualities desired in a participant of Group Discussion.

UNIT-IV

Presentation Skills: Knowing audience; acquiring content; organizing ideas; foreseeing the possible clarifications sought; adopting of appropriate medium; positive stage presence; Presenting and feedback

UNIT-V

Letter Writing & Résumé Writing Manual and Emailing; types and formats; content and body of the letter. Email etiquettes; Resume Writing, tools required for writing resume's, role of cover letter in a resume.

UNIT-VI

Interview Skills: Introduction, various types of questions asked in an interview, qualities required to be a competent interviewee.

UNIT-VII

Reading comprehension: Introduction, types of reading, qualities of a good reader

UNIT-VIII

Technical Report Writing
Formats and types of reports

Reference Books:
1. English language laboratories: A Comprehensive Manual; NiraKonar, PHI Learning Pvt. Ltd.,Delhi.
2. Effective Technical Communication: A Guide for Scientist and Engineers;Barun K. Mitra, OUP.
3. Great Answers to Though Interview Questions; Martin John Yate; Seventh Edition;CKogan Page.
4. Business Communication; Hory Sankar Mukerjee; OUP.
5. Technical Communication, Meenakshi Raman, Sangeeta Sharma, Oxford higher Education.
6. Professional Presentations; Malcom Goodale;Cambridge University Press.
7. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
8. Effective Technical Communication, M. Ashraf Rizvi, Tata McGraw Hill.
9. Communication Skills, Sanjay Kumar, PushpLatha, Oxford Higher Education.
10. Business communication; Second Edition,Prentice Hall of India , New Delhi.
11. English for Engineers Made Easy, AedaAbidi, Ritu Chaudhry, Cengage Learning.
12. Effective Business Communication ; Seventh Edition; Murphy, HertaA.,Herbert W. Hildebrandt, and Jane P.Thomas 2009,Tata Mc Graw-Hill Publishing Company Limited, New Delhi.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN OF STEEL STRUCTURES

Course Code: GR14A3007   L:3 T:1 P:0 C:4
III Year II Semester

COURSE OBJECTIVES: On completion of this Subject/Course the student shall be able to:
- Identify various types of structural steel and its properties. Also able to define concepts of Limit State Design.
- Classify and design various types of connections.
- Design Tension members and Compression members.
- Design Beams and eccentric connections.
- Analyze structures using plastic method of analysis and evaluate collapse load and plastic moment capacity.

COURSE OUTCOMES: On completion of this Subject/Course the student should be able to:
- Identify various types of structural steel and its properties. Also able to define concepts of LSD.
- Classify and design various types of connections.
- Design tension members for the given loads.
- Design compression members for the given loads and moments.
- Design the steelbeams and eccentric connections for the given loads and moments.
- Design the eccentric connections for the given loads and moments.
- Analyze structures using plastic method of analysis and evaluate collapse load and plastic moment capacity.

UNIT-I
Materials: Making of iron and steel, types of structural steel, mechanical properties of steel and   yield strength. Loads and combination, local buckling behavior of steel and concepts of limit state. Design Strengths, deflection limits, serviceability and stability check.

UNIT-II
Bolted connections and Riveted connections: IS – 800 – 2007 specifications, Design strength,efficiency of joint and prying action.
Welded connections: Types of welded joints, specifications and design requirements.

UNIT-III
Design of tension member: Design strength, design of splice and lug angle. Design of compression members: Design strength, buckling class, slenderness ratio, design strength, laced and battened columns,column splice,column slabbaseand gusset base.

UNIT- IV
Design of Beams: Introduction, types of sections, lateral stability of beams, lateral torsional buckling,bending strength of beams, shear strengthof beams webbuckling, web crippling, deflection, built-upbeams, lintels and purlins.
Design of eccentric connections: Framed, stiffened and seated connections.

UNIT-V
Eccentric and Moment connections: Introduction, beam-column connections, connections subjected to eccentric shear, bolted framed connections, bolted seat connections, bolted bracket connections, welded framed connections, welded seat connections, welded bracket connection, moment resistant connection, bolted moment connections and welded moment connections.

TEXT BOOKS
1. Design of steel structures – N. Subramanian, Oxford University Press – 2009.
2. Limit State Design of steel structures, S.K.Duggal, Tata McGraw – Hill, 2010

REFERENCE BOOKS
1. Design of Steel structures by K. S. Sai Ram, Pearson Education.
2. Design of Steel Structures Vol. 1 & 2 – Ramchandra, Standard Publications.
3. Design of steel structures , S. S. Bhavikatti, IK int Publication House, New Delhi, 2010
4. Design of steel structures, B. C Punmia A. K. Jain , Ashok Kumar Jain, Laxmi Publications
5. Design of steel structures, S. Ramamrutham,DhanpatRai Publishing Company (p) Limited

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

TRANSPORTATION ENGINEERING

Course Code: GR14A3008   L:3 T:1 P:0 C:4
III Year II Semester

COURSE OBJECTIVES: By the end of this course student will be able to
- Gain a solid understanding of the principles of highway engineering and traffic analysis
- Develop and interpret design standards for horizontal and vertical geometry.
- Have a strong analytical and practical knowledge of Planning, Designing and solving transportation problems
- Understand the type of conflicts that occur at intersection and design the intersection accordingly
- Gain the knowledge in railway engineering and airport engineering.

COURSE OUTCOMES
- Apply basic principles of physics in estimating stopping and overtaking sight distance requirements
- Analyze the factors influencing road vehicle performance, characteristics and design.
- Review the level of service for selected road segments
- Organize the basic traffic signal phasing and timing plan.
- Compute the geometric features of road like horizontal and vertical alignment
- Illustrate the basic traffic stream parameters and models, traffic flow models, and queuing theory
- Demonstrate the systematic approach where the interaction of humans and the vehicles and their impact on the society and transportation

UNIT-I
Highway development and planning: Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT-II
Highway geometric design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distances- Stopping sight Distance, Overtaking Sight Distance, intermediate Sight Distance and Head light

sight distance- Design of Horizontal Alignment- Design of Superelevation and Extra widening- Design of Transition Curves-Design of Vertical alignment-Gradients- Vertical curves.

UNIT-III
Traffic engineering: Traffic flow parameters-Volume, Speed, Density and headway- Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies, Parking types and Parking characteristics- Road Accidents-Causes and Preventive measures-Accident Data Recording – Condition Diagram and Collision Diagrams.
Traffic regulation and management:Road Traffic Signs – Types and Specifications – Road markings-Need for Road Markings-Types of Road Markings- Design of Traffic Signals –Webster Method –IRC Method.

UNIT-IV
Intersection design: Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections- Channelization: Objectives –Traffic Islands and Design criteria-Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersection.

UNIT-V
Introduction to railway and airport engineering: Gradients- Grade Compensation- Cant and Negative Superelevation- Cant Deficiency – Degree of Curve – Crossings and Turn outs.
 Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.

TEXT BOOKS:
1. Highway Engineering – S.K.Khanna&C.E.G.Justo, Nemchand& Bros., 9th edition (2011).
2. Railway Engineering – A text book of Transportation Engineering – S.P.Chandola – S.Chand& Co. Ltd. – (2001).
3. Highway Engineering Design – L.R.Kadiyali and Lal- Khanna Publications.
4. Airport Planning and Design- S.K.Khanna and Arora, Nemchand Bros.

REFERENCES
1. Highway Engineering – S.P.Bindra ,Dhanpat Rai & Sons. – 4th Edition (1981)
2. Traffic Engineering & Transportation Planning – Dr.L.R.Kadyali, Khanna publications – 8th Edition – 2011.
3. Railway Engineering – M.M.Agarwal, Prabha& Co., 15th Edition –August 1994.
4. Air Transportation Planning & design – Virendhra Kumar &StatishChandhra – Gal Gotia Publishers (1999).

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

WATER RESOURCE ENGINEERING-II

Course Code: GR14A3009   L:2 T:1 P:0 C:3
III Year II Semester

COURSE OBJECTIVES
- Teach the students about various practical applications of problems associated with improper usage and management of water resources in the world.
- Train the students and bring awareness in them about effective and proper usage of ground water resources and also motivate them for the research of potential natural ground water zones.
- Train them for the estimation and interpret the data obtained from mass – curve by using Excel tools for estimating the capacity of a reservoir.
- Train them for the effective and proper design of various types of dams and reservoirs, problems associated with those structures while handling in real scenario.
- Train them for the design of aqueducts, notches and other important irrigation structures according to their usage and location of construction.

COURSE OUTCOMES: After completing this course Water Resources Engineering - II, students will be able to:
- Estimate and calculate the inflow, outflows from the reservoir as well its capacity by using mass curve techniques
- Design and analyze the different types and components of various dams pertaining to corresponding boundary conditions
- Interpret performance, safety and stability of the gravity dam
- Calculate flow through the earthen dams and also corresponding remedial measures to prevent more seepage through dams, various irrigation structures
- Design various diversion head works by using Blighs and Khoslas theory
- Assess the efficiency of performance of any component of hydraulic structure like a weir, barrage, CD work, etc.
- Indicate different types of irrigation structures along with their designs and analysis by using different evaluation methods

UNIT-I
Storage Works-Reservoirs - Types of reservoirs, selection of site for reservoir zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve- Reservoir Sedimentation –Benefit cost ratio analysis of a reservoir- Life of Reservoir.-Types of dams, factors affecting selection of type of

dam, factors governing selection of site for a dam.

UNIT-II

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravitydam, elementary, common profile and practical profile of a gravity dam, limiting heightof a low gravity dam, Factors of Safety -'stability Analysis, Foundation fora Gravity Dam, drainage and inspection galleries and their impact, stress analysis of a gravity dam for reservoir full and reservoir empty conditions.

