FORWARDED TO THE REGISTRAR

PROFESSOR AND HEAD
DEPARTMENT OF CIVIL ENGINEERING
ANNAMALAI UNIVERSITY

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# ANNAMALAI UNIVERSITY
## ANNMALAINAGAR

# HAND BOOK

## B.E. (CIVIL) DEGREE PROGRAMME
## (PART TIME)

## (CHOICE BASED CREDIT SYSTEM)
## 2007-2008

# ANNAMALAI UNIVERSITY

ANNMALAINAGAR

# HAND BOOK

## B.E. (CIVIL) DEGREE PROGRAMME

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# B.E. CIVIL (PART-TIME)
# REGULATIONS AND SYLLABUS (CBCS)

## 1. Condition for Admission

Candidates for admission to First year of the 3½ years B.E Degree course by part-time shall be required to have passed th Diploma Examination in the appropriate branch conducted by th State Board of Technical Education of Tamilnadu or its equivalen examination accepted by the Syndicate of this University. They shal satisfy the conditions regarding eligibility norms as may be prescribec by the Syndicate of the Annamalai University from time to time.

## 2. Eligibility for the degree

A pass in a Diploma Course in any of the appropriate branch Civil / Mechanical / Electrical / Electronics Instrumentation / Chemical branches of Engineering conducted by the State Board of Technical Education of Tamil Nadu or its equivalent examination with 3 years professional experience in a recognized industry or organization after passing the Diploma Examination.

The admission is restricted to those working or residing within a radius of 75 Km from Annamalainagar. The application should be sent through their employers.

However the advance copy with all documents complete in all respects should be received before the prescribed last date. The application through proper channel to be received before entrance test.

## 3. Subject of study

The subjects of study and the syllabus for the subjects are given separately.

## 4. Scheme of Examinations

The scheme of Examinations is given separately.

**5. Choice Based Credit System**

Each course is normally assigned one credit per period of lecture/tutorial per week and one credit for two periods or part thereof for laboratory or practical or drawing per week.

Each semester curriculum shall normally have a blend of theory and practical courses. The total credits for the entire degree course will be 135. For the award of the degree a student has to earn a minimum of 135 credits.

**6. Duration of the programme**

A student is normally expected to complete the B.E programme in 3½ years but in any case not more than eight years from the time of admission.

**7. Registration for courses**

A newly admitted student will automatically be registered for all the courses prescribed for the first semester without any option.

Every other student shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration with the approval of the Dean on the recommendation of the Head of the Department along with a late fee will be done up to the last working day.

Registration for the project work shall be done only for the final semester.

**8. Assessment**

The break-up of assessment and examination marks for theory subjects is as follows.

First assessment (Term Test 1): 15 marks

Second assessment (Term Test 2): 15 marks

Third assessment (Assignment): 10 marks



End Semester Examination: 60 marks

The break-up of assessment and examination marks for practical subjects is as follows.

First assessment (test): 15 marks

Second assessment (test): 15 marks

Maintenance of record book: 10 marks

End Semester Examination: 60 marks

The project work will be assessed for 40 marks by a committee consisting of the guide and a minimum of two members nominated by the Head of the Department. One of the committee members will be nominated as the chairman by the Head of the Department. The Head of the Department may himself opt to be a member or the chairman. 60 marks are allotted for the project work and viva voce examination at the end of the semester.

**10. Student Counsellors**

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counsellor for those students throughout their period of study. Such student counsellors shall advise the students, give preliminary approval for the courses to be taken by the students during each semester and obtain the final approval of the Head of the Department.

**11. Class Committee**

For each of the semesters, separate class committees will be constituted by the respective Heads of Departments.

The composition of the class committees from first to seventh semester will be as follows.

Course co-ordinators of the common courses, if any, who shall be appointed by the Head of the Department from among the staff members teaching the common course.

A project co-ordinator (in the seventh semester committee only) who shall be appointed by the Head of the Department from among the project supervisors.

Teachers of other individual courses.

One Professor or Reader, preferably not teaching the concerned class, appointed as chairman by the Head of the Department. The Head of the Department may opt to be a member or the chairman.

The class committee shall meet four times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of assessment like test, assignment etc. for the first and third assessments and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The second assessment will be the mid-semester test. The third meeting will be held within a week after the second assessment is completed to review the performance and for follow-up action.

The fourth meeting will be held after all the assessments except the examinations are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 40 marks will be finalised for every student and tabulated and submitted to the Head of the Department for approval and transmission to the Controller of examinations.

**12. Withdrawal from a course**

A student can withdraw from a course at any time before a date fixed by the Head of the Department prior to the second assessment, with the approval of the Dean of the faculty on the recommendation of the Head of the Department.



**13. Temporary break of study**

A student can take a one-time temporary break of study covering the current semester and/or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid semester test. However, the student must complete the entire programme within the maximum period of eight years.

**14. Substitute assessments**

A student who has missed, for genuine reasons accepted by the Head of the department, one or more of the assessments of a course other than the examination, may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the date of the fourth meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Head of the Department within a week from the date of the missed assessment.

**15. Attendance requirements**

To be eligible to appear for the examination in a particular semester, a student must put in a minimum of 80 Yo of attendance in that semester. However, if the attendance is 75% or above but less than 80% in any semester, the authorities can permit the student to appear for the examination in that semester on payment of the prescribed condonation fee.

A student who withdraws from or does not meet the minimum attendance requirement in a course must re-register for and repeat the course.

**16. Passing and declaration of examination results**

All assessments of all the course on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University.

Thereafter, the Controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average and cumulative grade point average, and prepare the grade cards.

| | |
|---|---|
| 90 to 100 marks | Grade 'S' |
| 80 to 89 marks | Grade 'A' |
| 70 to 79 marks | Grade 'B' |
| 60 to 69 marks | Grade 'C' |
| 55 to 59 marks | Grade 'D' |
| 50 to 54 marks | Grade 'E' |
| Less than 50 marks | Grade 'F' |
| Insufficient attendance | Grade 'I' |
| Withdrawn from the course | Grade 'W' |

A student who obtains less than 24 marks out of 60 in the end semester examination or is absent for the examination will be awarded grade 'F'.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course. Such a course cannot be repeated by the student.

A student who obtains letter grade F in a course has to reappear for the examination in that course.

A student who obtains letter grades I or W in a course must reregister and repeat the course.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

S-10; A-9; B-8; C-7; D-6; E-5; F-0



Courses with grades I and W are not considered for calculation of grade point average or cumulative grade point average. F grade will be considered for computing OPA and CGPA.

A student can apply for retotalling of one or more of his examination answer papers within a week from the date of issue of grade sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of examinations with the recommendation of the Head of the Department.

After results are declared, grade cards will be issued to the students. The grade card will contain the list of courses registered during the semester, the grades scored.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the semester, divided by the sum of the number of credits for all courses taken in that semester. COPA is similarly calculated considering all the courses taken from the time of admission.

The results of the final semester will be withheld until the student obtains passing grade in all the subjects of all earlier semesters.

After successful completion of the programme, the degree will be awarded with the following classifications based on CGPA.

For First class with Distinction the student must earn a minimum of 135 credits within 3½ years from the time of admission, pass all the courses in the first attempt and obtain a CGPA of 8.25 or above.

For First class the student must earn a minimum of 135 credits within four years from the time of admission and obtain m CGPA of 6.75 or above.

For Second class the student must earn a minimum of 135 credits within eight years from the time of admission.

**17. Ranking of candidates**

The candidates who are eligible to get the B.E. degree in First Class with distinction will be ranked together on the basis of the CGPA.

The candidates passing with First class will be ranked next after those with distinction on the basis of the CGPA.

The ranking will be done separately for each branch of study.

**18. Electives**

Apart from the various elective courses offered in the curriculum of the branch of specialization, a student can choose a maximum of two electives from any specialization under the faculty during the entire period of study, with the approval of the head of the Department and the Head of the Department offering the course.

**19. The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the subjects of study and the syllabi from time to time.**

**20. Transitory Regulations**

Wherever there had been change of syllabi, examinations based on the existing syllabus will be conducted for three consecutive times after implementation of the new syllabus in order to enable the students to clear the arrears. Beyond that the students will have to take up their examinations in equivalent subjects, as per the new syllabus, on the recommendations of the Head of the Department concerned



**BACHELOR OF ENGINEERING (CIVIL) PART-TIME (CBCS)**

**SCHEME OF EXAMINATIONS**

**I SEMESTER**

| CODE | SUBJECT | INS./WEEK IN HOURS | | | DURATION OF EXAM (HOURS) | MARKS | | TOTAL | CREDIT UNITS |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P D | | EXAM | SESS | | |
| PCLEC101 | Mathematics-I | 3 | - | - - | 3 | 60 | 40 | 100 | 4 |
| PCLEC102 | Surveying | 3 | - | - - | 3 | 60 | 40 | 100 | 4 |
| PCLEC103 | Fluid Mechanics | 3 | - | - - | 3 | 60 | 40 | 100 | 4 |
| PCLEC104 | Engineering Geology | 3 | - | - - | 3 | 60 | 40 | 100 | 4 |
| PCLEC105 | Structural Mechanics-I | 3 | - | - - | 3 | 60 | 40 | 100 | 4 |
| **Total** | | **15** | | | **15** | **300** | **200** | **500** | **20** |

L – Lecture, T – Tutorial, P – Practical, D- Drawing

## II SEMESTER

| CODE | SUBJECT | INS./WEEK IN HOURS | | | | DURATION OF EXAM (HOURS) | MARKS | | TOTAL | CREDIT UNITS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | D | | EXAM | SESS | | |
| PCLEC201 | Mathematics-II | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC202 | Hydraulics And Hydraulic Machinery | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC203 | Transportation Engineering | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC204 | Structural Engineering-I | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC205 | Hydraulics Lab | - | - | 3 | - | 3 | 60 | 40 | 100 | 2 |
| **Total** | | **12** | **-** | **3** | **-** | **15** | **300** | **200** | **500** | **18** |

L – Lecture, T – Tutorial, P – Practical, D- Drawing

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## III SEMESTER

| CODE | SUBJECT | INS./WEEK IN HOURS | | | | DURATION OF EXAM (HOURS) | MARKS | | TOTAL | CREDIT UNITS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | D | | EXAM | SESS | | |
| PCLEC301 | Statistics & Numerical Methods | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC302 | Soil Mechanics | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC303 | Structural Mechanics-II | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC304 | Hydrology | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC305 | Soil Mechanics Lab | - | - | 3 | - | 3 | 60 | 40 | 100 | 2 |
| **Total** | | **12** | **-** | **3** | **-** | **15** | **300** | **200** | **500** | **18** |

L – Lecture, T – Tutorial, P – Practical, D- Drawing

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## IV SEMESTER

| CODE | SUBJECT | INS./WEEK IN HOURS | | | | DURATION OF EXAM (HOURS) | MARKS | | TOTAL | CREDIT UNITS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | D | | EXAM | SESS | | |
| CLEC401 | Ground Water Engineering | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| CLEC402 | Management Science | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| CLEC403 | Structural Engineering-II | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| CLEC404 | Architecture | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| CLEC405 | Computer Aided Design & Drawing Practical-I | - | - | 3 | - | 3 | 60 | 40 | 100 | 3 |
| **Total** | | 12 | - | 3 | - | 15 | 300 | 200 | 500 | 19 |

