NATIONAL INSTITUTE OF TECHNOLOGY

(Established by Ministry of Human Resources Development, Govt. Of India) Yupia, District Papum Pare, Arunachal Pradesh – 791112

Fax: 0360 – 2284972, E-mail: nitarunachal@gmail.com

Department of Civil Engineering

Professor Chandan Tilak Bhunia, Ph.D. [Engg.], FIETE, FIE (I), SMIEEE
DIRECTOR

FORWARD

To **achieve the target of being a global leader in the field of Technical Education**, there is some sort of time bound urgency **to work quickly, massively and strongly**, in respect of National Institute of Technology, Arunachal Pradesh being an **"Institute of National Importance"** (by an Act of Parliament) and being **established only in three years back in 2010**. I have therefore adopted a **'B' formula** as stated below to achieve the primary goal of producing world class visionary Engineers and Exceptionally brilliant Researchers and Innovators:

B- FORMULA

- **Best for Teaching**
- **Best for Research**
- **Best for Entrepreneurship & Innovation**
- **Best for Services to Society**

In implementing the **'B' formula** in letter and spirit, the framing of syllabi has been taken **as important legitimate parameter**. Therefore, extraordinary **efforts and dedications were directed for the last one year to frame** a syllabus **in a framework perhaps not available in the country as of today**.

Besides attention on **'B' formula** institute has given considerable importance to the major **faults of current Technical Education while framing the syllabus**. The major stumbling blocks in Technical Education today are:

I. The **present system is producing "Academic Engineers" rather than "Practical Engineers".**
II. The present system of education makes the **students to run after jobs rather than making them competent to create jobs.**
III. There is lack of **initiative to implement the reality of "Imagination is more important than knowledge".**

Taking due consideration of the findings made above, to my mind a credible syllabus has been framed in the institute in which the major innovations are introduction of :

I. **Man making and service to society oriented compulsory credit courses of NCC/NSS, values & ethics.**
II. **Compulsory audit course on Entrepreneurship for all branches.**
III. **Many add-on courses those are (non-credit courses) to be offered in vacation to enhance the employability of the students.**
IV. **Many audit courses like French, German, and Chinese to enhance the communication skill in global scale for the students.**
V. **Research and imagination building courses such as Research Paper Communication.**
VI. **Design Course as "Creative Design".**

Further, the syllabi have been framed **not to fit in a given structure as we believe structure is for syllabus and syllabus is not for structure. Therefore, as per requirement of the courses, the structure, the credit and the contact hours has been made available** in case to case.

The syllabus is also innovative as it includes:

I. **In addition to the list of text and reference books, a list of journals and magazines for giving students a flexible of open learning.**
II. **System of examination in each course as conventional examination, open book examination and online examination.**

Each course has been framed with definite objectives and learning outcomes. Syllabus has also identified the courses to be taught either of two models of teaching:

I. **J. C. Bose model of teaching where practice is the first theory.**
II. **S. N. Bose model of teaching where theory is the first practice.**

Besides the National Institute of Technology, Arunachal Pradesh has initiated a scheme of **simple and best teaching** in which for example:

I. **Instead of teaching RL, RC and RLC circuit separately, only RLC circuit will be taught and with given conditions on RLC circuits, RL and RC circuits will be derived and left to the students as interest building exercise.**
II. **Instead of teaching separately High Pass Filter, Band Pass Filter and Low Pass Filter etc.; one circuit will be taught to derive out other circuits, on conditions by the students.**

I am firmly confident that the framed syllabus will result in **incredible achievements, accelerated growth and pretty emphatic win over any other systems** and therefore **my students will not run after jobs rather jobs will run after my students.**

For the framing of this excellent piece of syllabus, **I like to congratulate all members of faculty, Deans and HODs in no other terms but "Sabash!".**

Prof. Dr. C.T. Bhunia
Director, NIT, (A.P.)

Civil engineering is mother engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including works like roads, bridges, canals, dams, and buildings. Civil engineering is one of the oldest engineering disciplines. It is traditionally broken into several sub-disciplines including environmental engineering, geotechnical engineering, geophysics, structural engineering, transportation engineering, earth science, municipal or urban engineering, water resources engineering, materials engineering, offshore engineering, quantity surveying, coastal engineering, surveying, and construction engineering. Civil Engineering persuades through all the levels in the public sector - from municipal administration through to national government, and in the private sector from individual homeowners through to international companies. The Department of Civil Engineering at the National Institute of Technology- Arunachal Pradesh, was formed in 2013 with an annual intake of 30 students.