UNITIII

Earth dams: Types of Earth dams, causes of failure of earth dam, criteria forsafe design of earth dam, seepage through earth dam-graphical method,measures for control of seepage through embankments and foundations.

Spillways: types of spillways, Design principles of Ogee spillways– Spillwaygates. Energy Dissipaters and Stilling Basins Significance of jump,Indian types of StillingBasins& USBR stilling basins.

UNIT-IV

Diversion Head works: Types of Diversion head works- weirs and barrages,layout of diversion head work - components. causes and failure of weirsand Barrages on permeable foundations,-Silt Ejectors and Silt Excludersweirs on Permeable Foundations - creep Theories - Bligh's, Lanet andKhosla's theories, Determination of uplift pressure- Various CorrectionFactors - Design principles of weirs on permeable foundations using creeptheories - exit gradient, U/s and D/s Sheet Piles - Launching Apron

UNIT-V

Canal falls: Types of falls and their location, design principles of Notch fall and sarada type fall. Canal regulation works, principles of design of distributor and head regulators, canal cross regulators-canal outlets, types of canal modules, proportionality, sensitivity and flexibility.

Cross drainage works types: selection of site, design principles of aqueduct siphon aqueduct and super passage. Design of Type II Aqueduct (Under Tunnel).

TEXT BOOKS
   1. Irrigation Engineering and Hydraulic Structures- S.K. Garg, 2014- Khanna publishers- 19th edition

REFERENCE BOOKS
   1. Irrigation and water power engineering- B.C.Punmia, PandeB.B.Lal, Ashok Kumar Jain, ArunKumar Jain- Laxmi publications 16th edition
   2. Irrigation Engineering & Hydraulic Structures- S.R. Sahasrabudhe,2013-
   S .K. Kataria& Sons

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

GEOTECHNICAL ENGINEERING - I

Course Code: GR14A3010   L:3   T:1   P:0   C:4
III Year   II Semester

COURSE OBJECTIVES: The objectives of this course will help the student to
- Educate about norms and principles of existing engineering practice in geotechnical engineering.
- Provide a strong background in geotechnical engineering with various aspects like consistency limits, grain size analysis, compaction, permeability, consolidation, shear strength of soils, etc.
- Train to have solid foundation in terms of basic properties required for different projects that encounter in difficult soil conditions.
- Identify the nature and behaviour of soil.
- Excel in basic engineering methods to succeed in real-time projects.

COURSE OUTCOMES: At the end of the course, the student will be able to
- Identify basic Engineering properties of soil and relate them with Civil Engineering practices
- Evaluate various experiments to determine the geotechnical properties of soil.
- Identify, formulate and solve various problems in geotechnical engineering.
- Analyse the mechanism and behavior of soil under various field situations
- Identify field equipment used in improving soil properties
- Articulate importance of extensive research in geotechnical engineering
- Analyze soil mechanics for development of construction sites both technically and economically

UNIT-I
Introduction: Soil formation, soil structure and clay mineralogy, adsorbed water, phase diagrams, mass-volume relationships, relative density.
Index properties of soils: Grain size analysis, sieve and hydrometer methods, consistency limits and indices, I.S. classification of soils.

UNIT-II
Permeability: Capillary rise, Darcy's law, factors affecting permeability, laboratory determination of coefficient of permeability, Permeability of layered systems, In-situ permeability tests - pumping-out tests.

Seepage through soils: Total, neutral and effective stresses, quick sand condition, Flownets, characteristics and uses.

UNIT-III
Stress distribution in soils: Introduction, Boussinesq's theory for point loads, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical plane and horizontal plane, Westergaard's theory, appropriate stress distribution methods - equivalent point load method and two to one method, Newmark's influence chart construction and use.

UNIT- IV
Compaction: Mechanism of compaction, factors affecting compaction, effects of compaction on soil properties, field compaction and compaction quality control.
Consolidation: Computation of settlements, stress history of clay, over consolidation ratio, laboratory consolidation test – logarithm of time fitting method and square root of time fitting method, preconsolidation pressure and its determination, Terzaghis 1-D consolidation theory.

UNIT- V
Shear strength of soils: Importance of shear strength, Mohr circle of stress, Mohr's - Coulomb failure theories, types of laboratory strength tests, shear strength of sands and clays, critical void ratio, liquefaction.

TEXT BOOKS
1. Gopal Ranjan and ASR Rao, Basic and Applied Soil Mechanics, New Age International Pvt. Ltd, New Delhi, 2nd edition (2000), Reprint (2014).
2. K.R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers Distributors, Delhi, 5th edition (2000), Reprint (2009).

REFERENCES
1. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundations, Laxmi publications Pvt. Ltd., New Delhi, 16th edition, Reprint (2012).
2. C. Venkataramiah, Geotechnical Engineering, New age International publishers (2002), 4th edition (2012).
3. Dr. P. Purushotham Raj, Soil Mechanics and Foundation Engineering, Pearson Education India (2008).
4. S. K.Gulhati & Manoj Datta, Geotechnical Engineering, Mc.Graw Hill Education Pvt Ltd., New Delhi (2005), 16th Reprint (2013).
5. Braja M. Das, Advanced Soil Mechanics, Taylor and Francis, 3rd edition (2008).
6. Donald P. Coduto, Geotechnical Engineering, Prentice-Hall India Publications, 2nd edition (2010).

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISASTER MANAGEMENT AND MITIGATION
(Open Elective)

Course Code: GR14A3011   L:3 T:1 P:0 C:4
III Year II Semester

COURSE OUTCOMES: By the end of this course student should be able to
- Identify different problems by various disasters and to predict solutions.
- Predict strategies to decrease economic loss by relating with previous disaster data
- Apply engineering technology to give a solution to mitigate loss caused due to disasters.
- Apply science and geology to understand the problems.
- Express councils present globally for the evaluation and mitigation of disasters.
- Devise latest technologies to resolve problems due to disasters.
- Propose various research programs.

Couse Objectives: On completion of this Subject/Course the student shall be able to:
- Acquire knowledge of types of disaster, and their impacts on environment and on human development.
- Recognize difference between endogenous and exogenous hazards and causes and their impacts.
- Interpret the causes for floods and droughts, their impacts.
- Awareness on emerging approaches in disaster management in preparedness, emergency stage and post disaster stage.
- Know the integrated approach for disaster preparedness mitigation & awareness and council available nationally and internationally.
- Understand the use of latest technologies used in disaster management & mitigation and awareness.
- Knowledge on various research programs done.

UNIT-I
Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology- Landscape Approach- Ecosystem Approach - Perception approach - Humanecology & its application in geographical researches.
Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/

Disasters - ExtraPlanetary Hazards/ disasters - Planetary Hazards-Endogenous Hazards - Exogenous Hazards.

UNIT-II

Endogenous Hazards: Volcanic Eruption - Earthquakes - Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - Human adjustment, perception & mitigation of earthquake.

Exogenous hazards/disasters: Infrequent events- Cumulative atmospheric hazards/ disasters, Infrequent events: Cyclones - Lightning - Hailstorms, Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes, distribution human adjustment, perception & mitigation), Cumulative atmospheric hazards/ disasters: Floods- Droughts- Cold waves-Heat waves

UNIT-III

Floods: Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation), Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Palnetary Hazards/ Disasters- Man induced Hazards /Disasters- Physical hazards/ Disasters-Soil Erosion Soil Erosion:- Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion, Chemical hazards/ disasters, Release of toxic chemicals, nuclear explosion- Sedimentation processes. Sedimentation processes - Global Sedimentation problems-Regional Sedimentation problems- Sedimentation & Environmental problems-Corrective measures of Erosion & Sedimentation. Biological hazards/ disasters:- Population Explosion.

Emerging approaches in Disaster Management- Three Stages
1. Pre- disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

UNIT-IV

Natural Disaster Reduction & Management
   a) Provision of Immediate relief measures to disaster affected people
   b) Prediction of Hazards & Disasters
   c) Measures of adjustment to natural hazards

Disaster Management: An integrated approach for disaster preparedness, mitigation & awareness. Mitigation- Institutions- discuss the work of following Institution.

a. Meteorological observatory
b. Seismological observatory
c. Volcanology Institution
d. Hydrology Laboratory
e. Industrial Safety inspectorate
f Institution of urban & regional planners
g. Chambers of Architects
h. Engineering Council
i. National Standards Committee

Integrated Planning: Contingency management Preparedness -
a) Education on disasters
b) Community involvement
c) The adjustment of Human Population to Natural hazards & disasters Role of Media

Monitoring Management: Discuss the programme of disaster research && mitigation of disaster of following organizations.
a) International Council for Scientific Unions (ICSU)- Scientific committee on problems of the Environment (SCOPE), International Geosphere-Biosphere programme(IGBP)
b) World federation of Engineering Organizations (WFED)
c) National Academy of Sciences
d) World Meteorological organizations (WMO)
e) Geographical Information System (GIS)
f) International Association of Seismology & Physics of Earth's Interior (IASPEI)
g) Various U.N agencies like UNCRD, IDNDR, WHO, UNESCO, UNICEF, UNEP.

UNIT-V
a. A regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India
b. Ecological planning for sustainability & sustainable development in India-Sustainable rural development: A Remedy to Disasters -Role of Panchayats in Disaster mitigations
c. Environmental policies &programmes in India- Institutions & National Centres for Natural Disaster reduction. Environmental legislations in India,Awareness, Conservation Movement,Education & training.