L – Lecture, T – Tutorial, P – Practical, D- Drawing

## V SEMESTER

| CODE | SUBJECT | INS./WEEK IN HOURS | | | | DURATION OF EXAM (HOURS) | MARKS | | TOTAL | CREDIT UNITS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | D | | EXAM | SESS | | |
| CLEC501 | Computer Programming | 3 | - | - | - | 3 | ~~60~~ 75 | ~~40~~ 25 | 100 | 4 |
| CLEC502 | Environmental Engineering-I | 3 | - | - | - | 3 | ~~60~~ 75 | ~~40~~ 25 | 100 | 4 |
| CLEC503 | Substructure Design (Foundation Engineering) | 3 | - | - | - | 3 | ~~60~~ 75 | ~~40~~ 25 | 100 | 4 |
| CLEC504 | Irrigation Structures and Water Power Engineering | 3 | - | - | - | 3 | ~~60~~ 75 | ~~40~~ 25 | 100 | 4 |
| CLEC505 | Computer Lab-I | - | - | 3 | - | 3 | ~~60~~ 60 | 40 | 100 | 3 |
| **Total** | | 12 | - | 3 | - | 15 | 300 | ~~200~~ 140 | 500 | 19 |

L – Lecture, T – Tutorial, P – Practical, D- Drawing

## VI SEMESTER

| CODE | SUBJECT | INS./WEEK IN HOURS L | T | P | D | DURATION OF EXAM (HOURS) | MARKS EXAM | SESS | TOTAL | CREDIT UNITS |
|---|---|---|---|---|---|---|---|---|---|---|
| PCLEC601 | Construction Techniques & Management | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC602 | RemoteSensing&GIS | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC603 | Environmental Engineering-II | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC604 | Computer Aided Design & Drawing Practical-II | - | - | 3 | - | 3 | 60 | 40 | 100 | 3 |
| PCLEC605 | Environmental Engineering Lab | - | - | 3 | - | 3 | 60 | 40 | 100 | 3 |
| **Total** | | **9** | - | **6** | - | **15** | **300** | **200** | **500** | **18** |

L – Lecture, T – Tutorial, P – Practical, D- Drawing

## VII SEMESTER

| CODE | SUBJECT | INS./WEEK IN HOURS L | T | P | D | DURATION OF EXAM (HOURS) | MARKS EXAM | SESS | TOTAL | CREDIT UNITS |
|---|---|---|---|---|---|---|---|---|---|---|
| PCLEC701 | Elective-I | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC702 | Elective-II | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC703 | Interior Design and Planning | 3 | - | - | - | 3 | 60 | 40 | 100 | 4 |
| PCLEC704 | Computer Lab-II | - | - | 3 | - | 3 | 60 | 40 | 100 | 3 |
| PCLEC705 | Project | 3 | - | - | - | | 60 | 40 | 100 | 8 |
| **Total** | | **12** | - | **3** | - | **12** | **300** | **200** | **500** | **23** |

L – Lecture, T – Tutorial, P – Practical, D- Drawing

**Elective – I & II Chosen from the following :**

1. Urban and Rural Planning
2. Drainage and Flood Control Engineering
3. Industrial Waste Treatment and Disposal
4. Civil Engineering Systems Analysis and Design
5. Maintenance and Rehabilitation of Structures
6. Advanced Hydrology
7. Pre stressed Concrete
8. Prefabricated & Industrial Structures
9. Services in Highrise Buildings
10. Watershed Conservation and Management
11. Water Resources Systems Management
12. Solid Waste and Hazardous Waste Management
13. Earth Quake Engineering
14. Hydro Power Engineering
15. Environmental Impact Assessment



# PCLEC 101 - MATHEMATICS-I

**Objective**

The course is aided at developing the skills of engineering students in the basics of chosen topics of Mathematics that are necessary for effective understanding of engineering subjects.

**Unit-I**

Inverse of fourth order matrix by elementary transformation and partitioning methods Characteristic equation - Cayley Hamilton theorem (Statement only) and its application in finding the inverse of a matrix - eigen values and eigen vectors and their properties- real quadratic forms reduction in to canonical form by elementary congruent transformations.

**Unit-II**

Differential Calculus: Functions of two or three variables (revision of partial differentiation) total differentiation - errors and approximations — envelops - Jacobians - functional relationship Taylor's series and Maclaurin's series Expansions functions of two variables -maxima and minima of two undetermined multipliers.

**Unit-III**

Three dimensional analytical geometry: Rectangular, Cartesian coordinates - direction cosines of a line –angle between two planes- conditions of perpendicularity and parallelism - different forms of equations of plane - angle between two planes- conditions of perpendicularity and parallelism equations of a plan through the intersection of two given planes - symmetric form of equations of line — plane and straight line - coplanar lines -skew lines.

**Unit- IV**

Equation of a sphere - circle as the plane - section of sphere - equation of sphere passing through a given circle - equation of a

cone having its vertex origin of a given point and passing through a plane curve - right circular cone.

**Unit- V**

Integral Calculus: Integration by parts - properties of definite integral - Reduction formulae- Evaluation of double and triple integrals change of order of integration - Application of multiple integrals for finding areas and volumes- Beta and gamma functions.

**TEXT BOOKS**


1. Dr. M.K Venakatraman, Engineering Mathematics (Series) National Publishing Co., Chennai-2005.
2. Narayanan S. Manicavachagam Pillai T.K, and Ramanaigh G, Advanced Mathematics for Engineering Students Vol-I, S. Viswanathan Printers and Publishers Pvt. Ltd. Chennai" 2000.
3. Dr. S. Arumugam & others, Engineering Maths series, Meenakshi Pub., Chennai., 2005.


**REFERENCE BOOKS**


1. Dass H.K, Engineering Mathematics, S Chand & Co: New Delhi, 2005.
2. Dr. K. Vairarnanickam & others, Engineering Maths Vol.-I Prentice Hail of India, New Delhi, 2006.




# PCLEC 102 – SURVEYING

**Objective**

This is an important supplementary course to a Civil engineer, as knowledge of the surveying practices and topography of the site influences the competency of a Civil engineer. This course covers the principles and practices of chain and compass surveying, levelling, theodolite surveying, tachometric surveying and triangulation.

**UNIT-I**

Tachometric Surveying: Principles of stadia formula-subtense bar-Precise instruments-micropic alidades-micropic and micrometer theodolites-nautical and box sextants-range finders.

**UNIT-II**

Curves: Elements of simple curve –setting out simple curves by chain and tape method-instrumental methods-compound, and transition curves-setting out curves by single and double theodolite methods.

**UNIT-III**

Triangulation: Classification of systems-classification of networks-types of triangulation stations-selection of stations-signals-observations from triangulation stations-selection of site for base line-base line measurement-corrections-reduction of measurements.

**UNIT-IV**

Adjustment of angles: Errors of observations weighted measurements-method of least squares.

**UNIT-V**

Spherical Trigonometry: Definitions of sphere, great and small circles, poles, axis and secondaries. Arc lengths of great circle and small circle, Spherical triangle, elements of spherical triangle and its solution by trigonometry formula and Napier's rule. Extrameridian observation of sun for determination of latitude, longitude, time and azimuth of survey lines.

**TEXT BOOKS**


1) Surveying & Levelling --Vol.II-T.P.Kanetkar Pune Vidyarthi Griha Prakashan,Pune 411 030-1990

2) Surveying-Vol.II & Vol-III-B.C.Punmia Laxmi publications,Madras-1992.

3) A Text Book of Advanced Surveying-Arora Standard Book House,1705-A Naisarak,Delhi-110 006,1992.




# PCLEC 103 - FLUID MECHANICS

**Objective**

To introduce the mechanics of fluids through a through understanding of the properties of the fluids, behaviour of fluids under static conditions. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy. The applications of the conservation of laws to flow measurements, flow through pipes, flow through open channels is studied.

**UNIT-I**

Fluid properties: Density-Specific weight-specific volume-specific gravity-compressibility-ideal and real fluid-Capillarity – surface tension.

**UNIT-II**

Static's of fluid: Pressure at a point-Pressure measurement-manometers and pressure gauges-total pressure and centre of pressure –buoyancy-equilibrium of floating bodies-metacentre.

**UNIT-III**

Kinematics and Dynamics: Steady and unsteady motion-path and stream lines-rotation and irrotational motion-equation of continuity-velocity --potential and stream function –local, convective and total accelerations-Euler's equation along a stream line – Bernoulli's equation for steady flow-flow in a curved path-free and forced vortex flow.

**UNIT-IV**

Flow of incompressible fluid in pipes: Laminar and turbulent flow- Reynolds's number-Pressure losses in pipes flowing in closed conduits-Hydraulic gradient-energy gradient-laminar flow in circular pipes-Turbulent flows in circular pipes-elementary concept of boundary layer-velocity distribution

in circular pipes-losses at entrance due to enlargement and contraction-flow between two reservoirs-size of pipe for a given discharge-pipes in series and parallel-transmission of power.

**UNIT-V**

Flow in open channels: Types of flow-Uniform flow equations for flow-chezy's formula –Manning's formula-velocity distribution –most efficient cross section –circular cross—section not flowing full-Total head and specific energy-critical depth and critical velocity-sub critical flow –hydraulic jump-measurements by notches- pitot tube and current meters.

**TEXT BOOKS**

1. Jagadish Lal; Fluid Mechanics.



# PCLEC104 -ENGINEERING GEOLOGY

**Objective**

The objective of this course is to study the properties of various minerals, different types of rocks and its geological formation, causes and effects of earthquakes, landslides and hydrogeology.

**UNIT-I**

Mineralogy: Principle, physical Properties of Minerals, the chief characteristics of rock forming minerals, quartz, felsper, mica, pyrozenes, amphiboles, olivine, garnet, epidote, paryle and other important minerals.

**UNIT-II**

Petrology: Rock- igneous, sedimentary and metamorphic, mode of formation of igneous rocks, granite, synite, diorite, obsidiam, pumice, tracyte, and basalt.

Sedimentary rock-mode of formation and classification-sandstone-limestone, Late rite, Shale Metamorphic rocks-mode of formation-important types.

**UNIT IJI**

**Structural Geology**

Dip. Strike, folds, faults, outlier, inlier, joints, unconformity and overlap, Chief forms of igneous bodies.

**UNIT-IV**

**Engineering Geology**

Earthquake-causes-effects-intensity-magnitude,distribution-seismographs-seismic zones of India.

Landslides-stability of slops and slides affecting cutting and embankment-prevention of landslide and soil erosion, soil conservation.

**UNIT-V**

**Hydrogeology:**

Geology and occurrence of ground water – undergro circulations-Artesian wells.

Geological conditions necessary for dams-resery Alignment of tunnels-Tunneling.

**REFERENCE BOOKS:**

1. Engineering geology, R.S.Khurumi.
2. Geology for Civil Engineers, A.C.Mclean C.D.Gribble.

## PCLEC105 STRUCTURAL MECHANICS – I

Common with CLEC503

### Objective

This course covers the analysis of complex structural elements like fixed and continued beams with different end conditions and arches with varying degrees of redundancy through classical methods of analysis.

**UNIT – I**

Column analogy method - Continuous beams – Theorem of three moments- B.M.D & S.F.D

**UNIT – II**

Analysis for moving loads - Influence lines (IL) - IL for beams with point load, UDL longer than span, UDL shorter than span and several point loads - Equivalent UDL - Absolute maximum bending moment - IL for trusses.