1. Surveying Lab
2. Civil Engineering Material Testing Lab
3. Environmental Engineering Lab
4. Geotechnical Engineering Lab
5. Transportation Engineering Lab
6. Structural Engineering Lab
7. Geology Lab

The objective of the department is to prepare students competent and qualified enough to take up any Civil Engineering challenges and to be able to pursue advanced studies and research in Civil Engineering on a competitive global perspective. The mission is culmination of departmental team effort to meet the goals of (full) Arunachal Pradesh, North Eastern region and the Nation at large.

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Department of Civil Engineering

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First Semester:

Subject Code	Subject	P	T	L	Credit
MAS -101	Engineering Mathematics - I	0	1	3	4
CHY – 101	Engineering Chemistry	3	0	3	4
PHY – 101	Engineering Physics - I	2	0	3	4
BIO – 101	Life Science	0	0	3	3
ME – 101	Engineering Mechanics	0	0	3	3
ME – 102	Workshop Practice-I	3	0	0	2
ME – 103	Engineering Drawing I	3	0	0	2
EEE – 101	Basic Electrical & Electronics Engineering	2	0	3	4
HSS – 101	Communication Skill	2	0	0	1
HSS – 102	NSS / NCC	2	0	0	1
HSS – 103	Foreign Language (French / Korean) (Audit)	2	0	0	1
		19	1	18	29

Second Semester:

Subject Code	Subject	P	T	L	Credit
MAS -201	Engineering Mathematics - II	0	1	3	4
ME – 201	Basic elements of Mechanical Engineering	0	0	3	3
CE- 201	Basic Civil Engineering	0	0	3	2
ME-202	Workshop Practice-II	3	0	0	2
CSE - 201	Programming in C	8	0	0	4
CHY – 201	Environmental Science	0	0	3	3
PHY - 201	Engineering Physics - II	2	0	3	4
ECE – 201	Digital Electronics & Logic Design	2	0	3	4
HSS – 201	History of Science & Technology	0	0	3	3
HSS – 202	Foreign Language (German / Chinese) (Audit)	2	0	0	0
		20	1	18	29

Third Semester:

Subject Code	Subject	Model	P	T	L	Credit
MAS -311	Mathematics III	S.N. Bose	0	1	3	4
CE-301	Building Construction Technology and material testing	J.C. Bose	3	0	3	4
CE-302	Surveying-I	J.C. Bose	3	0	3	5
CE-303	Structural Mechanics	J. C. Bose	2	1	3	4
CE-304	Water Supply and Sanitation Engineering	S.N. Bose	0	1	3	4
CE-305	Fluid Mechanics	J.C. Bose	3	0	3	4
HSS-301	Behavioral Science	S. N. Bose	0	0	2	2
			11	3	20	27

Fourth Semester

Subject Code	Subject	Model	P	T	L	Credit
MAS-401	Stochastic Process	S.N Bose	0	1	3	4
CE-401	Applied Hydraulic Engineering	S.N Bose	0	1	3	4
CE-402	Geotechnical Engineering-I	J.C. Bose	2	0	3	4
CE-403	Civil Engineering Drawing	J.C. Bose	2	0	0	2
CE-404	Structural Analysis-I	S.N Bose	2	1	3	4
CE 405	Engineering Geology	J.C. Bose	2	0	3	4
CE-406	Concrete Technology	J.C. Bose	2	0	3	4
HSS-401	Entrepreneurship and innovation	S.N. Bose	0	0	3	3
			12	2	21	29

Fifth Semester

Subject Code	Subject	Model	P	T	L	Credit
HSS-501	Industrial Engineering and management	S.N. Bose	0	0	3	3
CE-501	Design of RC Structures	S.N. Bose	0	1	3	4
CE-502	Surveying-II	J.C. Bose	3	0	3	4
CE-503	Transportation Engineering-I	J.C. Bose	3	0	3	4
CE-504	Environmental Engineering-I	J. C. Bose	3	0	3	4
CE-505	Structural Analysis-II	S.N. Bose	0	1	3	4
CE-506	Engineering Hydrology	S.N. Bose	0	1	3	4
			12	3	21	27

Sixth Semester

Subject Code	Subject	Model	P	T	L	Credit
CE 601	Geotechnical Engineering-II	J.C. Bose	3	0	3	4
CE 602	Design of Structures	S.N. Bose	0	1	3	4
CE 603	Irrigation and Hydraulic Structure	S.N. Bose	0	1	3	4
CE 604	Transportation Engineering-II	J.C. Bose	3	0	3	4
CE 605	Design of steel Structures	S.N. Bose	0	1	3	4
MAS 602	Numerical Methods in Engineering	J.C. Bose	3	0	3	4
HSS-601	Engineering Ethics and IPR	S.N Bose	0	0	3	3
HSS- 602	Disaster Management	S.N. Bose	0	0	2	2
			9	3	23	29