TEXT BOOK
1. Disaster Mitigation: Experiences and Reflections by PardeepSahni ,PHI Learning private limited.
2. Natural Hazard's & Disaster by Donald Hyndyman& David Hydman_ Cengage Learning

REFERENCE BOOKS

1. R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi, 1990.
2. Savinder Singh Environmental Geography, PrayagPustakBhawan, 1997.
3. Kates,B.I& White, GF The Environment as Hazards, oxford, New York, 1978.
4. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi,2000.
5. H.K. Gupta (Ed) Disaster Management, Orient Blackswan, 2003.
6. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994.
7. Dr. Satender , Disaster Management in Hills, Concept Publishing Co., New Delhi, 2003.
8. A.S. Arya Action Plan For Earthquake,Disaster, Mitigation in V.K.Sharma(Ed) Disaster Management IIPA Publication New Delhi, 1994.
9. R.K. Bhandani An overview on Natural &Man made Disaster & their Reduction, CSIR,   New Delhi.
10. M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management, HPA, New Delhi, 2001.
11. Disaster Management Handbook Edited by Jack Pinowski CRC Press Taylor & Francis Group.
12. Hazard Mitigation in Emergency Management by Tanveer Islam and JeffrayRyan , Elsevier.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

BRIDGE ENGINEERING
(Open Elective)

Course Code: GR14A3012   L:3 T:1 P:0 C:4
III Year II Semester

COURSE OBJECTIVES
- Develop an understanding and appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
- Develop an intuitive feeling about the sizing of bridge elements. ie. Develop a clear
- Understanding of conceptual design.
- Recognize the load flow mechanism and identify loads on bridges.
- Carry out the design of bridge starting from conceptual design, selecting suitable bridge,
- Geometry to sizing of its elements.
- Identify the method which is suitable to analyze and design of piers and abutments.

COURSE OUTCOMES: By the end of this course student should be able to
- Illustrate conceptual design for short, medium and long span bridges.
- Analyze structural behavior of different longitudinal and transverse bridge types.
- Design bearings, joints, piers and abutments.
- Compare composite and slab deck bridges.
- Evaluate life-cycle costs of bridges.
- Recognize the importance of different loadings that are acting on bridges.
- Demonstrate sizing of bridge elements, i.e. develop a clear understanding of conceptual design.

UNIT-I
Introduction: Importance of site investigation in bridge design. Highway bridge loading standards. Impact factor, railway bridge loading standards (B.G.ML Bridge) various loads in bridges.

Box Culvert: General aspects, design loads, design of box culvert subjected to RC class AA tracked vehicle only.

UNIT-II
Deck Slab Bridge: Introduction, effective width method of analysis, design of deck slab bridge (simply supported) subjected to class AA tracked vehicle only.

Beam & Slab Bridge (T-beam Bridge): General features, design of interior panel of slab, pigeauds method, design of T-beam bridge supported to class AA tracked vehicle only.

UNIT-III
Plate Girder Bridge: Introduction, elements of a plate girder and their design, design of a deck type welded plate girder, bridge of single line B.G.
Composite Bridges: Introduction, advantages, design of composite bridges consisting of RCC slabs over steel girders including shear connectors.

UNIT-IV
Bridge Bearings: General features, types of bearings, design principles of steel rocker & roller bearings, design of a steel rocker bearing, design of elastomeric pad bearing.

UNIT-V
Piers and Abutments: General features, bed block, materials, piers and abutments. Types of piers, forces acting on piers, stability analysis of piers, general features of abutments, forces acting on abutments, stability analysis of abutments, types of wing walls, approaches and types of bridge foundation (excluding design).

TEXT BOOKS
1. Bridge Engineering by Ponnu Swamy, TATA Mcgraw Hill company, New Delhi.
2. Design of Bridges by N.Krishnam Raju, Oxford & IBH, Publishing company Pvt.ltd., Delhi.
3. Design of Bridges structure by T.R.Jadadish&M.A.Jayaram Prentice Hall of India Pvt., Delhi.
4. Deign of Bridges stucture by D.J.Victor.
5. Relavant IRC & Railway bridge codes.

REFERENCE BOOKS
1. Design of steel structures by B.C.Punmia, Ashok kumarjain and Arunkumarjain, Laxmi publications, New Delhi.
2. Design of Steel strutures by Ramachandra.
3. Design of R.C.C. structures B.C.Punmia, Ashok kumarjain and Arunkumarjain, Laxmi publications, New Delhi.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

MANAGEMENT SCIENCE

Course Code: GR14A3102   L:3 T:1 P:0 C:4
III Year II Semester

OBJECTIVE: Objective of the course is to familiarize the students with management concepts, theories, functions and contemporary issues.

Outcome: After studying the course the student will be able to understand:
- The basic concepts, theories and approaches relating to management, organization, and leadership;
- Principles of operations, statistical quality control and inventory control necessary for better managing production;
- Fundamentals necessary for understanding marketing management;
- Certain concepts and important functions of personnel management and industrial relations;
- Tools and techniques of Project Management;
- Strategic Management and Contemporary Strategic Issues;
- Certain latest concepts like MIS, End User Computing, MRP, JIT, TQM, Six Sigma and CMM, SCM, ERP, PM, BPO, Business Process Re-engineering and Bench Marking, Balanced Score Card.

UNIT-I
Introduction to Management & Organisation: Concepts of Management and Organization: Nature, Importance, Functions and Theories of Management;Systems Approach to Management; Leadership Styles; Social Responsibilities of Management. Designing Organisational Structures: Basic concepts relating to Organisation; Departmentation and Decentralisation, Types and Evolution of mechanistic and organic structures of organisation and suitability.

UNIT-II
Operations &Marketing Management: Principles and Types of Plant Layout, Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement.Statistical Quality Control: Control Charts for Variables and Attributes (Simple Problems) and Acceptance Sampling, Deming's contribution to quality. Objectives of InventoryControl, EOQ, ABC Analysis, Purchase Procedures, Stores Management and Stores Records - Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle, Channels of Distribution.

UNIT-III
Human Resources Management (HRM): Concepts of Personnel Management, HRM and HRD and Industrial Relations (IR), HRM vs. PMIR. Basic functions of HR Manager: Manpower planning, Recruitment and Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Analysis, Job Description, and Job Evaluation.

UNIT-IV
Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing (simple problems).

UNIT-V
Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Contemporary Management Practices: Basic concepts of MIS, End User Computing, Materials Requirement Planning (MRP), Just-In-Time (JIT) System, Total Quality Management (TQM), Six Sigma and Capability Maturity Model (CMM) Levels, Supply Chain Management, Enterprise Resource Planning (ERP), Performance Management, Business Process Outsourcing (BPO), Business Process Re-engineering and Bench Marking, Balanced Score Card.

Teaching Methodologies
   a) Lecture Method
   b) Use of OHP
   c) Power Point Presentation
   d) Tutorials and Assignments

Text Book
   1. Aryasri: Management Science, TMH, 2009.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

GEOTECHNICAL ENGINEERING LAB

Course Code: GR14A3013   L:0 T:0 P:2 C:2
III Year II Semester

COURSE OBJECTIVES: The objectives of this course will help the student to
- Distinguish various soil properties and its behavior.
- Carry out firm foundation in testing various types of soils and their properties.
- Experience with the measurement of geotechnical laboratory parameters.
- Excel in experiment research and to succeed with real time projects.
- Report the results of various experiments

COURSE OUTCOMES: At the end of the course, the student will be able to
- Classify the soils and its basic properties.
- Analyze soil behavior and its mechanism.
- Find role of basic properties of soil in simple and complex applications.
- Develop a proficiency in handling experimental data.
- Report the results of a laboratory experiment at a professional standard.
- Analyze data for real time applications.
- Recommend extensive research in geotechnical properties.

List of experiments
1. Liquid limit and plastic limit
2. Grain size distribution by sieve analysis
3. Field density by core cutter method
4. Field density by sand replacement method
5. Relative density of sands
6. Standard and modified compaction test
7. Permeability of soil by constant and variable head test
8. California Bearing Ratio Test
9. Consolidation test
10. Unconfined compression test
11. Direct shear test
12. Vane shear test
13. Tri-axial test (Demonstration)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

HIGHWAY MATERIALS LAB

Course Code: GR14A3014   L:0 T:0 P:2 C:2
III Year II Semester

COURSE OBJECTIVES
- To provide knowledge of physical and mechanical characteristics of highway materials.
- To demonstrate various experiments on highway materials to check their suitability in road construction.
- To illustrate design methods and test procedures for strength determination of bituminous mixes
- To facilitate knowledge of optimum material selection for pavement layers.
- To demonstrate the importance of stability of bitumen mixes

COURSE OUTCOMES: On completion of this course student shall be able to,
- Estimate desired characteristics of soil and aggregates.
- Distinguish suitable materials for road construction.
- Categorize pavement materials by their physical and mechanical properties.
- Demonstrate various experiments on bitumen to measure various properties.
- Design bituminous mixes as per pavement requirement.
- Evaluate mixes for their strength and deformation characteristics.
- Calibrate optimum binder content for the construction of pavement surface in flexible pavements

I. ROAD AGGREGATES
1. Crushing value
2. Impact value
3. Specific gravity and water absorption
4. Abrasion test
5. Shape test.

II. BITUMINOUS MATERIALS
1. Penetration test
2. Ductility test
3. Softening point test
4. Flash and fire point tests

III. BITUMINOUS MIXES

IV-Year

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

GEOTECHNICAL ENGINEERING-II

Course Code: GR14A4001   L:3 T:1 P:0 C:4
IV Year I Semester

Course Objectives: The objectives of this course will help the student to
- Plan and conduct a site investigation program, including in situ tests.
- Explore soil data to analyze slope stability and its design.
- Interpret in-situ soil data, consolidation analysis for shallow and deep foundations.
- Analyze bearing capacity and settlement for foundations.
- Utilize their knowledge in foundation engineering to analyze various types of problems associated with real-time practice.