**UNIT – III**

Three-hinged arches - Horizontal thrust - Effect of temperature change - Straining actions - Influence lines - Parabolic and Circular arches - Two-hinged arches -Horizontal thrust - Effect of temperature change - Straining actions - Influence lines - Parabolic and Circular arches.

**UNIT – IV**

Cables and Suspension bridges - Equation of the cable - Horizontal thrust on the cable - Tension in the cable - Length of the cable - Effect of temperature on the cable - Stiffening girders in suspension bridges - with three-hinged and two-hinged stiffening girders - IL for moving loads over suspension bridges.

**UNIT – V**

Moment Distribution method - Continuous beams - Simple frames- Portal frames with and without side sway

**Text Books:**


1. **Dr.B. C. Punmia, et al,** *Strength of Materials and Theory of Structures - Vol.I,* Lakshmi Publications, 1992.

2. **S.Ramamrutham & R. Narayan,** *Theory of Structures,* Dhanpat Rai and Sons, 1992.


Reference Books:


1. **C. S. Reddy,** *Basic Structural Analysis,* Tata McGraw Hill Book Co., 1996.

2. **C. K. Wang,** *Intermediate Structural Analysis,* Tata McGraw Hill Book Co., 1984.

3. **Vazirani and Ratwani.** *Analysis of Structures - Vol.I.*

# PCLEC201 - MATHEMATICS-II

## Objective

The course in aimed at developing skills of engineering students in the basics of chosen topics of mathematics that are imperative for effective understanding of Engineering subjects.

## Unit-I

Trigonometry : Expansion of Sin nx and cos nx in terms of cosines and sines of multiples of x - Expansion of sin nx and cos nx in series of powers of sin nx and cos nx - Expansion of sin nx and cos nx and tan nx in series or ascending power of x - Evaluation of indeterminate quantities, exponential circular, hyperbolic and inverse hyperbolic functions and their relations.

## Unit-II

Differential Equations: Linear equations of second order with constant coefficients -Applications in electric circuit and deflection of beams - Simulations differential equations with variable coefficients - Euler's homogenous differential equations - Legehder's differential equations reducible to Euler's homogenous equation.

## Unit-III

Complete Solution in terms of an integral of corresponding homogenous equation obtained by inspection - Reduction to normal form by removing the first derivative change of independent variable - Variation of parameters.

## Unit-IV

Vector scalar and vector point function - Differentiation of vectors - Gradient of a scalar function _ Simple application - Divergence and of Vector functions Solenoidal and irrotational fields - simple application - Laplacian operator - Expansion formulae of first order second order differential operators.

**Unit- V**

**Vector Integration**

Line- integral - surface integral - Volume Integral - Gauss divergence theorem - Strokes theorem - Greens theorem in plane (Proof of theorem not needed) - simple applications.

## TEXT BOOKS


1. Dr. M.K. Venaktaraman, Engineering Mathematics (Series) National Publishing Co., Chennai, 2005.
2. Dr. S. Arumugam & others. Engineering Maths series, Meenakshi Publications, Chennai, 2005.


## REFERENCE BOOKS


1. Marie C. Potter and Jack Goldberg, Mathematical methods, Prentice Hall of India, New Delhi-1.




# PCLEC202 - HYDRAULICS AND HYDRALIC MACHINERY

**Objective**

To introduce the various hydraulic Engineering problems like open channel flow, dimensional analysis and also hydraulic machines such as turbines, pumps.

**UNIT-I**

Advanced hydraulics: Gradually varied flow in open channels – back water curves. Venturi flume – open channel surges-gauging of rivers and channels.

Dimensional analysis and similitude-Reynold's, Froude's Cauchy, Weber and Mach Number-model studies. Raleigh's and Bucklingham II-Method.

**UNIT-II**

Impact of water on vanes-impulse and momentum-dynamic force on stationary and moving flat and curved vanes-dynamic force on pipe bends-jet propulsion.

**UNIT-III**

Turbines: Classification based on action and direction of flow –velocity triangles-calculation of torque , force, discharge, ,power and efficiency of reaction-impulse and characteristics curve –sclection of turbines.

**UNIT-IV**

Centrifugal pumps-classification -velocity triangle- calculation of work done and efficiency –minimum starting speed-unit and specific quantities and characteristics curves – effect of change of speed and diameter.

**UNIT-V**

Reciprocating pump: Principle of working –calculation of discharge , slip ,work done and efficiency –acceleration head and its effects-friction loss-air vessels.

**TEXT BOOKS :**

1. Fluid Mechanics and Hydraulics-Jagdish lal.
2. Hydraulic Machines-Jagdish lal.



# PCLEC203 - TRANSPORTATION ENGINEERING

**Objective**

To give an overview / basis of highway engineering with respect to the development, planning, design, construction and maintenance of highways. This course covers the traffic signals, traffic problems in cities and traffic environment. Also covers the airport layout, terminal buildings and runway details.

**UNIT –I**

Airports-their importance-spacing and position in relation to their zone-details of their location and layout-auxiliary and terminal buildings-their location and layout.

**UNIT -II**

Runway lighting and drainage –Other accessories such as hangers and repair yards-airport zoning.

**UNIT-III**

Tunnels- introductions-tunnel surveying-soil classification-various tunneling methods in soft strata and hard rock-tunnel shafts and caissons-tunnel lining-tunnel drainage-tunnel ventilation-dust prevention-lighting-modern machines used in tunneling.

**UNIT-IV**

Harbours- classification and requirement – choice of site Principles of design – forms of harbours – signal – breakwater and their uses – types of breakwater.

**UNIT-V**

Channel regulations – dredging – types of dredgers – land reclamation and coastal protection-jetties, docks and basins.

**TEXT BOOKS**

1. Harbour Engineering, K.SRINIVASAN, charotar publishing house-ANAND,338001.
2. Airport Techniques, P.B.SHANANI, Oxford &IBH Publishing Co., New Delhi.

## PCLEC204 - STRUCTURAL ENGINEERING-I

CLEC 405

### Objective

To introduce the various philosophies of R.C, design and to study in detail the working stress and limit state design of structural elements such as beams, columns, foundations as per IS 456 – 2000 and also to know the design of steel sections for Compression, Tension and Flexural members as per IS 800 – 2007.

**UNIT-I**

Introduction to working stress method - Analysis - Design - Limit state method - R.C. beams - Assumptions - Moment of resistance - Categorisation- Design guidelines - Analysis and Design of Singly-reinforced beams, Doubly-reinforced beams and Flanged beams - Cantilever beams -Lintel beams- Codal provisions.

**UNIT-II**

R.C.Slabs - Categorisation-Effective span-Design guidelines -Cantilever slabs – One - way slabs - Two-way slabs - Simple Stairs- Codal provisions.

**UNIT-III**

Axially loaded columns-Eccentrically loaded columns-short and long columns-isolated footings-combined footings-simple raft foundation-pile foundation-Design based on limit state method.

**UNIT-IV**

Limit State Design - Basic for Design – Ductility - Partial safety factors for loads - Partial Safety Factors for Materials – Deflection Limits.

Bolted connections – Location details of Fasteners - Bearing and Friction Grip type bolts - shear capacity – Tension capacity- Bearing Capacity – Bolts subjected to combined shear and tension – slip resistance – Design of connections as per IS 800-2007 provisions.

Welded connections - Butt joint – Lap joint – Size of weld – Throat thickness – Weld symbols – Weld types - Design of connections as per IS 800-2007 provisions.

**UNIT-V**

Tension members – Types – Bolted and welded connection of Tension members – Design of Tension members as per IS 800-2007 provisions.

Compression members – Effective lengths – Slenderness ratios – Design details – Column Bases Angle Struts – Laced Columns – Battened columns - Design of compression members as per IS 800-2007 provisions.

Beams – Effective span of Beams – Shear - Beams of unsymmetrical sections – Design of beams as per IS 800- 2007 provisions. Plate girders – Elements of a plate girder – Design of web – Design of flanges – Connections –Design of plate girders as per IS 800 - 2007 provisions.

TEXT BOOKS:


1) **N.Subramanian,** 2008, *Design of Steel Structures*, Oxford University Press
2) **Dowling P.J., P.Knowles and G.W.Owens,** 1988, *Structural steel Design*, The Steel Construction Institute and Butterworths, London.

# PCLEC205 - HYDRAULICS LAB

## Objective

This course gives training to the students in the practical determination of flow parameters of various fluid flow systems.

Co-efficient of discharge, Co-efficient of velocity and Co-efficient of contraction for various types of Orifices and Mouthpieces.

Co-efficient of discharge for Notches.

Friction in Pipes - Losses in Pipelines.

Co-efficient of Venturimeter and Orificemeter - Discharge equation Co-efficient for different of Vanes in the impact of jet on vanes.

Characteristic Curves for different types of Centrifugal Pumps, Reciprocating Pumps and Turbines.

# CLEC501/ PCLEC 301 - NUMERICAL METHODS

(Common to Regular and Part-Time B.E. Civil)

## Objective

Closed form solutions are not always possible and necessary in the solution of many differential and partial differential equations describing various structural phenomena. Hence numerical methods offer easier and less cumbersome procedures for the solution of such equations. This course covers the finite difference techniques and power series methods of solution of these equations.

## UNIT-I

Method of Finite Difference: Finite Difference Operators-E, - Δ Solution of First and Second Order Linear Difference Equations with Constant Coefficients - Non-homogeneous Linear Difference Equations with Constant Coefficients.

## UNIT-II

Interpolation-Newton-Gregory Forward and Backward, Interpolation - Newtons Divided Difference Formula-Lagranges Interpolation Formula for Unequal Intervals-Gauss Interpolation Formula-Sterling Interpolation Formula-Numerical Differentiation-Numerical Integration-Trapezoidal Rule-Simpsons 1/3 and 3/8 Rule.

## UNIT-III

Numerical solution of Algebraic and Transcendental Equations - Balzano's Bisection Method - Successive Approximation Method-Regular-Falsi Method-Newton-Raphson Method, Graffies' Root Squaring Method.

Numerical solution of simultaneous Linear Algebraic Equations - Gauss Elimination method - Gauss Jordan Elimination Method- Gauss Siedel Iteration Method - Crout's method.

## UNIT-IV

Numerical Solutions of Ordinary Differential Equation of First, Second Order and Simultaneous Equations-Taylor's Series Method – Euler's Method-Improved Eulers Method-Modified Euler's Method.

Runge- Kutta Method of Fourth Order Milne's-Predictor Corrector Method – Picard's Method.

## UNIT- V

Numerical Solution of Partial Differential Equations - Elliptic Equation - Poisson's Equation - Laplace Equation - Liebermans' Interative Method- Relaxation Method - Hyperbolic Equations - One Dimensional Heat Equation -Bender-Schmidt Recurrence-Relation-Crank Nicholson's Implicit Method.

## TEXT BOOKS:


1. Numerical Methods in Science and Engineering -Dr. M. K. Venkatraman, National Publishing Co., Madras, September 2005.
2. Numerical Methods - Kandasamy.P, Thilagavathy.K and Gunavathy.K, S.Chand & Co., 2005.
3. Numerical Methods for Science and Engineering Computation - M.K.Jain, S.R.K Iyeagal & R.K.Jain, Wiley Eastern Company, 1984.
4. Numerical Methods in Science and Engineering - S.Rajasekaran, Wiley Publishing Allahabad, 1992.