COURSE OUTCOMES: At the end of the course, the student will be able to
- List the various soil exploration techniques and interpret the resulting soil profiles.
- Analyze slope stability and design of earth retaining walls
- Apply bearing capacity equations for shallow and deep foundations and to evaluate rate of settlement
- Choose a suitable foundation based on soil properties for various soils.
- Identify and solve foundation related engineering problems
- Estimate pile and pile group capacity for any kind of soil including group efficiency and negative friction.
- Explain the functions and design criteria of well foundations.

UNIT-I
Soil exploration: Introduction, methods of soil exploration, boring and sampling methods, Field tests - penetration tests, plate load test, Menard pressuremeter test, planning and preparation of soil investigation report, borehole logs.

UNIT-II
Earth slope stability: Infinite slopes, finite slopes, types of failures, factor of safety of infinite slopes, stability analysis by standard method of slices, total stress and effective stress method of analysis, Taylor's stability Number, stability of earth dam slopes under different conditions.

UNIT-III
Earth pressure and retaining walls: Introduction, Rankine's theory of earth pressure, active and passive earth pressures, Coulomb's earth pressure theory,

Culmann's graphical method, types of retaining walls, stability of cantilever retaining walls.

UNIT-IV
Bearing capacity and settlement analysis of shallow foundations: Types and choice of foundation, location of depth, modes of soil failure, safe bearing capacity by Terzaghi, Meyerhof, Skempton and IS Methods, effect of water table on bearing capacity, safe bearing pressure based on N value, settlement analysis, contact pressure, settlement from plate load test, settlement from penetration tests.

UNIT-V
Deep foundations: Types of piles, static pile formulae, dynamic pile formulae, pile load tests, load carrying capacity of pile groups in sands and clays, settlement of pile groups, negative skin friction, types and different shapes of well foundations, components of well foundations.
Ground improvement methods: Introduction, soil stabilization using lime and cement.

TEXT BOOKS
1. Gopal Ranjan and ASR Rao, Basic and Applied Soil Mechanics, New Age International Pvt. Ltd, New Delhi, 2nd edition (2000), Reprint (2014).
2. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundations, Laxmi publications Pvt. Ltd., New Delhi, 16th edition, Reprint (2012).

REFERENCE BOOKS
1. Braja M. Das, Principles of Foundation Engineering, Cengage Learning, New Delhi, 6th edition (2007), Reprint (2012).
2. Bowles, J.E., Foundation Analysis and Design, McGraw-Hill Publishing Company, Newyork, 5th edition (1997).
3. Swami Saran, Analysis and Design of Substructures, Oxford and IBH Publishing company Pvt Ltd., 2nd edition (2006).
4. S. K.Gulhati & Manoj Datta, Geotechnical Engineering, Mc.Graw Hill Education Pvt Ltd., New Delhi (2005), 16th Reprint (2013).
5. Teng,W.C, Foundation Design, Prentice Hall, New Jersey, 13th edition, Reprint (1992).

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ESTIMATION AND COSTING

Course Code: GR14A4002   L:3 T:1 P:0 C:4
IV Year I Semester

COURSE OBJECTIVES
- Understanding the process of quantity survey.
- Estimating the quantities of materials for buildings and roads.
- Calculate rate per unit of any item.
- Provide knowledge on Contracts and tendering process.
- Assessing the value of a property

COURSE OUTCOMES: By the end of this course student should be able to:
- Calculate the quantities of different items in a building.
- Estimate the quantities of materials required for different types of roads and structures.
- Handle the tendering process for executing any civil engineering work.
- Assess the value of any property.
- Recognize the process and importance of cost estimation, cost budgeting and cost control.
- Estimate the rate per unit of any item of work.
- Interpret the process and importance of valuation of buildings and other structures.

UNIT-I
General items of work in building: Standard Units, Principles of working out quantities for detailed and abstract estimates, approximate methods of Estimating. Detailed Estimates of Buildings – centerline method, longwall short wall method.

UNIT-II
Earthwork for roads hill roads (two level sections only) and canals. Quantities of materials for different types of roads.

UNIT- III
Rate Analysis –Working out data for various items of work over head and contingent charges. Reinforcement bar bending and bar requirement schedules.

UNIT-IV
Contracts: Types of contracts – contract Documents – Conditions of contract,

contract procedures, Tendering process, Rights and responsibilities of parties to contracts**.**

UNIT-V
Valuation of buildings: Purpose and principles of valuation, Depreciation, methods of calculating depreciation, methods of valuation, Rental method, development method, profit based method**.**

TEXT BOOKS
1. Estimating & Costing by B.N.Dutta, UBS publishers.
2. Estimating & Costing by G.S.Birdie.
3. Valuation of real properties by S.C. Rangawala, Charotar publishing house.

REFERENCE BOOKS
1. Estimating, Costing & Specifications by M.Chakraborthi, Laxmi publications.
2. Standard schedule of rates and standard Data Book by Public works department.
3. SP:27, Handbook of method of measurement of building works, Bureau of Indian Standards.
4. IS:1200, Methods of measurements
5. National Building code.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL ENGINEERING

Course Code: GR14A4003   L:2 T:1 P:0 C:3
IV Year I Semester

COURSE OBJECTIVES: The objective of this Course is to make the student:
- Identify opportunities in environmental engineering field.
- Identify, formulate and solving problems on analysis of water.
- Predict the population in a city such that design of water treatment plant and STP can be done and quantity of water required can be estimated.
- Assess various techniques in treatment of water and wastewater.
- Identify methods of disposal of sewage and their impact on environment

COURSE OUTCOMES: On completion of this Course the student shall be able to:
- Design and implement a drinking water supply system for a residential community
- Identify the cause of outbreak of epidemics and eradicate.
- Establish drinking water supply and wastewater collection system for a town.
- Identify safe disposal methods for wastewater
- Design suitable treatment for wastewater.
- Identify suitable sources of water for a public water supply system.
- Resolve all operational and maintenance issues of water supply and sanitary engineering.

UNIT-I
Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – water demand – factors affecting – fluctuations – fire demand – storage capacity – water quality and testing – drinking water standards.
 Sources of water: Comparison from quality, quantity and other considerations – intakes – infiltration galleries.

UNIT-II
Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation, flocculation, clarifier design – coagulants – feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation comparison of filters – disinfection – theory of chlorination, chlorine demand, other disinfection practices- Miscellaneous treatment methods.

UNIT- III
Distribution systems: requirements – methods and layouts, design procedures- Hardy Cross and equivalent pipe methods service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines – pump house.

UNIT-IV
Conservancy and water carriage systems: sewage and storm water estimation – time of concentration – storm water overflows combined flow – characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. equations. Design of sewers – shapes and materials – sewer appurtenances manholes –inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – components requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming – dilution.

UNIT-V
Layout and general out line of various units in a waste water treatment plant – primary treatment design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – biological treatment – trickling filters –standard and high rate. Construction and design of oxidation ponds - Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

TEXT BOOKS
1. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt. Ltd, New Delhi.
2. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers.
3. Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons Publishers.

REFERENCE BOOK
1. Water and Wastewater Technology by Mark J Hammer and Mark J. Hammer Jr.
2. Water and Wastewater Technology by Steel
3. Water and Wastewater Engineering by Fair, Geyer and Okun
4. Wastewater treatment- concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India
5. Wastewater Engineering by Metcalf and Eddy.
6. Unit operations in Environmental Engineering by R. Elangovan and M.K. Saseetharan, New age International

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

GROUND WATER DEVELOPMENT AND MANAGEMENT
(ELLECTIVE-I)

Course Code: GR14A4004   L:3 T:1 P:0 C:4
IV Year I Semester

COURSE OBJECTIVES
- To explain the occurrence of groundwater in various aquifers and describe aquifer parameters
- To describe the groundwater movement using the differential equation governing groundwater flow in three dimensions using Cartesian and polar coordinates
- To explain the analysis of pumping test data for steady and unsteady groundwater flow
- To explain the surface and subsurface investigations of groundwater
- To explain the artificial recharge of groundwater, saline water intrusion in aquifers and ground water basin management.

COURSE OUTCOMES: To develop in the student
- Enumerate the porosity, specific yield and specific retention of aquifer
- Calculate the storage coefficient and transmissivity of aquifers and to derive differential equation governing groundwater flow in three dimensions in Cartesian and Polar coordinates
- Examine the pumping test data in steady and unsteady groundwater flow towards a well in confined and unconfined aquifers using Dupit's and Theim's equations
- Appraise surface and subsurface methods of exploration of investigation of groundwater
- Assess the methods of recharge of groundwater using GIS and Remote sensing.
- Compile dynamics of saline water intrusion and to manage the groundwater basin.
- Synthesize the overall concepts and procedures necessary for the development and management of ground water resources

UNIT-I
Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT-II

Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground waterflow contours their applications.

UNIT-III

Analysis of Pumping Test Data – I: Steady flow groundwater flow towards a well in confined and unconfined aquifers, Dupit's and Theism's equations, Assumptions, Formation constants, yield of an open well interface and well tests. Analysis of Pumping Test Data – II: Unsteady flow towards a well, Non equilibrium equations, Thesis solution, Jocob and Chow's simplifications, Leak aquifers.

UNIT-IV

Surface and Subsurface Investigation: Surface methods of exploration, Electrical resistivity and Seismic refraction methods. Subsurface methods, Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

UNIT-V

Artificial Recharge of Ground Water: Concept of artificial recharge, recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies.

Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben- Herzberg relation, Shape of interface, control of seawater intrusion. Groundwater Basin Management: Concepts of conjunction use, Case studies.