75 Ext marks
25 Int marks

Common with CLEC 504

## PCLEC302 SOIL MECHANICS

### Objective

This is one of the core courses necessary for successful structural engineering practice. An understanding of the nature, properties and behavioural response of soils is essential for a safe and stable design of foundations. This course covers the principles involved in the understanding of the behaviour of soils as a supporting medium for structures.

**UNIT – I**

Introduction - Soil problems in Civil Engineering - the nature of soil-Soil description and classification for Engineering purposes.

Compaction - Soil compaction - Theory & comparison of laboratory and field compaction methods.

**UNIT – II**

Soil water and water Flow - Soil water - Static pressure in water - permeability measurement in the laboratory and field - flow through porous strata - Flow net and its properties - Flow net around a sheet pile only.

**UNIT – III**

Stress distribution and settlement - Effective stress concept in dry and saturated soils - Stress distribution in soil media - use of influence charts - Components of settlements - Immediate and consolidation settlements – Terzaghi's one dimensional consolidation theory.

**UNIT - IV**

Shear strength of granular materials - shear strength of saturated soil - measurement of shear strength in direct shear and triaxial compression - Mohr Coulomb strength envelope.

**UNIT - V**

Slope failure mechanisms - total stress analysis for saturated clays - friction circle method, tension cracks - use of stability number.

**Text Books:**


1. **Dr. B. C. Punmia**, *Soil Mechanics & Foundation Engineering*, Lakshmi Publications, 2005.
2. **V. N. S.Moothy** , *Soil Mechanics & Foundation Engineering.*
3. **Arora**, *Soil Mechanics & Foundation Engineering.*
4. **C. Venkataramaiah**, *Geotechnical Engineering.*


**Reference Books:**


1. **Cooper**, *Problems in Engineering Soils.*
2. **Shamsher Prakash**, *Problems in Soil Mechanics.*
3. K.Terzaghi and **R.B.Peck**, *Soil Mechanics in Engineering Practice.*

75 External marks
25 Internal marks

Common with CLEC 603

## PCLEC303 STRUCTURAL MECHANICS – II

### Objective

This course provides advanced and modern methods of structural analysis of simple and complicated structures and structural systems. This course can also be a prelude to a basic course in finite element analysis.

**UNIT – I**

Slope deflection method - Continuous beams - Simple frames - Portal frames. Consistent-deformation method - Continuous beams - Simple frames - Portal frames.

**UNIT – II**

Strain energy method - Beams and Frames- Beams curved in plan.

**UNIT – III**

Flexibility method - Beams - Trusses - Simple frames - Portal frames.

**UNIT - IV**

Stiffness method - Beams - Trusses - Simple frames

**UNIT - V**

Stiffness method - Portal frames - Grids - Lack of fit - Temperature stresses – Support settlements - Elastic supports.

**Text Books :**


1. **C. S. Reddy,** *Basic Structural Analysis*, Ed.2, Tata McGraw Hill Publications,1996.
2. **Sarwar Alam Raz,** *Analytical Methods in Structural Engineering*, Ed.2, New Age International, 2001.
3. **W. Weaver and J. M. Gere,** *Matrix Analysis of Framed Structures,* Ed.2, CBS Publishers and Distributors, 1999.
4. **G. S. Pandit and S. P. Gupta,** *Structural Analysis a Matrix Approach*, Tata McGraw Hill Publications, 1981.


**Reference Books:**


1. **Dr. N. C. Sinha and Dr. P. K. Gayen**, *Advanced Theory of Structures*
2. **C. K. Wang,** *Intermediate Structural Analysis*, Tata McGraw Hill Publications, 1983.
3. **Vazirani V.N, Ratwani.M.M,** *Advance Theory of Structures and Matrix Method of Analysis*, Khanna Publishers, 1995.

# PCLEC304 – HYDROLOGY

## Objective

This subject aims at making the students to understand th various components of hydrologic cycle, which is responsible fo spatial and temporal distribution of water availability in any regior

## UNIT-I

Introduction – Definition and scope – Hydrologica cycle – The Global water Budget – Practical application – Meteo rology – structure and Constituents of atmosphere – Genera Circulation – Transitory systems.

## UNIT-II

Precipitation – Formation – Types – forms Measurement Analysis and Interpretation of Rainfall data – Rainfall mass curv and Rainfall hyetograph, Intensity – Duration – Frequency analysi Depth – Area – Duration Analysis, Estimation of averag depth – Missing precipitation – Double mass curve – Rain gaug network – Climate and weather seasons in India.

## UNIT-III

Evaporation – Factors influencing estimation Measurement – Reducing evaporation Transpiration Infiltration Factors influencing – Measurement – Equations – Indices.

## UNIT-IV

Runoff – Components – Factors influencing – Rainfall Runoff relationships.

Hydrograph – Analysis – Unit hydrograph theory Applications of UH.

Stream flow measurement – Stage - Dischar Relationship – Stream gauge site selection.

**UNIT-V**

Flood – Design flood – Frequency methods – Flood routing – Reservoir Routing – Channel Routing – Muskingham Routing - Flood forecasting.

**REFERENCE BOOKS**


1. Hydrology and Water Resources Engineering-S.K.Garg, Tata McGraw Hill.
2. Engineering Hydrology-R.Subramanya, New Age International,2005.
3. Hydrology- H.M. Raghunath, Wiley Eastern Limited,1986.
4. Elementary Hydrology-Vijay P.Singh, Prentice Hall of India Pvt.Ltd.,1994.
5. Flood Control and Drainage Engineering-S.N.Ghose, Oxford and IBH Publishing Co. Pvt. Ltd.,1986.
6. Hydrology & Water Resources Engineering-Sharma R.K and Sharma.T.K.


## PCLEC305 – SOIL MECHANICS LAB

Syllabus to cover Soil Mechanics (Third Semester).



## PCLEC401 - GROUND WATER ENGINEERING

**Objective**

To introduce the student the principles of groundwater governing equations, characteristics of aquifers, construction of wells, investigation and artificial recharge of groundwater.

**UNIT-I**

Occurrence-scope and place of ground water in Hydraulic cycle-origin of ground water-rock Properties affecting ground water types of aquifers.

**UNIT-II**

Ground water and well hydraulics-Darcy's law-coefficient of permeability –laboratory measurement of permeability-field measurement of permeability –general flow equation-steady unidirectional flow-steady radial flow to a well both in confined and unconfined aquifer-steady flow with uniform recharge –unsteady radial flow to a well in confined aquifer –Non equilibrium equation for pumping tests by theis method and Jacob method.

**UNIT-III**

Construction of wells-methods for constructing hollow wells and for drilling deep wells-wells completion perforation screens and gravel packing-rings for vertical and radial drilling –collector wells-infiltration galleries.

**UNIT-IV**

Surface and sub-surface investigations of ground water-geophysical exploration-electrical methods-seismic refraction methods-subsurface investigation-test drilling and resistivity.

**UNIT-V**

Artificial recharge of ground water and sea water intrusion-Ghyben-Herzberg relation between fresh and saline water.

**TEXT BOOKS**


1. David Keith Todd (University of California, Berkeley) and David Keith Todd (Consulting Engineer INC., Ground Water Hydrology, John Wiley & Sons,2004.
2. K.Subramanya., Engineering Hydrology, Tata McGraw Hill Publishing Company Limited, New Delhi,2005.
3. Charles R. Fitts., Ground Water Science, Academic Press,2006.




## PCLEC402 - MANAGEMENT SCIENCES

**Objective**

To introduce the basic concepts of Management needed for Civil Engineer.

**UNIT – I BASIC CONCEPTS IN MANAGEMENT**

**Types of business operations** - Sole proprietorship Partnership - Company - Public and- private sector enterprises / Joint ventures, collaborations.

**Functions of Management** - Principles of management Functions of management - Functions of a manager.

**Production Management** - Planning –scheduling- procurement - Inventory control - management tools - L.P. - PERT, CPM, etc.

**UNIT – II INTRODUCTION TO MARKETING AND FINANCIAL MANAGEMENT**

Market - Marketing, Segmentation, Positioning, Marketing Research, Market Planning, Scope of financial management - Cost accounting Vs Financial accounting, Appraisal of projects, Investment decisions - concept of payback.

**UNIT – III MATERIALS AND EQUIPMENT MANAGEMENT**

Planning - Identification, Procurement, Schedule and Cost control - systems approach in resource management - ABC analysis, VED analysis, FSN analysis, vendor rating evaluation, buying versus leasing of equipment.

**UNIT – IV HUMAN RESOURCE MANAGEMENT**

Scope and objectives of HRM - Man power policy and planning - Recruitment and selection - Training performance appraisal - Wage policy and compensation systems Company union

relationship and collective bargaining Accidents - Absenteeism an turn over - Grievances / conflicts - Identification and resolution.

**UNIT – V INTRODUCTION TO COMPUTEI APPLICATION IN CONSTRUCTION MANAGEMENT**

Planning - Scheduling and Resource-analysis - Recordin and operations- Project accounting, costing and finance usage o project management software.

**TEXTBOOKS**

1. Konni, Donnel C.O. and weighurich. H., Management Eigh edition, McGraw Hill International Book Company, 1997
2. Philip Kotler, Marketing management, Prentice-Hall o India, Edition 1998.

**REFERENCE BOOKS**

1. Momoria, Personal management, Himalaya Publishing Co. 1992.
2. Sharma, J.L., Construction management and accounts Sathya Prakashan, New Delhi, 1994.
3. Srinath, L.S. An introduction to project management, Tata McGraw Hill publications, 1995.
4. Rajan Saxena, Marketing Management, Tata McGraw Hill publishing Company Limited, 2005.

## CLEC505/PCLEC403 - STRUCTURAL ENGINEERING-II

### Objective

This course covers the design of R.C.C multistoreyed complicated structures, retaining walls, water tanks and Bridges based on limit state design. This course also enables the students to develop confidence in the design of steel roof trusses and its elements.

**UNIT I**

Analysis and design of multi-storeyed frames for gravity loads and wind loads –substitute frames method- portal and cantilever method- Design based on Limit state method.

**UNIT-II**

Retaining Walls- Cantilever type and Counterfort type retaining Walls- Design based on Limit state method.

**UNIT-III**

Water tanks- Tanks resting on ground- elevated water tanks-staging for water tanks- Design based on Limit state method.

**UNIT-IV**

Design of deck slab for bridges-Design of solid slab bridge- Pigeaude's curve.

**UNIT-V**

Industrial buildings - Types - Elements of an industrial building - Loads on industrial buildings - Wind loads on Industrial Buildings - Roof trusses - Components of a roof truss - Loads on roofs - Design of purlins - Analysis and Design of roof truss.

**TEXT BOOKS:**


1. "Reinforced Concrete Structures Vol –II",B.C. Punmia, A.K.Jain, Arunkumar Jain.
2. "Design of Steel Structures", N.Subramanian, 2008, Oxford University Press
3. "Limit state Design"- Dr.Ramachandra #I.S.3370(Part-IV)-Code of Practice for Liquid Retaining Structures.
4. "Structural Engineering" – Arulmanickam, Engineering Education Series.
5. "Limit State Design" – Dr.Ramachandra, Standard Book House, Nai Sarak. Delhi, 1990.


**IS CODES:**


1. IS 456 – 2000, Code of practice for plain and Reinforce concrete.
2. IS 800 – 2007, General construction in steel – code of practice
3. SP:7-1983, National Building Code of India.
4. SPL 16-1980, Design Aids for R.C.C.