TEXT BOOKS:
1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.

REFERENCE BOOKS
1. Groundwater by Beaver, John Wiley & sons.
2. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRESTREESED CONCRETE
(ELLECTIVE-1)

Course Code: GR14A4005   L:3   T:1   P:0   C:4
IV Year I Semester

COURSE OBJECTIVES:
- To develop an advanced understanding of the behavior, analysis and design of prestressed concrete structures.
- To become familiar with professional and contemporary issues in the design and fabrication of prestressed concrete members
- Be able to identify and interpret the appropriate relevant industry design codes.
- Be able to perform analysis and design of prestressed concrete members and connections.
- To demonstrate the losses of stresses in prestressed concrete members

COURSE OUTCOMES: At the end of this course, student should be able to
- Examine the transfer and development length as well as prestress losses
- Demonstrate the design calculations to predict service behavior of prestressed concrete structures, accounting for the time-dependent effects of concrete creep and shrinkage
- Design for ultimate strength of prestressed concrete structures.
- Illustrate the prestressed concrete structures to satisfy relevant Design Standards.
- Evaluate the prestressed concrete fabrication and construction process.
- Demonstrate the prestressed concrete models and sections in complex applications that can handle social and global needs
- Attain the overall knowledge of prestressed concrete structures.

UNIT-I
Introduction: Historic development – General principles of prestressing, pre-tensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics.
I.S.Code provisions, Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System, Freyssinet system and Gifford – Udall System.

UNIT-II
Losses of prestress: Loss of prestress in pre-tensioned and post-tensioned

members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

Analysis of sections for flexure; Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.
 UNIT IIIDesign of sections for flexure and shear: Allowable stress, Design criteria as per I.S.Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile.
 Analysis of end blocks: by Guyon's method and Mugnel method, Anchorage zone stresses – Approximate method of design – Anchorage zone reinforcement – Transfer of pre-tensioned members.

UNIT-IV
Composite section: Introduction – Analysis of stress – Differential shrinkage – General designs considerations.

UNIT-V
Deflections of prestressed concrete beams: Importance of control of deflections – factors influencing deflections – short term deflections of uncracked members, prediction of long term deflections.

TEXT BOOKS
1. Prestressed Concrete by N. Krishna Raju; - Tata Mc.Graw Hill Publications.
2. Prestressed Concrete by N.Rajasekharan; - Narosa publications.

REFERENCE BOOKS
1. Prestressed Concrete by S.Ramamrutham; Dhanpat Rai Publications.
2. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns, John Wiley & Sons.
3. IS:1343 Code of practice for prestressed concrete

Codes: BIS code on prestressed concrete, IS 1343.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPTIMIZATION TECHNIQUES IN CIVIL ENGINEERING
(PROGRAM ELECTIVE)

Course Code: GR14A4006   L:3 T:1 P:0 C:4
IV Year I Semester

Course Objectives:
- Introduce the concept of optimization.
- Provide Knowledge on various optimization techniques.
- Teach the applications of Linear programming in civil Engineering.
- Teach the applications of Non-Linear programming in civil Engineering.
- Understand the concept of constrained optimization techniques.

Course Outcomes: By the end of this course, students should be able to
- Formulate mathematical models for the problems in Civil Engineering.
- Understandmajor limitations and capabilities of deterministic operations research modeling to relate with industry or government.
- Analyze problems using linear programming and other mathematical programming algorithms
- Analyze real world problems of Network analysis, Project Management, for optimal solutions in civil engineering
- Classify different techniques to solve Non- Linear Programming Problems
- Use search techniques, which are based on iterative methods, to find optimal solutions of Non-Linear Programming Problems which helps in understanding multistage decision problems.
- Understand different Software applications for optimization techniques to validate existing methods.

UNIT-I
Introduction: Engineering application of Optimization, Formulation of design problems as mathematical programming problems, classification of optimization problems.

UNIT-II
Optimization Techniques: Classical optimization, multivariable with no constraints, unconstrained minimization techniques, penalty function techniques, Lagrange multipliers and feasibility techniques.

UNIT-III
Linear Programming: Graphical method, Simplex method, Duality in linear programming (LP), Sensitivity analysis Applications in civil engineering.

UNIT-IV

Non Linear Programming techniques/method: Unconstrained optimization, one dimensional minimization, golden section, elimination, quadratic and cubic, Fibonacci, interpolation, Direct search, Descent, Constrained optimization, Direct and indirect, Optimization with calculus, Khun Tucker conditions

UNIT-V

Constrained optimization techniques: Direct, complex, cutting plane, exterior penalty function methods for structural engineering problems.

TEXT BOOKS

1. Introduction to operation research by Hamdy A Taha, Prentice Hall of India.
2. Introduction to Optimization techniques by Dr. S.S.Rao.

REFERENCE BOOKS

1. Water Resources Systems : Modeling Techniques and Analysis,Dr.Vedula and Dr. Mujumdar Tata-McGraw Hill
2. Multicriteria analysis in Engineering and Management by Dr.K.Srinivasa Raju and Dr. D. Nagesh Kumar, Prentice Hall of India.
3. NPTEL course material on www.nptel.iitm.ac.in for Optimization.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

FINITE ELEMENT METHODS
(ELECTIVE-II)

Course Code: GR14A4007   L:3   T:1   P:0   C:4
IV Year I Semester

COURSE OBJECTIVES
- To equip the students with the Finite Element Analysis fundamentals.
- To enable the students to formulate the design problems into FEA.
- To introduce basic aspects of finite element technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.
- Analyze a physical problem, develop experimental procedures for accurately investigating the problem, and effectively perform and document findings.
- Understand forces associated with different parts of a structure.

COURSE OUTCOMES: After completion of the course, student should be able to
- Identify mathematical model for solution of common engineering problems.
- Formulate simple problems into finite elements
- Define basic aspects of finite element technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems
- Compare the solutions obtained from finite element analyses
- Formulate finite element analysis equation
- Evaluate finite element software to solve engineering problems in Solid mechanics, fluid mechanics and heat transfer.
- Solve element matrix equation by different methods by applying basic laws in mechanics and integration by parts.

UNIT-
Introduction: Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh –Ritz method of functional approximation.
 Principles of Elasticity: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with Axi-symmetric loading.

UNIT-II
One Dimensional FEM: Stiffness matrix for bar element - shape functions for one

dimensional elements – one dimensional problems.

UNIT-III
Two Dimensional FEM : Different types of elements for plane stress and plane strain analysis – Displacement models – generalized co-ordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Naturalcoordinate system – area and volume coordinates UNIT IV
Generation of element stiffness and nodal load matrices for 3-noded triangular element and four noded rectangular elements. Isoparametric formulation: Concepts of iso-parametric elements for 2D analysis -formulation of CST element, 4 –noded and 8-noded iso-parametric quadrilateral elements –Lagrangian and Serendipity elements.

UNIT-V
Axi-symmetric analysis: Basic principles-Formulation of 4-noded iso-parametric axi-symmetric element
 Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOK
1. Finite Elements Methods in Engineering by Tirupati.R. Chandrepatla and Ashok D. Belegundu - Pearson Education Publications.
2. Finite element analysis by S.S. Bhavikatti-New age International publishers.
3. Finite element analysis by David V Hutton, Tata Mc Graw Hill, New Delhi.

REFERENCE BOOKS
1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E.Plesha. John Wiley & Sons.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers.
3. Text book of Finite Element analysis by P.Seshu – Prentice Hall of India.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

WATER RESOURCES SYSTEM PLANNING AND MANAGEMENT
(ELECTIVE-II)

Course Code: GR14A4008   L:3 T:1 P:0 C:4
IV Year I Semester

COURSE OBJECTIVES
- Understand various concepts of system analysis, optimisation techniques, objective function and constraints.
- Apply linear programming when compared with practical applications and applying the same to find the optimized solutions.
- Introduce about the concept of Dynamic or Non – Linear optimising techniques and simulation theory along with some basic applications in Water Resource Engineering.
- Compare various applications of Water Resources Engineering in Economics and Management like allocation of water to crops, cost – benefit analysis, Optimal crop   pattern by using all linear, non – linear and dynamic programming techniques.
- Demonstrate the application of simulation techniques in water resources engineering.

COURSE OUTCOMES: After completing this course, Water Resources System Planning and Management (WRPM), students will be able to:
- Enumerate the fundamental concepts of systems, optimization techniques, objective function and constraints in water resource system.
- Evaluate the applicability of Linear Programming models in water resource systems.
- Apply the concept of Belman's Principle for both forward and backward recursive dynamic programming in water resource systems.
- Assimilate the concepts of simulation in Water Resources Engineering.
- Assess the concepts of cost benefit analysis in Water Resources Economics and Management.
- Apply different types of the systems, optimization techniques and the concept of simulation in water resource systems.
- Synthesize different system planning techniques and their simulation methods in the strategic management of Water resources available.

UNIT-I
Introduction: concepts of systems analysis, definition, systems approach to

water resources planning and management, role of optimization models, objective function and constraints, types of optimization techniques.

UNIT-II

Linear programming: Formulation linear programming models, graphical method, simplex method, application of Linear programming in water resources.
Linear programming – II: Revised simplex method, duality in linear programming, sensitivity and post optimality analysis.

UNIT-III

Dynamics programming: Belman's principles of optimality, forward and backward recursive dynamic programming, curse of dimensionality, application of dynamic programming for resource allocation.

Non-linear optimatization techniques: Clerical of method optimization, Kuhn-Tucker, gradient based research techniques for simple unconstrained optimization.

UNIT-IV

Simulation: Application of simulation techniques in water resources.

UNIT-V

Water resources economics: Principles of Economics analysis, benefit cost analysis, socio economic intuitional and pricing of water resources.
Water resources management: Planning of reservoir system, optimal operation of single reservoir system, allocation of water resources, optimal cropping pattern, conjunctive use of surface and sub-surface water resources.

TEXT BOOKS
1. Water Resources System Analysis – Vedula & Mujumdar – Tata Mc.Graw Hill Company Ltd. 2005.
2. Water Resources Economics - James & Lee. Oxford Publishers 2005.

REFERENCE BOOKS
1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

GROUND IMPROVEMENT TECHNIQUES
(ELECTIVE - II)

Course Code: GR14A4009   L:3 T:1 P:0 C:4
IV Year I Semester

COURSE OBJECTIVES: The objectives of this course will help the student to
- Recognize various types of ground improvement techniques.
- Select various ground improvement techniques like dewatering, grouting, in-situ densification methods, geo-synthetics, reinforced earth, soil stabilization, etc.
- Educate solid foundation in terms of in-situ ground improvement methods required for different projects that come across in difficult foundation conditions.
- Identify the aptness of best ground improvement technique.
- Improve on in most contemporary ground modification methods to be successful in real-time projects.

COURSE OUTCOMES: At the end of the course, the student will be able to
- Identify dewatering technique for the field related problems.
- Discuss grouting methods in civil engineering applications.
- Assess the field problems related to problematic soils by adopting various ground improvement techniques.
- Differentiate reinforced earth retaining structures.
- Classify various   techniques for stabilization more technically and economically by using geotextiles.
- Recognize the suitability and practicability required for various ground improvement methods.
- Assess the importance of extensive research in various ground improvement techniques.

UNIT-I
Introduction: Need for ground improvement, objectives, classification of ground improvement techniques.
Dewatering: Methods of dewatering - sumps, single and multi stage well points, vacuum well points, electro-osmosis method, horizontal wells and drains.

UNIT-II
In-situ densification methods in granular soils: Vibration at the ground surface, impact at the ground surface, vibration at depth, impact at depth.
In-situ densification methods in cohesive soils: Preloading, vertical drains, sand drains, stone and lime columns, thermal methods.

UNIT-III

Grouting: Characteristics of grouts, grouting methods, grouting technology, ascending, descending and stage grouting.

Stabilisation: Methods of stabilization, mechanism of cement and lime stabilization, factors effecting stabilization.

UNIT-IV

Reinforced Earth: Mechanism, components of reinforced earth, types of reinforcing elements, applications, factors governing design of reinforced earth walls, design principles of reinforced earth walls, soil nailing.

UNIT-V

Geosynthetics: Types of geosynthetics, functions and applications of geosynthetic materials - geotextiles, geogrids and geomembranes.

Expansive soils: Problems of expansive soils, tests for identification, swelling pressure tests, improvement of expansive soils, foundation techniques in expansive soils, under-reamed piles.

TEXT BOOKS

1. Hausmann M.R. Engineering Principles of Ground Modification, McGraw-Hill International Edition (1990).
2. Dr. P. Purushotham Raj, Ground Improvement Techniques, Laxmi Publications, New Delhi, 1st edition (1999), Reprint (2013).

REFERENCE BOOKS

1. Moseley M.P. and K.Kirsch, Ground Improvement, Blackie Academic and Professional, Florida, 2nd edition (2007).
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A, Ground Control and Improvement, John Wiley and Sons, New York, USA (1994).
3. Robert M. Koerner, Designing with Geosynthetics, Xlibris Corporation, 6th edition (2012).
4. F.H.Chen, Foundations on Expansive soils, Elsevier Science, 2nd edition (1988).

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IRRIGATION DESIGN & DRAWING

Course Code: GR14A4010   L:0 T:0 P:2 C:2
IV Year I Semester

COURSE OBJECTIVES
- To teach the students about the importance of various hydraulic structures
- To train the students in view of designing the different components of hydraulic structures based on the importance and location of construction
- To enable them to draw the designed hydraulic structures at any scale using CAD tools.
- To provide knowledge of evaluating methods of hydraulic structures
- To teach the students about the methods of analyzing hydraulic structures

COURSE OUTCOMES: After completing this course Irrigation Design & Drawing Laboratory, students will be able to:
- Identify the importance of various irrigation & Hydraulic structures.
- Determine the applicability of various structures to be proposed at the site.
- Calculate the various components of hydraulic structures for the given data.
- Design hydraulic structures at any scale.
- Analyze the various hydraulic structures like Canal regulator, under tunnel etc.
- Design and draw the hydraulic structures using Q-CAD tool
- Evaluate different types of hydraulic structures, their design and drawings using various drafting tools

Design and drawing of the follwoing hydraulic structures.

GROUP A
1. Surplus weir
2. Syphon well drop
3. Trapezoidal notch fall
4. Tank sluice with tower head

GROUP B
1. Sloping glacis weir
2. Canal regulator

Final Examination Pattern

The question paper is divided into two parts with two questions in each part. The student has to answer ONE question from each part. Part I should cover the designs and drawings from Group A for 45 marks and Part II should cover only designs from Group B carrying 30 marks.

However, the students are supposed to practice the drawings for Group B structures also for internal evaluation.

TEXT BOOKS

1. Water Resources Engineering - Principles and Practice by Challa Satyanarayana Murthy, New Age International Publishers.
2. Irrigation engineering and hydraulic structures by S.K.Garg, Standard Book House.

REFERENCE BOOKS

1. Irrigation Water power and water Resources Engineering by K.R.Arora, Standard Publishers

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL ENGINEERING LAB

Course Code: GR14A4011   L:0 T:0 P:2 C:2
IV Year I Semester

COURSE OBJECTIVES: The objective of this Laboratory Course is to make students:
- Gain knowledge in various parameters of water.
- Identify the significance to conduct experiments on water purity.
- Explain current environmental issues through laboratory experiments.
- Prepare the students to excel in experiment research Programme or to succeed in industry
- Develop problem solving and laboratory skills using modern instrumentation

COURSE OUTCOMES: On completionof this Course the student shall be ableto:
- Develop skills in low cost water treatment methods.
- Describe the knowledge of physical, chemical and biological parameters of water and their importance.
- Develop the social responsibility to eradicate water borne diseases.
- Recognize the methods to control environmental pollution.
- Develop ability to work effectively in teams
- Express water quality parameters in written reports
- Generalize the various quality control aspects of industrial effluents by performing the different lab tests.

List of Experiments
1. Determination of pH and Turbidity
2. Determination of Conductivity and Total dissolved solids.
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides.
5. Determination and Estimation of total solids, organic solids and inorganic solids.
6. Determination of Iron.
7. Determination of Dissolved Oxygen.
8. Determination of Nitrogen.
9. Determination of total Phosphorous.
10. Determination of B.O.D
11. Determination of C.O.D
12. Determination of Optimum coagulant dose.

13. Determination of Chlorine demand.
14. Presumptive coliform test.

NOTE: At least 8 of the above experiments are to be conducted.

TEXT BOOKS
1. Standard Methods for Analysis of water and Wastewater – APHA.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING LAB

Course Code: GR14A4012   L:0 T:0 P:2 C:2
IV Year I Semester

COURSE OBJECTIVES
- Analyze and Design the RCC beams with different supports and loads.
- Analyze and Design the RCC multi- storied buildings with different load combinations.
- Analyze and Design the RCC water tanks of different shapes.
- Analyze and Design the Steel beams and trusses of different sections with various load combinations.
- Analyze and Design the Steel Towers and Deck bridge of different sections with various load combinations.

Course Outcomes: By the end of this course, students should be able to:
- Analyze and Design the various types of Beams for the different loads.
- Analyze and Design a 2D frame of Multi-Storied Building.
- Analyze and Design a 3D frame of Multi-Storied Building.
- Analyze and Design a RCC Over Head tank.
- Analyze and Design the different types of Steel Trusses.
- Analyze and Design a Steel Tower with arms on both sides.
- Analyze and Design a Steel Deck Bridge.

List of Exercises
1 Introduction to STAAD Pro Software
2 Design of beams for various supports (SSB,OHB,CT and FX) with PL and UDL
3 Design of beams for various supports (SSB,OHB,CT and FX) with UVL and ML
4 Analysis and Design of multi-storied building (2D frame)
5 Analysis and Design of multi-storied building (3D frame) with DL and LL
6 Analysis and Design of multi-storied building (3D frame) with DL LL and WL
7 Analysis and Design of multi-storied building (3D frame) with DL LL and EL
8 Analysis and Design of multi-storied building (3D frame) with plates
9 Analysis and Design of multi-storied building (3D frame) and Result analysis
10 Analysis and Design of RCC Rectangular Over Head Tank

11 Analysis and Design of RCC Circular Over Head Tank
12 Analysis and Design of beams for various cross section (I, C, T, L and composite sections)
13 Analysis and Design of various Steel Tubular Trusses
14 Analysis and Design of Industrial buildings with various Trusses
15 Analysis and Design of Steel Over Head Tank

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

CONSTRUCTION TECHNOLOGY & PROJECT MANAGEMENT

Course Code: GR14A4013   L:2 T:1 P:0 C:3
IV Year II Semester

COURSE OBJECTIVES
- To attain knowledge in primary construction methods and materials.
- Ability to define fundamentals of construction law, Quality control and safety rules.
- Develop construction cost accounting and resource optimization using knowledge acquired through Scheduling, PERT and CPM
- Identify various construction equipment and associate them with different works in the construction site
- Broaden the career potential of individuals through applied learning experiences in construction, management and technology.