**REFERENCE BOOKS:**


1. "Design of Reinforced Concrete Structures"- S.Ramamurtham, Dhanpat Rai & Sons, 2001.
2. "Design of Steel Structures", P. Dayaratnam, S. Chand & Co. Ltd., Ramnagar, NewDelhi, 2010.

# PCLEC404 – ARCHITECTURE

## Objective

To make the students to know about the basic principles and influences on architecture, history of architecture, planning of various buildings.

## UNIT-I

Influences on architecture-nature-climate and topography-man-personality and interests.

## UNIT-II

Represented plan-growth of mass from plan-organisation of space-Principles of composition-contrast proportion-scale balance-unity and character of composition.

## UNIT-III

Review of history of architecture-Egyptian, classical and Indian architectural elements-walls, columns, roofs and openings.

## UNIT-IV

Planning of buildings-simple structures-aspect, grouping, circulation, sanitation and orientation-planning and treatment of interiors-general principles of acoustics-design of auditoriums, lecture rooms-acoustic materials.

## UNIT-V

Drawing-line sketches of planned buildings-residences, clinics, community hall-general idea of perspective drawing (course work only).

## REFERENCE BOOKS


1. Francis O.K. Ching, "Architecture: Form, Space and Order" VNR, N.Y., 1999.
2. Givoni B., "Man Climate and Architecture ", Applied Science, Barking ESSEX,1982.
3. Edward D. Mills; "Planning the Architects Handbook", Butterworth London, 1995.
4. Gallian B. Arthur and Simon Eisner, "The Urban Pattern City Planning and Design", Affiliated Press Pvt. Ltd., New Delhi, 1995 .
5. Margaret Roberts, "An Introduction to Town Planning Planning Techniques", Hutchinson, London, 1990.




## PCLEC405 – COMPUTER AIDED DESIGN AND DRAWING PRACTICAL-I

### Objective

This course enables the students in studying and training them in doing the structural drawings themselves for various systems.

Introduction of AutoCAD, Simple Exercises in AutoCAD.

**Using ACAD**

Plate – 1 - Lintel with Sunshade
- Cantilever Canopy

Plate – 2 - Roof/Floor System (Continuous) with flanged beams

Plate – 3 - Footings

Plate – 4 - Raft Foundation

Plate – 5 - Pile Foundation

Plate – 6 - Simple Stairs

Plate – 7 - Multistory Buildings

Plate – 8 - Retaining Walls

Plate – 9 - Elevated Water Tank

Plate – 10 - Steel Roof Truss

Plate – 11 - Plate Girder with connection

**TEXT BOOKS**


1. Structural Design and Drawing - Dr. N. Krishnaraju
2. Engineering Graphics using AUTOCAD, T.Jeyapoovan, Vikas Publishing House Pvt. Ltd.,2000.
3. Engineering Drawing and Graphics and AUTOCAD, K.Venugopal, New Age International Publishers,2001.
4. Computer Application in Civil Engineering, New Chand & Bros., Roorkee, India,1979.

## PCLEC501 - COMPUTER PROGRAMMING

### UNIT – I

The C Character set – identifiers & Keywords – data types – constants – variables – arrays – declarations – expressions – statements – symbolic constants operators & expressions – arithmetic operators – unary operators – relational & logic operators – assignment operators – conditional operators – library functions – data input & output functions.

### UNIT – II

Control statements – While statements – do while statement – for-nested loops – if else – switch break – continue – comma operator – go to statement – programs.

### UNIT – III

Functions – defining a function – accessing a function – passing arguments to function – specifying arguments data types – function prototypes – storage classes – auto – static – external and register variables.

### UNIT – IV

Array – defining a array – processing array – passing array to a function – multi dimensional array – array – array & strings. Pointers – declarations – pointers to a function – pointers and one dimensional array – operating a pointer – pointer and multi dimensional array – array of pointers – passing functions to other functions.

### UNIT – V

Simple problems involving shear, bending and torsional stresses calculation for beams. Axial forces in Euler columns. Addition, Subtraction, Transpose, Inversion of Matrices, arranging numbers in ascending and descending order.



### REFERNCE BOOKS


1. Gottfried B.S., 'Programming with 'C' – DOS.
2. Ravichandran D., 'Programming in C'.
3. Balagurudsamy E., Programming in ANSI C'.
4. Yashwant Kanetkar, 'Let us C'.

# PCLEC502 - ENVIRONMENTAL ENGINEERING-I

**Objective**

To make the students conversant with basic principles of Water Supply Engineering. This course covers quantification of water, analysis, sources, conveyance, treatment and distribution of water.

## UNIT-I WATER SUPPLY

Objectives of public water supply schemes –Health acceptability, adequacy, Convenience and Economy.

Standards and Planning factors for public water supplies in India-water analysis-Population forecasts-Variation in demand pattern.

## UNIT-II SOURCES OF WATER

Surface and groundwater sources-Characteristics-impounded storage reservoirs-mass curve analysis-Intake structures-wells, Infiltration galleries, deep tube wells-construction, development and sanitary protection of wells-Estimating yield of wells under steady –state conditions.

## UNIT-III TRANSMISSION OF WATER

Pipe and channels for transmitting water-Hydraulics of pipe flow-use of charts and nomograms for flow computations-materials for pipes and conduits-Laying, jointing and testing of C.I., R.C.C., A.CV., and PVC pipes-Appurtenances of pipes, pumps and pumping stations-selection of pumps.

## UNIT-IV TREATMENT OF WATER

Unit Processes of water treatment- Principles, functions and design of mixing basins, flocculators, sedimentation tanks and sand



filters. Principles of disinfection –water softening: aeration-iron and Manganese removal.

## UNIT-V DISTRIBUTION AND STORAGE

Continuous Vs intermittent supplies, types, functions and requirements-Analysis of distribution networks using Hardy cross method of balancing-Equivalent pipes-elementary methods of pipes sizing-Operation and maintenance –Leak detection- Equalising and service reservoirs-Elevated and ground level reservoirs-location and determination of capacity-appurtenances.

## REFERENCE BOOKS

1. "Water Supply Engineering ",by S.K.Garg.
2. "Water and Wastewater Engineering" ,by Fair,G.M. Geyer., J.C., and Okum, D.A.

## CLEC 604 / PCLEC 503 FOUNDATION ENGINEERING

**Objective**

This is an extension course to the basic course on soil mechanics. This course helps the students to apply the principles of soil behaviour learnt in the earlier course towards a safe and stable design of shallow and deep foundations.

**UNIT – I**

Shallow Foundations - Types of foundation - choice of foundation type - general principles of foundation design.

Bearing capacity of soils - Bearing capacity of shallow foundations - Ultimate, Net and allowable bearing pressures - Factors influencing bearing capacity - code provisions.

**UNIT – II**

Site Exploration, Field Tests and Settlement - Methods of site exploration - Sampling procedures and sampling disturbance - Exploration report.

Field tests for determination of bearing capacity - Causes for settlement - Settlement components - Settlements of footing on sands and clays - Code provisions - Minimisation of settlement.

**UNIT - III**

Earth pressure and retaining walls - States of plastic equilibrium - Rankine and Coulomb theories - Application to the retaining walls of simple configuration - Stability considerations.

**UNIT – IV**

Piles - Considerations leading to selection of piles - Estimation of individual and group capacity - Static and dynamic approaches - Pile load tests and interpretation - Code provisions.

**UNIT – V**

Special Foundations - Foundations for bridges - Caissons-well foundations - Cofferdams - Principles of design and construction - Foundations for machinery - Principles of design - Code provisions - Foundations on expansive soils - Use of under-reamed piles.

**Text Books:**


1. **Dr. B. C. Punmia,** *Soil Mechanics and Foundation Engineering, Lakshmi Publications, New Delhi, 2005.*
2. **V. N. S.Moothy,** *Soil Mechanics and Foundation Engineering,* Oscar Publications, 1992.
3. **Arora. K.R.,** *Soil Mechanics and Foundation Engineering,* Oscar Publications, 2000.
4. **C. Venkatramaiah**, *Geotechnical Engineering*, Purna, 2003.


**Reference Books:**


1. **Oza,** *Soil Mechanics and Foundation Engineering,* Tata McGraw Hill Publications, 1969.
2. **Ramaiah and Chickanagappa,** *Soil Mechanics and Foundation Engineering*
3. **J. E. Bowles,** *Foundation Analysis and Design*
4. **Singh & Bharat,** *Soil Mechanics and Foundation Engineering,* Tata McGraw Hill Publications, 1976.
5. **S.K.Garg,** *Soil Mechanics and Foundation Engineering,* 1999.

# PCLEC504-IRRIGATION STRUCTURE AND WATER POWER ENGINEERING

**Objective**

The course aims at equipping the students with a basic understanding of the principles and operation of irrigation works and hydro electric systems which will help them design hydraulic structural systems and water power installations.

**UNIT – I**

Necessity for irrigation – Types of irrigation – Duty – Factors affecting duty – Importance – Expressions for duty – canal falls, location types, Comparison, design principles.

**UNIT – II**

Diversion head works – definition – Weirs – Barrages – Causes of failure – Khosla's theory – Bligh's theory – Factors governing the design of weir or a barrage – Flood banks – Protective works – Retrogression of levels.

**UNIT – III**

Storage works – Dams – Types – Problems – Methods of construction – Selection of a particular type of a dam – Selection of dam site – Earth dams – Causes of failure – Stability of slopes – Slope protection – Tank bunds – Minor and Major tanks – Design principles – gravity dam, forces acting on dams, modes of failure, high, low dams – functions & types of galleries.

**UNIT – IV**

Distribution Systems – Design and alignment of main canals – Practical selection of canals – Water logging – alkalinity of soils – Principles of design of drainage canals – Lining of canals – Works for regulation of water levels – Cross drainage and surplus works – Communication works.



**UNIT – V**

Canal Regulator, Canal Regulation works, Design of Canal Regulator – Water power – History and Development in India – General Principles – Classification – High, Low, Medium head installations – Components of Hydroelectric installations.

**TEXT BOOKS**


1. Irrigation and Water Power Engineering – Dr.B.C.Punmia & Lal Pandey, Lakshmi Publications,2005.
2. Irrigation Engineering and Hydraulic Structures – Santosh Kumar Garg, Khanna Publishers,2005.
3. Irrigation Engineering and Practices-A.M.Michael, Vikas Publishing House.


**REFERENCE BOOKS**


1. Irrigation Engineering – M.S.Misra.
2. Principle and Practice of Irrigation Engineering – S.K.Sharma.
3. Principles of Hydrology – Ward R.C. and Robinson, Tata McGraw Hill,1990.
4. Irrigation Water Resources & Water Power Engineering, Tata McGraw Hill,1995.

## PCLEC505-COMPUTER LAB-I

### PROGRAMMING IN 'C' LANGUAGE

Matrix operations - Addition, Subtraction, Transpose, Inversion of Matrices, Solution of Simultaneous Equations.

Simple problems involving shear, bending and torsional stresses calculation for beams.

Axial forces in Euler columns.

Design of singly and doubly reinforced rectangular, T and L beams.

Deflection calculations of beams for different loading conditions.

### USING ACAD SOFTWARE

Building layouts, landscaping, plans, elevations, sectional views etc., to scale.

Reinforcement detailing of one way and two way slabs with all boundary conditions.

Reinforcement detailing of longitudinal and cross sectional views of T and L beams.

Reinforcement details of column for all shapes with lapping provisions and anchorage details, Detailing of tension and compression steel members.