COURSE OUTCOMES
- Discuss various construction schedules to manage a construction project.
- Summarize different construction methods and its application based on the field requirements.
- Identifyvarious construction equipment used in the construction site.
- Apply probability, statistics, and decision analysis in project planning, quality systems and safety management of construction activity.
- Prepare CostEstimates and documentation for various types of constructions.
- Associate in Contracting, tendering and Bidding in constructions.
- Practice Construction Law and Arbitration

UNIT-I
Fundamentals of construction technology-Construction activities – Process-Construction schedule-Construction records – Documents – Quality – Safety-Codes and Regulations.

UNIT-II
Construction method – Earthwork – Piling – Formwork-fabrication and erection Mechanized construction-construction equipment – Excavators – Rollers – Dozers –Scrapers – Cranes-Drag lines and Clamshells

UNIT-III
Quality control-Assurance and Safety-ISO: 9000 Quality Systems-Principles on Safety-Personal, Fine and Electrical Safety, environmental protection – concept of green building

UNIT-IV
Contract management – project estimation – types of estimation – contract document – classification with specific reference to PPP and BOT Projects – bidding – procurement process - Construction planning – project planning techniques – planning of manpower, material, equipment and finance.

UNIT-V
Project scheduling – PERT – CPM, Preparation of network, Determination of slacks or floats. Critical activities. Critical path, project duration .expected mean time, probability of completion of project, Estimation of critical path, problems. Resource leveling - Construction claims, Dispute and project closure Dispute Resolution – Arbitration – Construction Closure

TEXT BOOKS
1. Construction Technology by Subirk.Sarkar, SubhajitSaraswati-Oxford University Press.
2. Construction Project Management-Theory and Practice-NirajJha Pearson Education

REFERENCE BOOKS
1. Construction Planning Equipment and methods by-Peurifoy R.L, Ledbetter W.B and Schexnayder C.J, TMH 2010.
2. Project Planning and Control with PERT & CPM – B.C.Punmia, K.K.Khandelwal-Laxmi Publication.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED REINFORCED CONCRETE STRUCTURAL DESIGN
(ELECTIVE-II)

Course Code: GR14A4014   L:2 T:1 P:0 C:3
IV Year II Semester

COURSE OBJECTIVES: On completion of this Subject/Course the student shall be able to:
- Design the retaining walls.
- Design water tanks
- Design bridges
- Design flat slabs
- Design bunkers and silos

COURSE OUTCOMES: On completion of this Subject/Course the student should be able to:
- Design the cantilever type and counter fort retaining wall.
- Design ground level water tanks.
- Design over head water tanks.
- Design bridges.
- Design flat slabs.
- Design bunkers.
- Designsilos.

UNIT-I
Retaining walls: Introduction, design of cantilever type retaining wall and counter fort retaining wall.

UNIT-II
Water tanks: Introduction, design of Rectangular and Circular tanks resting on ground and Rectangular and Circular overhead water tanks.

UNIT-III
Bridges: Introduction, design of slab and T-beam bridges.

UNIT- IV
Flat Slabs: Introduction, design flat slabs interior and exterior panels.

UNIT-V
Bunkers and Silos: Introduction, design of square and circular bunkers, design of shallow and deep bins.

TEXT BOOKS
1. Design of RCC structures by DrB.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain., Laxmi publications, New Delhi
2. Design of RCC Structures by S.Rammrutham, DhanpatiRai publishing company.
3. IS 456: 2000 - Indian Code of Practice for plain and reinforced concrete.
4. SP-16 Design aids for Reinforced concrete.

REFERENCE BOOKS
1. Reinforced Concrete Design by N.Krishna Raju and R.N.Pranesh, New age International Publishers, New Delhi.
2. Limit state Design of reinforced concrete by PC Varghese, PHI, New Delhi.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

PAVEMENT ANALYSIS & DESIGN
(ELECTIVE-IV)

Course Code: GR14A4015   L:2 T:1 P:0 C:3
IV Year II Semester

COURSE OBJECTIVES: The objectives of this course are
- To give a detailed notion of methods of highway design and controlling factors
- To introduce software tools for design and maintenance of pavements
- To provide the idea of design standards and traffic data collection for flexible and rigid pavements
- To give the knowledge of predictability about material constraints and optimal utilization
- To introduce the vital traffic parameters and the methods of their estimation.
- To provide the knowledge of major failures in pavements, causes and preventive measures

COURSE OUTCOMES: On completion of this Course the student shall be able to:
- Illustrate highway design methods, constraints and controlling factors.
- Design pavementsusing road software tools.
- Apply the design standards in designing principal elements of the highway.
- Acquire necessary information like volume and axle load data to design flexible and rigid pavements.
- Predict the resource constraints and utilize the available materials in a sustainable way.
- Examine the basic parameter of traffic engineering and the methods which help to estimate those parameters.
- Recognize the major failure modes of flexible and rigid pavement and helps in maintaining them properly.

UNIT-I
Introduction to pavement design:Types of Pavements-Functions of individual layers-Variables considered in Pavement Design- Factors affecting Pavement Design: Wheel loads,Tire Pressure,Contact Pressure, ESWL & ESAL concepts

UNIT- II
Material characteristics:Tests on sub-grade,Tests on aggregates-Aggregate properties and their importance-Tests on Bitumen-Requirements of design mix-

Marshall method of mix design.

UNIT-III
Stresses in flexible and rigid pavements: Stresses in Flexible pavements-Layered systems concept-One layer system-Boussinesq two layer system-Burmister theory of Pavement design. Stresses in Rigid pavements-Importance of Joints in rigid Pavements-Types of joints-use of tie bars and dowel bars-Relative stiffness-Modulus of Subgrade Reaction-Stresses due to warping-Stresses due to loads-Stresses due to friction.

UNIT-IV
Flexible and rigid pavement design: Flexible Pavement Design concepts-CBR method of Flexible Pavement design-IRC method of design-Asphalt Institute method and AASTHO methods. Rigid Pavement design concepts-IRC method of Rigid pavement design-PCA method-Design of tie bars and dowel bars.

UNIT-V
Highway construction and maintenance: Construction: Construction of Bituminous Pavements, construction of Cement Concrete Roads, Soil Stabilization, Use of Geosynthetics. Highway maintenance –Pavement failures, failures in flexible Pavements, Rigid Pavement failures, Pavement evaluation-Benkelman Beam method, Overlay design.

TEXT BOOKS
1. Highway Engineering-S.K. Khanna &C.E.G. Justo, Nemchand& Bros.
2. Pavement Analysis and Design – Yang H. Huang
3. Principles of Pavement Design – E. J. Yoder, M. W. Witczak
4. Highway and traffic Engineering-SubashSaxena

REFERENCE BOOKS
1. Principles of traffic and highway engineering- Garber &Hoel.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

WATER SHED MANAGEMENT
(ELECTIVE-III)

Course Code: GR14A4016 L:2 T:1 P:0 C:3
IV Year II Semester

COURSE OBJECTIVES
- Students will have knowledge on restoration of soil quality and thus, raising productivity rates.
- Students will have idea on Improvement of the income of the population with simultaneous regeneration of natural resources
- Students will have knowledge on improvement of infrastructure for storage, transport and agricultural marketing.
- Students will be able to reducing the impact of natural hazards.
- Students will have knowledge on improvement of physical health supported by clean drinking water, access to sanitation, improved nourishment.
- Students will have idea on Improvement of an effective management of the financial resources available for environmental and international cooperation.

COURSE OUTCOMES
- Examine and recommend principles for protection, management, and monitoring watersheds.
- Measure, monitor, and assess watershed health in other regional streams.
- Demonstrate and develop suitable restoration work plans.
- Illustrate broad-based theories and applications in the watershed management field to solve problems and address issues in the profession.
- Evaluate the sediment delivery risk level for erosion problem areas.
- Explain the physical and biological processes of watersheds.
- Compare different types of the management systems.

UNIT-I
Introduction: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

UNIT-II
Characteristics of watershed: size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology,

socio-economic characteristics, basic data on watersheds.

 Principles of erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

UNIT-III
Measures to control erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

Water harvesting: Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

UNIT- IV
Land management: Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.

Ecosystem management: Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

UNIT-V
Planning of watershed management activities, peoples participation, preparation of action plan, administrative requirements, strategic policies and their implementation

TEXT BOOKS
1. Watershed Management by JVS Murthy, - New Age International Publishers.
2. Water Resource Engineering by R.Awurbs and WP James, - Prentice Hall Publishers.

REFERENCE BOOKS
1. Land and Water Management by VVN Murthy, - Kalyani Publications.
2. Irrigation and Water Management by D.K.Majumdar, Prentice Hall of India.
3. Water resources system management by S.R. Sahasrabudhe – JP publications

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

REMOTE SENSING AND GIS

Course Code: GR14A4017   L:2 T:1 P:0 C:3
IV Year II Semester

COURSE OBJECTIVES
- Understanding the principle of Remote sensing.
- Providing knowledge about various Satellites, their purpose, functionality and objectives.
- Understand working of GIS .
- Understand the application of GIS in various Civil Engineering practices.
- Inculcate the knowledge of spatial analysis

COURSE OUTCOMES: After completion of this course, students will be able to
- Describe the fundamental concepts of Geographic Information Science and Technology.
- Demonstrate proficiency in the basic functions of geospatial software.
- Understand fundamental remote sensing and spatial analysis techniques.
- Understand map creation and design principles, including thematic map display, employment of map projections, and cartographic design.
- Analyze the creation and acquisition of spatial data.
- Recognize the topo maps prepared by survey of India.
- Overlay different maps in GIS.

UNIT-I
Introduction to Photogrammetry: Principle and types of aerial photographs, stereoscopy, Map Vs Mosaic, ground control, Parallax measurements for height determinations.

UNIT II
Remote Sensing-I: Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units.

Remote Sensing-II: Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data

analysis.

UNIT-III

Geographic Information System: Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

Types of data representation: Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

UNIT-IV

GIS Spatial Analysis: Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

UNIT-V

GIS Applications in Civil Engineering: Water Resources Applications-I: Land use / Land cover in water resources, Surface water mapping and inventory, Rainfall – Runoff relations and runoff potential indices of watersheds, Flood and Drought impact assessment and monitoring, Watershed management for sustainable development and Watershed characteristics. Reservoir sedimentation, Fluvial Geomorphology, water resources management and monitoring, Ground Water Targeting, Identification of sites for artificial Recharge structures, Drainage Morphometry, Inland water quality survey and management, water depth estimation and bathymetry.

Applications in Highway Engineering, Environmental Engineering

TEXT BOOKS

1. Remote Sensing and its applications by LRA Narayana, University Press 1999.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.
3. Remote sensing and image interpretation by Thomas Lillesand, 7th Edition, John Wiley & sons.

REFERENCE BOOKS

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy, 2001, B.S. Publications.
3. Remote sensing of the environment –An earth resource perspective by John R Jensen, Prentice Hall
4. GIS by Kang – Tsung Chang, TMH Publications & Co.,

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

AIRPORT, DOCS & HARBOUR ENGINEERING
(ELECTIVE-III)

Course Code: GR14A4018   L:2 T:1 P:0 C:3
IV Year II Semester

COURSE OBJECTIVES
- Estimate the geometric design characteristics of an airport including taxiways, aprons and runways.
- Understand the imaginary surfaces where aircraft traverses
- Demonstrate airport visual aids and traffic control.
- Understand the effect of waves on costal structures and backwaters.
- Familiarize the components of docks and harbors.

COURSE OUTCOMES: By the end of this course, student should be able to
- Identify thecomponentsof aircraft
- Compare various alternative structures of docks and airports
- Interpret planning and design principles of some of the components of waterway and airway transportation.
- Describe different imaginary surfaces in airport.
- Analyze the characteristics ofAircraft
- Record and reproduce of data to draw wind rose diagrams.
- Evaluate the length of runway based on different design parameters.

PART-A (Airport Engineering)

UNIT-I
Airport planning – Aircraft characteristics – Airport classifications – Site selection of an airport – Regional planning.

UNIT-II
Airport obstructions: Airport obstruction- Zoning laws- Classification of obstructions-Imaginary surfaces-Approach zone-Turning zone.

Runway design: Analysis of wind- Wind rose diagram- data determination of the best orientation of the runway configurations- Basic runway length- Corrections to runway length by ICAO and FAA specification-Runway geometric design.

UNIT III
Visual aids: Airport marking – Airport lighting – Instrument Landing Systems (ILS).

PART-B (Docks&Harbor Engineering)

UNIT- IV
Harbors& Ports: Water transportation- Harbors- Natural harbors- Site selection- Shape of the harbor- Harbor planning- Features of a harbor-Ports-Classification of ports.

Natural Phenomenon –Tides- Waves and wind- Effect of waves on coastal structures-Breakwaters-Classification of breakwaters-Construction of breakwaters.

UNIT- V
Docks & Port facilities: Docks- Wet and dry docks- Working principles of drydock- Dock entrances- Floating drydock-Types of floating docks- Entrance locks.

Navigational facilities-Light house-Floating signals-Wreckage buoys-Cargo handling facilities-Apron-Transitsheds-Warehouse.

TEXT BOOKS
1. Planning & Design of Airports- Robert Horonjeff, Francis McKelvey; TataMcGrawhill.
2. Harbour, Dock & Tunnel Engineering- R.Srinivasan; Charotar Publishers, Ahmedabad.

REFERENCE BOOKS
1. Airport Planning and Design- S.K.Khanna, M.G.Arora&S.S.Jain; NemChand & Bros, Roorkee, India.
2. Dock &Harbour Engineering- H.P.Oza&G.H.Oza; Charotar Publishers, Ahmedabad.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL IMPACT ASSESMENT
(ELECTIVE-IV)

Course Code: GR14A4019   L:2 T:1 P:0 C:3
IV Year II Semester

COURSE OBJECTIVES
- Learn the purpose and role of EIA in the decision-making process.
- Provide knowledge on the strengths of EIA in regard to environmental management.
- Introduce the technical and social/political limitations of EIA.
- Teach the administration and procedures that apply in the student's jurisdiction.
- Demonstrate the screening process and scoping process and how it is applied.
- Demonstrate the format of an EIA Report (Environmental Impact Statement, or Environmental Statement)

COURSE OUTCOMES: By the end of this course students will be able to
- Identify elements of community and environment likely to be affected by the proposed developments.
- Identify the negative impacts and propose the provision of infrastructure or mitigation measures.
- Develop current EIA methods and the techniques.
- Develop current assessment methods, environmental monitoring systems and legislation.
- Assess process of environmental impact modelling and prediction as a design tool.
- Interact with experts of other fields to assess the impact.
- Present EIA report in a way understandable by everyone.

UNIT-I
Introduction: Impact of development projects – Sustainable development-Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA-Stages of EIA, Types of EIA

UNIT-II
E I A Methodologies: Introduction, Criteria for the selection of EIA Methodology, Methods of EIA – Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives.

UNIT-III
Prediction and Assessment: of Impact on land, water, air, social & cultural activities and on flora & fauna- Mathematical models- Public participation

UNIT-IV
Environmental Management Plan: Plan for mitigation of adverse impact on environment – Options for mitigation of impact on water, air, land and on flora & fauna - Addressing the issues related to the Project Affected People. Post project monitoring, introduction to ISO 14000.

UNIT-V
Case studies: EIA for infrastructure projects – Dams – Highways – Multi-storey Buildings – Water Supply and Drainage Projects – Waste water treatment plants, STP.

TEXT BOOKS
1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

REFERENCE BOOKS
1. Environmental Impact Assessment, by Larry Canter, 2nd edition, Mc Graw Hill Publishers
2. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science, 1999
3. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katania & Sons Publication., New Delhi.
4. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

REMOTE SENSING & GIS LAB

Course Code: GR14A4020   L:0 T:0 P:2 C:2
IV Year II Semester

COURSE OBJECTIVES:
- To teach the students to use the functions and commands of GIS software User Interface, to open files and view data, GIS Layer Control facility.
- To train the students to locate and apply the many features of GIS using the various menu and button options for zooming and panning, the various drawing tools and how to change symbols, lines, polygons and text.
- To educate the students to locate and apply the features of GIS to label a map and use the label settings to modify the appearance of labels, the measuring facility to analyze distances between objects.
- To prepare the students to use the functions and commands of GIS software to use selection tools to analyze maps and data, to create thematic maps from data attributes as well as perform SQL queries, Be able to create a layout window and print a map
- To enable the students to recognize and analyze maps prepared by survey of India

COURSE OUTCOMES: After completing the GIS, students will be able to
1. Describe the fundamental concepts of Geographic Information Science and Technology.
2. Demonstrate proficiency in the basic functions of geospatial software.
3. find awareness of fundamental remote sensing and spatial analysis techniques.
4. Evaluate basic proficiency in map creation and design principles, including thematic map display, employment of map projections, and cartographic design.
5. Analyze proficiency in the creation and acquisition of spatial data.
6. Recognize the topo maps prepared by survey of India.
7. Determine the overlaying of different maps in GIS.

SOFTWARE: 1. Q GIS
2.4 EXCERCISES:
1. Digitization of Map/ Toposheet
2.   Creation of thematic maps.
3.   Study of features estimation
4.   Developing Digital Elevation model
5. Simple applications of GIS in water Resources Engineering & Transportation Engineering.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED STEELSTRUCTURAL DESIGN
(ELECTIVE-III)

Course Code: GR14A4145   L:2 T:1 P:0 C:3
IV Year II Semester

COURSE OBJECTIVES: On completion of this Subject/Course the student shall be able to:
- Design the components of roof trusses
- Design PlateGirder
- Design Steel bridges
- Design steel water tanks
- Design Gantry Girder

COURSE OUTCOMES: On completion of this Subject/Course the student should be able to:
- Design the purlins.
- Design roof trusses.
- Design Plate Girder.
- Design Steel bridges.
- Design Steel Rectangular Water tanks.
- Design Steel Cylindrical Water tanks.
- Design Gantry Girder.

UNIT-I
Design of roof trusses: Introduction, types of roof trusses, components of a roof truss, spacing of purlins, roof coverings, design of purlins and design of roof trusses.

UNIT-II
Design of Plate girder: Introduction, components of a plate girder, design elements, design of web plate and flanges, curtailment of flange plates, stiffeners, splices and design of plate girder.

UNIT-III
Design of steel bridges: Introduction, solid web girders and deck type plate girder bridges.

UNIT-IV
Design of steel water tanks: Introduction, design loads, design of rectangular and cylindrical tanks.

UNIT-V
Design of Gantry girder: Introduction, types of gantry girders and crane rails, construction details and design procedure.

TEXT BOOKS
1. Design of steel structures by Dr B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain., Laxmi publications, New Delhi
2. Design of Steel Structures by N Subramanian, Oxford University Press
3. IS 800: 2007 - Indian Code of Practice for Construction in Steel
4. IS: 875 (Part III) code of practice for design loads
5. Hand book of Steel Tables.

REFERENCE BOOKS
1. Structural design and drawing by N.Krishna RajuUniversity press, Hyderabad.
2. Limit state Design of steel structures by Dr.V L Shaw, Structures Publications,
3. Limit state Design of Steel Structures by S K Duggal, TMH, and New Delhi.