### REFERENCE BOOKS


1. Gottfried B.S., 'Programming with 'C' – DOS.
2. Ravichandran D., 'Programming in C'.
3. Balagurudsamy E., Programming in ANSI C'.
4. Yashwant Kanetkar, 'Let us C'.
5. ACAD-2005 Manuals.
6. Autodesk Architectural Desktop 3.3 – Manuals.
7. ACAD-2006 Manuals.




CLEC606

## PCLEC601 - CONSTRUCTION TECHNIQUES AND MANAGEMENT

### Objective

To make aware of the various techniques and practices on various stages of construction, elements of management, project planning and cost analysis.

### UNIT-I

Modern methods of construction on site, off site construction.

Prefabrication techniques-Principles-types-economy-joints and connections-Production, transport and erection of precast units.

### UNIT-II

Construction techniques-modern construction-industrial buildings systems for housing.

Construction machinery and equipment-excavation-bulldozers-graders-belt conveyors-hoisting and conveying cranes and hoists-wire ropes.

### UNIT-III

Elements of management-objective and functions of construction management-construction planning and organization-Types of organization-site organization and labour organization.

Organization of PWD and related departments-Functions of the officers-Method of executing work-type of contracts-contract agreements.

### UNIT-IV

Project planning, scheduling and control-bar and gantt charts-development of network-PERT networks-time estimates-frequency distribution-probability distribution-concept of slack-critical path.

**UNIT-V**

CPM Network-comparison with PERT –Activity time estimate events times-concept of floats-critical activities and critical path.

Cost analysis-direct and indirect cost-crash and normal duration-optimum cost –updating-resources smoothing-resources levelling.

**REFERENCE BOOKS**


1. Construction Management and Accounts, HARPAL SINGH, Tata Mc GRAW-Hill Publishing company Limited, New Delhi.
2. Construction Management and Accounts,B.L.gupta&AMIT GUPTA,Standard Distributers,1705B,Nai Sarak,New Delhi-6.
3. Construction Planning and Equipment, Dr.B.SATYANARAYANAN &S.C.SAXENA,standard publishers Distributors,1705B,NaiSarak NewDelhi-6




# PCLEC602 – REMOTE SENSING & GIS

**Objective**

To introduce the basic concepts and principles of various components or remote sensing. To provide an exposure to GIS and its practical applications in Civil Engineering.

**UNIT-I EMR AND ITS INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL**

Definition of Remote Sensing and its components Electromagnetic Spectrum - wavelength regions important for remote sensing - Wave theory, Particle theory, Stefan Boltzman and Wein's Displacement law - Atmospheric scattering, absorption - Atmospheric windows - Spectral signature concepts - Typical spectral reflective characteristics of water, vegetation, soil.

**UNIT-II PLATFORMS AND SENSORS**

Types of platforms - orbit types, Sun synchronous and Geosynchronous - Passive and Active sensors - Resolution concepts - Payload description of important Earth Resources and Meteorological satellites - Airborne and Space borne TIR and microwave sensors - Types of data products.

**UNIT-III IMAGE INTERPRETATION AND ANALYSIS**

Types of image interpretation - Visual interpretation keys Basic elements of image interpretation - Digital image processing - Pre-processing - Image enhancement techniques - Multispectral image classification - Supervised and unsupervised.

**UNIT-IV GEOGRAPHIC INFORMATION SYSTEM**

Introduction - Maps – Definitions - Map projections - Types of projections - Map analysis - GIS Definition - Basic components of GIS - Standard GIS softwares - Data type- Spatial and Non Spatial (attribute data) - Measurement scales - Data Base Management Systems (DBMS).

## UNIT-V DATA-ENTRY, STORAGE AND ANALYSIS

Data models: vector and raster - Data compression - Data input by digitization and scanning - Attribute data analysis and integrated data analysis - Modeling in GIS – Highway Alignment Studies - Land Information System.

## TEXTBOOKS


1. Lilles and. M Thomas, and Kiefer.W Ralph (2002). Remote Sensing and Image Interpretation. John Wiley and Sons, New York.
2. Anji Reddy, M. (2001). Textbook of Remote Sensing an Geographical Information Systems. Second edn. B Publications, Hyderabad.
3. C.P. Lo, Albert K.W. Yeung (2002) Concepts and Techniques of GIS, Prentice Hall of India Pvt. Ltd.
4. Peter A.Burrough, Rachael A. McDonnell (2000). Principle of GIS, Oxford Univ. Press.
5. Ian Heywood (2000). An Introduction to GIS, Pearson Education Asia.




# PCLEC603 - ENVIRONMENTAL ENGINEERING-II

### Objective

To make the students conversant with basic principles of Wastewater Engineering. This course covers details about collection, conveyance, characterization, treatment and disposal of domestic wastewater.

### UNIT-I Sewerage

Definitions-collections & conveyance of sewage-classification of sewerage system-quantity of sewage –fluctuation of sewage flow-Hydraulics of sewers-self cleansing velocity-shapes of sewers-Design of sewers-Design of storm water drains.

### UNIT-II Construction of Sewers

Materials for sewers-joints in sewers-laying & testing of sewers-ventilation-cleaning of sewers-sewers appurtenances-sewage –pumping-types of pumps-pumping station.

Principles and layout of House Drainage system-Sanitary fixtures and fittings-one pipe system and two pipe system-street connection.

### UNIT-III Quality and Disposal of sewage

Characteristics and composition of sewage-Analysis of sewage.

B.O.D and its significance-population equivalent objectives of sewage disposal-Methods of disposal-Discharge into bodies of water-self purification of natural waters.

### UNIT-IV Sewage Treatment

Unit Processes in Sewage Treatment-screens, Grit Chamber, Skimming tank-Settling tanks-septic tanks and disposal arrangements- Imhoff tank-Trickling filters-Intermittent sand filters.

**UNIT-V Advanced Treatment Techniques**

Activated sludge process-Primary & Secondary Treatment-Methods of aeration-oxidation pond-Aerated lagoons-Principle& Design of waste stabilization lagoons-objectives of sludge treatment-characteristic of sludge-sludge digestors-Methods of sludge disposal.

**REFERENCE BOOKS**


1. "Waste Disposal Engineering",by S.K.Garg.
2. "Waste water Engineering,collection,Treatment and disposal" by Metcalf,L.,& Eddy,H.P.




# PCLEC604 – COMPUTER AIDED DESIGN AND DRAWING PRACTICAL-II

**Objective**

The objective of this course is to enable the students in studying and understanding structural drawings by training them in doing the structural drawings using AutoCAD for various systems.

**Design of the following Irrigation Structures and Drawing the details using AutoCAD:**

i. Tank Sluice with Tower Head
ii. A tank surplus weir.
iii. A canal drop (Notch type )
iv. A canal regulator cum Bridge
v. Cross drainage work: Super passage only.

**Design of the following Water and Wastewater Treatment Units and Drawing the details using AutoCAD:**

i. River or canal intake
ii. Slow sand filter
iii. Rapid sand filter
iv. Clarifloculator
v. Septic tank
vi. Trickling Filter (Conventional type)
vii. Activate Sludge Process
viii. Layout of Water Supply System for a Town
ix. Layout of Sewerage System for a Town

## PCLEC605 – ENVIRONMENTAL ENGINEERING LAB

**Objective**

Students should be conversant with the experimental procedures for quantitative estimation of important environmental water quality parameters.

1. Determination of **Chloride** content for the given samples.
2. Determination of **Dissolved Oxygen** for the given samples.
3. Determination of **PH** for the given samples.
4. Determination of **Hardness** for the given samples.
5. Determination of **Total Solids (TDS, TSS)** for the given samples
6. Determination of **Turbidity** of various water and wastewater samples using Nephelo Turbidity meter.
7. Determination of **Electrical Conductivity** for the given samples.
8. Determination of **Sulphates** for the given samples.
9. Determination of **Chemical Oxygen Demand** for the given samples.
10. Determination of **Bio-Chemical Oxygen Demand** for the given samples.
11. Determination of **Residual Chlorine** for the given samples.
12. Determination of **Chlorine Demand** for the given samples.
13. Determination of **optimum dosage of coagulant** using Jar test apparatus.
14. Determination of **infiltration capacity of the soil** using Double ring infiltrometer.



## PCLEC701 – ELECTIVE-I

Refer Appendix – I

## PCLEC702 – ELECTIVE-II

Refer Appendix – I

## PCLEC703 – INTERIOR DESIGN AND PLANNING

**Objective**

This course introduces students to basic design principles, design theory and concept development. Emphasis will be placed on design process, problem solving, spatial organization, anthropometrics and universal design awareness. This course focuses on the fundamental concepts of residential dream room, kitchen and bath design. The students will be introduced to the concept of landscape designing, its importance in interior design.

**Unit – I**

Concept Development : In this design studio the students will be exposed to designing an interior for the first time. The emphasis will be placed on Design process: Analysis, Synthesis and Evaluation. Anthropometrics: data relating to the human body and the standard sizes of furniture and fixtures. Universal design awareness : Definition and principles of Universal design. Presentation techniques : Presentation drawings – use and necessity Difference between presentation and working drawings. Other forms of presentations – models, sketches, photographs etc.

**Unit – II**

Theory : Anthropometrics & Ergonomics - Importance of Furniture - Basic Terminology - Maintenance of Furniture

**Unit - III**

Design Project – 1 : Dream Room – Design, Concept of space, Sketch presentation, Finishes of space, Exercise. Design Project – 2 : Residential Bathroom – Type of bathrooms, Requirements, Design guidelines for a private bathroom, Change in the profile of a bathroom over the last 10 years, Exercise. Design Project – 3 : Kitchen Design – Types of Kitchen, Types of residential kitchens based on shape, Requirements of a residential kitchen, Design guidelines for a residential kitchen, Change in the use of a kitchen over the last 10 years, study of anthropometric data related to kitchens, Exercise.

**Unit - IV**

Paneling and partitions : Reasons for using paneling, paneling materials, method of construction, partition types, advantages, applications and method of construction.

False Ceiling : Areas of application, types of false ceilings, requirements of a good ceiling material. Staircases : Technical terms, requirements of a good stair, classification of stairs and hand rails and newel posts.

**Unit - V**

Fundamentals of Landscaping : Historical background, principles of Landscape design, Elements of design. Process of Landscape Design : Site analysis, Site assessment, developing an understanding of qualities of exterior spaces, Defining use areas. Types of landscaping : Exterior Landscaping, Interior landscaping, Transitional zones between interior and exteriors, Xeriscape.



**TUTORIALS**

1. Complete interior for a two bedroom residential apartment
2. A residential dwelling for a family of 6 member
3. Single bedroom flat
4. Bungalow type residence

**REFERENCE BOOKS**


1. Time Savers Standards for Interior Design and Space Planning - by Joseph De Chiara
2. Time Savers Standards for Building Types - by Joseph De Chiara
3. Landscape Architecture - by Simonds
4. Landscape Design : A practical Approach (5th Edition) - by Leroy G Hannebaum
5. Magazines and Periodicals

## PCLEC704 – COMPUTER LAB-II

**Objective**

To enable the students to be conversant with the use of advanced software packages like SAP, STAAD PRO, SAP 2000N, 3D Home Architecture, ERDAS and GIS Softwares.

- Use of Structural Engineering Software Packages like STAAD PRO, SAP 2000N, 3D Home Architecture to solve simple problems.
- Use of Quantity and Cost Estimation Software, PRIMAVERA, MS Project to solve simple problems.
- Use of Water Distribution Network Softwares, Watershed planning softwares.
- Use of Image processing softwares like ERDAS.
- Use of GIS related softwares.

**REFERENCES**


1. STAAD. PRO Manual
2. SAP 2000N Manual
3. ERDAS Manual
4. ARC VIEW Manual


## PCLEC705 – PROJECT

The Project work should be taken at the beginning of VI semester and the final report needs to be submitted by the students on a date fixed by the Head of the Department towards the end of the VII semester. There will be a viva-voce examination on the project.



## Appendix – I

**Objective**

Apart from core subjects, some specialized subjects are introduced in electives with a motive to specialize in a particular field having field applications.

### 1. URBAN AND RURAL PLANNING

**UNIT-I**

Development of urban planning-ancient and modern planning-industrial contribution to modern planning-stages, type of survey, collection of data-objects and principles of zoning-role of density and floor space index-planning of residential neighborhoods, Industrial areas, Parks and play grounds, schools-Master plan.

Urban renewal-Conservation, re-establishment and redevelopment-slum clearance.

**UNIT-II**

Development of new town-urban ,modern and satellite towns.

**UNIT-III**

Levels of planning review and preparation of regional and national planning development control-building byelaws-zoning-town and country planning acts-land acquisition acts.

**UNIT-IV**

Rural Planning-rural urban differences-Principles of rural planning-urbanisation-integral rural development programme.

**UNIT-V**

Rural housing-grouping of houses-Principles and design environmental sanitation-usage of low cost materials

## 2. DRAINAGE AND FLOOD CONTROL ENGINEERING

**UNIT-I**

Drainage-importance-land drainage by open channels economics of land drainage-flood ways-under drainage-action of the drains-locations of outlet-tile drains systems-drainability of soils-Highway drainage –airport drainage.

**UNIT-II**

Flood protection by channel improvements-roughness of channel-effect of cut-off pile dykes-tree retardation-revetment.

**UNIT-III**

Flood protection by levees.

**UNIT-IV**

Drainage of levees-maintenance of levees.

**UNIT-V**

Flood Protection by reservoirs-effect of natural reservoirs artificial reservoirs-flood routing-through rivers –through reservoirs.



## 3. INDUSTRIAL WASTEWATER TREATMENT AND DISPOSAL

**UNIT-I**

Effects of industrial waste on streams, land and air-Waste water treatment plants-water quality criteria-effluent standards-process modification-methods and material changes, house keeping etc to reduce waste discharge and strength of the waste-established recovery methods for by products within the plant operations.

**UNIT-II**

Characterisation of major industrial wastes-chemical manufacturing industries.

**UNIT-III**

Conventional methods of treatments and disposal of industrial waste water-separation of solids, Sedimentation, Ponding and filtration.

**UNIT-IV**

Removal of organic contents-biological treatment methods-stabilization ponds-activated sludge process-aerobic and anaerobic digestion-oxidation ditch.

**UNIT-V**

Physico Chemical Treatment Methods: Neutralization, coagulation, flocculation, absorption-Municipal wastes.

## 4. CIVIL ENGINEERING SYSTEMS ANALYSIS AND DESIGN

**Unit – I**

Introduction to systems engineering - four distinct phases of civil engineering projects: planning, design, construction and operation - design methodology - the notion of a system - function of the systems engineer mathematical decision - making models - statement of mathematical model - classification - methods of finding and optimal solution.

**Unit – II**

Linear programming - general form of an LP problem - solution techniques - graphical method - simplex method -solution procedures for minimization problem, maximization problem - excess and artificial variables degeneracy – duality.

Special forms of LP problems - transportation problems - obtaining initial feasible solution - assignment problems - integer programming.

**Unit – III**

Non-linear programming - introduction and scope - optimum - seeking strategies - gradient methods - direct search methods - unconstrained function - constrained functions.

**Unit – IV**

Dynamic programming - DP terminology - the principle of optimality allocation process.

**Unit – V**

Economic aspects of systems engineering - cash flow - interest and equivalence of time - compound interest factors - non-uniform series cash flows -depreciation and salvage value - project appraisal techniques.



**REFERENCE BOOKS:**


1. Civil engineering systems analysis and design - Alan A. Smith, Ernest Hinton and Roland W. Lewis, John Wiley & Sons, 1983 edition.
2. Civil engineering systems - Andrew B. Templeman, The Macmillan Press Ltd. 1982 edition.
3. Civil and Environmental Systems Engineering - Charles S. Revelle, E.
4. Earl Whitlach and Jeff. R. Wright, Pearson Prentice Hall Inc., New Jersey, 2004 edition.

## 5. MAINTENANCE AND REHABILITATION OF STRUCTURES

**Objective**

To get the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

### UNIT-I MAINTENANCE AND REPAIR STRATEGIES

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

### UNIT-II SERVICEABILITY AND DURABILITY OF CONCRETE

Quality assurance for concrete construction concrete properties – strength, permeability, thermal properties and cracking – Effects due to climate, temperature, chemicals, corrosion – design and construction errors – Effects of cover thickness and cracking.

### UNIT-III MATERIALS AND TECHNIQUES FOR REPAIR

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete. Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection

### UNIT-IV REPAIRS TO STRUCTURES

Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire leakage and marine exposure.



### UNIT-V DEMOLITION TECHNIQUES

Engineered demolition techniques for Dilapilated structure – Case studies.

### TEXT BOOKS


1. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, 1991.
2. R.T. Allen and S.C. Edwards, Repair of Concrete Structures, Blakie and Sons, UK, 1987.


### REFERENCE BOOKS


1. M.S.Shetty, Concrete Technology – Theory and Practice, S.Chand and Company, New Delhi, 1992.
2. Santhakumar, A.R., Training Course notes on Damage Assessment and repair in low Cost Housing, "RHDC-NBO" Anna University, July, 1992.
3. Raikar, R.N., Learning from failures – Deficiencies in Design, Construction and Service – R&D centre (SDCPL), Raikar Bhavan, Bombay, 1987.
4. N. Palaniappan, Estate Management, Anna Institute of Management, Chennai, 1992.
5. Lakshmipathy, M. etal. Lecture notes of Workshop on "Repairs and Rehabilitation of Structures", 29-30th October 1999.

## 6. ADVANCED HYDROLOGY

**UNIT-I**

Hydrologic cycle, space and time scale, classification of hydrologic models, Precipitation: mechanisms, types, spatial and temporal variation, use of I-D-F and D-A-D curves, design storm, probable maximum precipitation. Infiltration: Process description, measurement, modeling - Richard's equation, Green-Ampt model, SCS model.

**UNIT-II**

Evaporation: process description, modified Penman equation, evaporation control. Evapotranspiration: process description, measurement, Penman-Monteith Equation

**UNIT-III**

Drainage basin characteristics, stream networks laws. Stream flow: factors affecting base flow, Hydrograph analysis, UH theory, IUH. Watershed modeling: descrete and continuous simulation models.

**UNIT-IV**

Design flood estimation: PMF estimation, regional flood frequency analysis. Flood routing: reservoir routing, channel routing - Muskingum - Cunge method, Droughts: indicators, classification, forecasting and management.

**UNIT-V**

Hydrologic Design: uncertainty concepts, first order reliability method (FORM), risk based design of culverts, storm sewers, reservoirs. Basics of stochastic modeling of hydrologic processes.



**REFERENCE BOOKS :**


1. Applied Hydrology - Van TE Chow, David R. Maidurent and Latty W.Mays, Mc Graw Hill Book Company, 1988.
2. Stochastic Water Resources Technology- N.T.Kottegodq, Mc Millen Press, London,1980.

## 7. PRESTRESED CONCRETE

**UNIT-I**

Definition-Principle of pre stressing-Techniques of pre stressing-systems of pre stressing-Material of pre stressing-Allowable stresses-Losses in pre stressing.

**UNIT-II**

Design for flexure –slabs-pre-tensional beams-end block-cable layout-Design for shear and bond.

**UNIT-III**

Ultimate strength of prestressed concrete sections-Analysis and design of composite sections

**UNIT-IV**

Continuous beams-Layout of cables-cap cables-concordant cables-linear transformation.

**UNIT-V**

Miscellaneous structures-Poles-Piles-Columns-Ties-Circular pre stressing-Pipes-water tanks.

**TEXT BOOKS:**

1. Pre stressed Concrete-N.Krishna Raju
2. Fundamentals of Pre stressed Concrete-Sinha and Roy.
3. IS: 1343-1980-Code of practice concrete for Pre stressed Concrete.
4. Fundamentals of Pre stressed concrete V.Natarajan.

**REFERENCES:**

1. Design of Prestressed Concrete Structures-T.Y.Lin.
2. Prestressed Concrete-Vazirani and Chandola.



## 8. PREFABRICATED & INDUSTRIAL STRUCTURES

**UNIT-I**

Prefabricated structures: Advantages and disadvantages--general principles of prefabrication-suitable fields of application-economy of prefabrication-types of prefabrication.

**UNIT-II**

Designing of cross section for load carrying structures beams, slabs, columns and floor systems-structural behavior of precast units-handling and erection stresses-joints and connections-dimensions and detailing –production-transport and erection of precast units.

Construction techniques-modular construction-industrial building systems for housing.

**UNIT-III**

Industrial structures: General-specific requirements for industries like textiles, sugar, cement, chemical, etc,-site layout and external –facilities-standard.

Structural materials used-planning of multi storeyed buildings-shell and R.C frames-workshops and ware houses.

**UNIT-IV**

North lights and Monitors-chimneys, bunkers and silos.

**UNIT-V**

Functional requirements-layout planning for staircases-lifts-refuse disposals, utilization of waste materials-cranes and conveyor lifting-natural and artificial ventilation-fire protection.

**REFERENCES :**

1) Dunham-Planning Industrial Structures.
2) Ketchum-Industrial Buildings.
3) Water Henn-Building for Industry.

## 9. SERVICES IN HIGHRISE BUILDINGS

### Objective

High rise buildings are a pleasure to watch, but they are made a pleasure to live in only when the functional requirements are adequately provided through proper ventilation, sanitation and water supply in addition to safety measures during calamities like fire. This course covers the principles and practices to be followed in the provision of good service systems.

**UNIT – I**

Planning of building services – Important considerations – Floor loadings – Building cost – Material requirements.

**UNIT – II**

Water supply services – Collection and examination of water samples – Standards – Internal storage and distribution – Bulk water supply – Water treatment – Selection of pumps – Pump rooms and sump.

**UNIT – III**

Sanitation services – Sewerage collection and disposal – Storm water drains – Sewage disposal – Septic tanks – Solid waste disposal – Refuse disposal systems.

**UNIT – IV**

Lift and Escalators – Types – Selection – Codes and Rules – Structural provisions – Strength considerations – Pits and overheads – Safety precautions.

**UNIT – V**

Air-conditioning – Provisions in buildings – Systems.

Acoustics – Noise in buildings – Noise control – Materials – Methods.

Fire fighting services – Classification – Modes of fire – First-aid – Fighting installations – Fire extinguishers – Provisions in building from fire safety angle – Codes and rules.

**REFERENCE BOOKS :**


1. Services in Building complexes and High Rise buildings – V.K.Jain
2. Handbook of Utilities and Services in Buildings – Harris.




## 10. WATERSHED CONSERVATION AND MANAGEMENT

### Objective

To introduce the student to the concept of dynamic process of a watershed resulting in soil erosion.

2. At the completion of the course the students should be able to understand the appropriate Conservation measures to be adopted for remediation of watershed.

**UNIT – I WATERSHED**

Watershed - concept - classification - characteristics History of erosion - Erosion problems of India - Approaches to soil and water conservation.

**UNIT – II SOIL CONSERVATION**

Soil erosion - Types of soil erosion - Controlling soil erosion - Soil erosion by wind and water - soil conservation practices - vegetative practices - mechanical practices - erosion control in torrents and gullies - soil loss estimation models.

**UNIT – III WATER CONSERVATION**

Need for water conservation - water conservation measures - water harvesting - principle and techniques - flood water harvesting.

**UNIT – IV WATERSHED MANAGEMENT**

Watershed programmes - factors affecting watershed management - planning of watershed works - watershed water resources - watershed management practices.

**Unit – V MANAGEMENT PRACTICES**

Joint forest management - Grass land farming and' management - Range and pastures - Grazing practices Wasteland development.

## TEXT BOOKS


1. R. Suresh, Soil and Water Conservation Engineering, Standard Publishers distributors, New Delhi, 2000.
2. Ghanshyam Das, Hydrology and Soil conservation Engineering, Prentice-Hall India, New Delhi, 2000.
3. E.M. Tideman, Watershed Management - Guideline for Indian Conditions, Omega Scientific Publishers, New Delhi, 1996.




## 11. WATER RESOURCES SYSTEMS MANAGEMENT

**Objective**

To introduce the student to the concept of Mathematical approaches for managing the water resources system.

2. At the completion of the course the students should be able to apply an appropriate system approach to optimally operate a water resource system.

### UNIT – I SYSTEM APPROACH

Philosophy of modelling - Goals and Objectives - Basics of system analysis concept - scopes and steps in systems engineering.

### UNIT – II PHYSICAL AND SOCIO-ECONOMIC DATA

Collection, evaluation and processing - project appraisal public involvement, master Comprehensive and integrated planning of water resources project.

### UNIT – III LINEAR PROGRAMMING

Operation research - introduction - Problem Formulation graphical solution- Simplex method - Sensitivity analysis simple applications.

### UNIT – IV DYNAMIC PROGRAMMING

Optimality criteria Stage coach problem - Bellman's optimality criteria Problem formulation and Solution - simple applications

### UNIT – V SIMULATION

Basic principles - Methodology and Philosophy - Model development - input and outputs - Deterministic simulation - simple applications

## REFERENCE BOOKS


1. Chadurvedi M.C., Water resource Systems Planning and Management, Tata McGraw Hill inc., New Delhi, 1997 .
2. Goodman Aluvin s., Principles of water resources Planning, Prentice-Hall, India 1984.
3. Taha, H.A., Operation Research, McMillan Publication Co., New York, 1995.
4. Maass, A., Husfchimidt M.M., Dorfman R., Thomas H.A., Marglin S.A and Fair G.M., Design of Water Resources System, Hardward University Press, Cambridge, Mass., 1995.
5. Hall Warren, A. and John A. Dracup., Water Resources System Engineering, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1998.
6. Pillai K.M., Water Management and Planning, 1987.




# 12. SOLID WASTE AND HAZARDOUS WASTE MANAGEMENT

## UNIT – I

Introduction -goals and objectives of solid waste management - social aspects - health factors - generation of solid wastes - method of disposal as a factor dependent upon the quality of refuse.

## UNIT – II

Storage system - dust bins at the streets - collection facility - frequency of collection - method of transport.

Volume reduction - methods - compaction and baling - grinding of garbage -disposal methods.

Incinerators - design and operation - dust and air pollution problems – use disposal methods cost considerations.

## UNIT – III

Sanitary land fill method - site sclection machineries involved - cost consideration - environmental factors such as odours, flies and vectors and leachate and groundwater pollution - supervision - of the process operation.

## UNIT – IV

Recovery and Reuse - Ocean disposal - impact assessment - precautions required for the operation of the project - cost considerations.

## UNIT – V

Composting methods - recommended procedures impact assessment - cost consideration - disposal of industrial solid waste and hazardous refuse - precautions needs.

## REFERENCES


1. "Solid Waste Management", Haggerty, D.J., Von Nostrand Renihold company, New York, 1973.
2. "Municipal Refuse Disposal", NY American Public Works Association, 1966.
3. "Refuse Collection Practice", by American Public Works Association, 1967.
4. "Management of Solid Wastes in Developing Countries" - Flintoff, F., WHO Publication, 1972.




## 13. EARTH QUAKE ENGINEERING

### Objective

Earthquake Engineering has evinced a great deal or curiosity and interest in the wake or the recent Bhuj earthquake and more regions have been added to the list of seismic prone zones. This course deals with the Elements of Engineering Seismology and seismic design philosophy of structures.

### UNIT - I

Elements of Engineering Seismology: Earthquake occurrence in the world, causes of earthquake, plate tectonics, earthquake mechanism, seismic zoning map of India & its use. Earthquake Effects:- On, ground and soil liquefaction, buildings, structures, power plants, switch, yards, equipments & other lifeline structures. Secondary Effects- Land and rock slides, liquefaction, fires, tsunami~, floods, release of poisonous gases and radiation.

### UNIT-II

Earthquake Phenomenon:- focus, epicenter, seismic waves, magnitude, intensity, intensity scale and its correlation with ground acceleration, characteristics of strong ground motions and attenuation, earthquake recording instruments. Do's and Don'ts for protection of life and property

### UNIT-III

Introduction to theory of vibrations: Single degree un-damped and damped systems, elastic response to simple load functions & earthquake response spectra.

### UNIT-IV

Introduction to seismic Design of Structures: Philosophy and principles of earthquake resistance design- Strength and stiffness, ductility design and detailing (IS: 13920), design of energy absorbing devices, concepts of seismic base isolation and seismic active control. Building forms and architectural design concepts- Horizontal and vertical eccentricities due to mass and stiffness distribution, structural redundancy and setbacks.

**UNIT- V**

Equivalent static lateral earthquake force on building (IS: 1893): Equivalent static method Seismic coefficients-evaluation, estimation of fundamental time period, base shear and its distribution, Vulnerability Atlas.

Performance of building and Structures: Main causes of damage-Intensity of earth quake forces, lack of strength and integrity in buildings, quasi resonance, lack of ductility, lack of detailing. Lessons learnt from the past earthquakes:- case studies of important Indian earthquakes, major world earthquakes, earthquake catalogue, assessment of damage. Use of relevant codes.

**REFERENCE BOOKS:**


1. Anil k Chopra, Dynamics of Structures, McGraw-Hill International edition, 1998.
2. Clough, R.W. and Penzien, J., Dynamics of Structures, Second edition, McGraw-Hill International edition, 1993.
3. Arnold, C. and Reitherman, R., Building Configuration and Seismic Design, John Wiley & Sons, Inc., New York, 1982.
4. Dowrick, D.J., Earthquake Resistant Design, John Wiley & Sons, Chichester, u.K., 1977.
5. Paulay, T. and Priestley, MJ.N., Seismic Design of Reinforced and Masonry Buildings, John Wiley & Sons, Inc., New York, 1992.
6. Jaikrishna and Chandrasekaran, A.R Elements of Earthquake Engineering, Sarita Prakashan, Meerut, 1986.
7. National Earthquake Hazard Reduction Programme (NEHRP), Guidelines for seismic design of Buildings, Federal Emergency Management Agency - 312, Washinton DC, 2000.




**LIST OF IS CODES:**


1. IS 1893: 2002 - Criteria for Earthquake Design of Structures, Bureau of Indian Standards, New Delhi.
2. IS 4236: 1976 — Code of Practice for Earthquake Resistant Design and Construction of Buildings, Bureau of Indian Standards, New Delhi.
3. IS 13920: 1992 - Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces - Code of Practice, Bureau of Indian Standards, New Delhi.
4. Explanatory Handbook of Codes for Earthquake Engineering, Special Publication SP 22, Bureau of Indian Standards, New Delhi.
5. Explanatory Handbook on Indian Standard Code of Practice for Plain and Reinforced Concrete (IS 456:2000) Special Publication SP:24, Bureau of Indian Standards New Delhi.

## 14. HYDRO POWER ENGINEERING

**Objective**

This course aims at equipping the students with a basic understanding of the principles of Hydro Power plants and their safety requirements.

**UNIT- I**

Pipe flow: Pump - pipeline system, appurtenances, minor losses, water distribution network analysis and design. Transients in pipelines - causes, simple analysis, transient control using surge tanks, air chambers and control valves.

**UNIT- II**

Hydraulic Jump, Surge analysis, design of spillways, energy dissipaters, channel transitions. Dam break analysis.

**UNIT- III**

Planning , Analysis and design of different types of power plants - Chimneys, Induced draught and Natural draught cooling towers.

**UNIT- IV**

Turbo generator Foundation, Material handling structures, Intake towers, storage structures and other supporting structures for equipments.

**UNIT- V**

Introduction, Power plant structure, Layout of hydro power plants, Types of power houses, Underground power houses, Types of underground power plants, alignment and layout of cavities, Investigations and studies, Safety requirements, Sizing of a power house, Joints in hydropower plants.

**TEXT BOOKS :**


a. Roberson, J. A. Cassidy and Chaudhry, M. H., Hydraulic Engineering, Houghton Mifflin, Boston, 1988.

b. Stephenson, D., Pipeline design for Water Engineers, Elsevier Scientific Publishers, 1981.

c. R.K Sharma and T.K.Sharma, A Text Book of Water Power Engineering, S.Chand Publishers, 2003




## 13. ENVIRONMENTAL IMPACT ASSESSMENT

**Objective**

Students should be conversant with assessment of environmental impacts due to major infrastructure projects and their management

**UNIT-I INTRODUCTION**

Impact of Development on Environment and Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) - Objectives - Historical development - EIA Types - EIA in project cycle - capability and limitations Legal provisions on EIA.

**UNIT-II METHODOLOGIES**

Elements of EIA - Process screening, Methods of EIA Strengths, weaknesses and applicability - appropriate methodology.

**UNIT-III PREDICTION AND ASSESSMENT**

Socio Economic Impact - Prediction and Assessment of Impact on land, water, air and noise energy impact; Impact on flora and fauna; Mathematical models for prediction; Public participation - Reports - Exchange of Information - Post Audit - rapid EIA.

**UNIT-IV ENVIRONMENTAL MANAGEMENT PLAN**

Plan for mitigation of adverse impact on environment options for mitigation of impact on water, air and land, flora and fauna; Addressing the issues related to the Project Affected People - Environment management Plan.

## UNIT-V CASE STUDIES

EIA case studies on Roads, bridges, ports, Harbour, Airport, Dams, Irrigation projects, Power plants, Railways.

## TEXT BOOKS


1. Anjaneyulu, Y. Environmental Impact Assessment methodologies B.S. Publications, Hyderabad, 2002.
2. Canter, R.L. Environmental Impact Assessment, McGraw Hill Inc., New Delhi, 1996.
3. S.K. Shukla and P.R. Srivastava, Concepts in Environmental Impact Analysis, Common Wealth Publishers, New Delhi, 1992.


## REFERENCE BOOKS


1. John G. Rau and David C Hooten (Ed)., Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1990.
2. Environmental Assessment Source book, Vol. II and III. The World Bank, Washington, D.C., 1991.
3. Judith Pelts, Handbook of Environmental Impact Assessment Vol. I and II. Blackwell Science, New York, 1999.