Seventh Semester

Subject Code	Subject	Model	P	T	L	Credit
HSS 701	Mass Communication for Technology	S.N. Bose	0	0	3	3
XXX-701	Research paper Communication	J.C. Bose	2	0	0	1
CE 701	Construction Planning and Management	S.N. Bose	0	0	3	3
CE 702	Environmental Engineering-II	S.N. Bose	0	1	3	4
CE 703	Numerical Analysis and Computer Applications in Civil Engineering	J.C. Bose	3	0	0	3
CE 704	Estimation and Valuation	J.C. Bose	3	0	3	4
CE-71X	Elective I	S.N. Bose	0	1	3	4
CE-72X	Elective II	S.N. Bose	0	1	3	4
			8	2	18	26

Eight Semester

Subject Code	Subject	Model	P	T	L	Credit
XXX-801	Industrial Training	J.C. Bose	2	0	0	2
XXX 802	Project works	J.C. Bose	12	0	0	8
XXX 803	Seminar	J.C. Bose	2	0	0	2
XXX 804	Grand Viva	J.C. Bose	4	0	0	4
			20	0	0	16

Teaching Methodology:

All subject papers in each of the semester require to be divided into two groups; one group will be taught in a model named "JC Bose model" where practice is first theory. The other model will be "SN Bose model" which is the conventional mode of teaching with theory as the first practice.

Semester	J C Bose Model	S N Bose Model
1st	Engineering Drawing-I Workshop Practice. Basic Electrical & Electronics Engineering. NSS/ NCC. Engineering Mathematics- I.	Chemistry. Physics-I. Life Science. Communication Skill.
2nd	Engineering Mechanics Environmental Science Digital Electronics & Logic Design History of Science & Technology Basic Civil Engineering Engineering Mathematics- II. Basic elements of Mechanical Engineering. Physics-II	Programming in C
3rd	Structural Mechanics Surveying-I Fluid Mechanics Civil Engineering materials & Testing	Mathematics-III Water Supply and Sanitation Engineering Behavioral Science
4th	Civil Engineering Drawing Concrete Technology Building Const Technology Engineering Geology Geotechnical Engineering-I	Entrepreneurship and innovation Stochastic Process Structural Analysis-I
5th	Surveying-II Transportation Engineering-I Environmental Engineering-I	Industrial management Structural Analysis-II Engineering Hydrology Design of RCC Structures

Semester	J C Bose Model	S N Bose Model
6th	Geotechnical Engineering-II Transportation Engineering-II Numerical Methods in Engineering	Engineering Ethics and IPR Disaster Management Design of Steel Structures Design of Structures Irrigation and Hydraulic Structure
7th	Numerical Analysis and Computer application in Civil Engineering Estimation and Valuation Research paper Communication	Mass Communication and Technology Environmental Engineering-II Construction planning and management Elective-I Elective-II
8th		Industrial Training Project -I Seminar Grand viva

Examination System:

Semester	Conventional	Open Book	Online
1st	Chemistry-I. Life Science. Graphic Communication Communication Skill. Engineering Mechanics Engineering Drawing-I Workshop Practice-I NSS/ NCC Foreign Language (French/ Korean) Engineering Mathematics- I. Physics-I. Basic Electrical & Electronics Engineering	.	

2nd	Engineering Mathematics- II. Environmental Science Physics-II Basic Civil Engineering Workshop Practice-II Digital Electronics & Logic Design Basic elements of Mechanical Engineering. History of Science & Technology Foreign Language (German/ Chinese)	Programming in C	
3rd	Structural Mechanics Surveying-I Fluid Mechanics Mathematics-III Water Supply and Sanitation Engineering Behavioral Science Civil Engineering materials & Testing		
4th	Civil Engineering Drawing Concrete Technology Building Const Technology Engineering Geology Geotechnical Engineering-I Entrepreneurship and innovation Stochastic Process Structural Analysis-I		
5th	Surveying-II Transportation Engineering-I Environmental Engineering-I Industrial management Structural Analysis-II Engineering Hydrology Design of RCC Structures		
6th	Geotechnical Engineering-II Transportation Engineering-II Numerical methods in Engineering Engineering Ethics and IPR		
	Disaster Management		
	Design of Steel Structures		
	Design of Structures		
	Irrigation and Hydraulic Structure		

7th	Environmental Engineering-II Estimation and Valuation Mass Communication and Technology Research paper Communication Construction planning and management Irrigation Engineering and Hydrology Elective-I Elective-II		
8th	Industrial Training Project Works Seminar Grand Viva		

SUMMARY TABLE OF DIFFERENT COURSES:

Semester	Credit Course	I-Course	Audit Course	Add-on course
1st	Engineering Mathematics-I Engineering Chemistry Life Science. Engineering Mechanics Communication Skill. Engineering Physics-I. Basic Electrical & Electronics Engg Workshop Practice – I Engineering Drawing - I	NIL	NSS/ NCC Foreign Language (French/ Korean)	NIL
2nd	Engineering Mathematics- II. Environmental Science Engineering Physics-II Basic Civil Engineering Workshop Practice-II Digital Electronics & Logic Design Basic elements of Mechanical Engineering. History of Science & Technology Programming in C	NIL	Foreign Language (French/ Korean)	NIL

Semester	Credit Course	I-Course	Audit Course	Add-on course
3rd	Structural Mechanics Surveying-I Fluid Mechanics Mathematics-III Water Supply and Sanitation Engineering Behavioral Science Civil Engineering materials & Testing	NIL	NIL	NIL
4th	Civil Engineering Drawing Concrete Technology Building Const Technology Engineering Geology Geotechnical Engineering-I Entrepreneurship and innovation Stochastic Process Structural Analysis-I	NIL	NIL	NIL
5th	Surveying-II Transportation Engineering-I Environmental Engineering-I Industrial management Structural Analysis-II Engineering Hydrology Design of RCC Structures	NIL	NIL	NIL
6th	Geotechnical Engineering-II Transportation Engineering-II Numerical methods in Engineering Engineering Ethics and IPR Disaster Management Design of Steel Structures Design of Structures Irrigation and Hydraulic Structure	NIL	NIL	NIL

Semester	Credit Course	I-Course	Audit Course	Add-on course
7th	Estimation and Valuation Mass Communication for Technology Research paper Communication Construction planning and management Environmental Engineering-II Computer application In Civil Engineering Elective I Elective II	NIL	NIL	NIL
8th	Industrial Training Project Works Seminar Grand Viva	NIL	NIL	NIL

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Department of Civil Engineering

First Semester

FIRST SEMESTER
(COMMON TO ALL BRANCHES)

Subject Code	Subject	P	T	L	Credit
MAS -101	Engineering Mathematics - I	0	1	3	4
CHY – 101	Engineering Chemistry	3	0	3	4
PHY – 101	Engineering Physics - I	2	0	3	4
BIO – 101	Life Science	0	0	3	3
ME – 101	Engineering Mechanics	0	0	3	3
ME – 102	Workshop Practice-I	3	0	0	2
ME – 103	Engineering Drawing I	3	0	0	2
EEE – 101	Basic Electrical & Electronics Engineering	2	0	3	4
HSS – 101	Communication Skill	2	0	0	1
HSS – 102	NSS / NCC	2	0	0	1
HSS – 103	Foreign Language (French / Korean) (Audit)	2	0	0	1
		19	1	18	29

Name of the Module: Engineering Mathematics-I
Module Code: MAS 101
Semester: 1st
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

Providing high quality education in pure and applied mathematics in order to prepare students for graduate studies or professional careers in mathematical sciences and related fields.
Imparting theoretical knowledge and to develop computing skill to the students in the area of Science and Technology.
Providing teaching and learning to make the students competent to their calculating ability, logical ability and decision making ability.
Giving students theoretical knowledge of Calculus, Algebra and their practical applications in the various fields of Science and Engineering.
Apply their knowledge in modern industry or teaching, or secure acceptance in high-quality graduate programs in mathematics and other fields such as the field of quantitative/mathematical finance, mathematical computing, statistics and actuarial science.

Learning Outcomes:

Upon completion of the subject:

Students will become more confident about their computing skill, logical skill and decision making skill.

Students are so trained that they will find various applications of Calculus and Algebra in the practical fields science and engineering.

Students will become more competent to analyze mathematical and statistical problems, precisely define the key terms, and draw clear and reasonable conclusions.

Student will be able to use mathematical and statistical techniques to solve well defined problems and present their mathematical work, both in oral and written format, to various audiences (students, mathematicians, and non-mathematicians).

Student will be able to understand, and construct correct mathematical and statistical proofs and use the library and electronic data-bases to locate information on mathematical problems.

Student will be able to explain the importance of mathematics and its techniques to solve real life problems and provide the limitations of such techniques and the validity of the results.

Student will be able to propose new mathematical and statistical questions and suggest possible software packages and/or computer programming to find solutions to these questions.

Student will be able to continue to acquire mathematical and statistical knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in mathematics.

C. **Subject Matter:**

Unit I:

Matrices: Introduction to Matrices and their basic properties, Transpose of a matrix, verification of the properties of Transposes, Symmetric and Skew symmetric matrices and their properties. Determinant of a square matrix, Minors and Co-factors, Laplace‟s method of expansion of a determinant, Product of determinants, Adjoint of a determinant, Jacobi‟s theorem on adjoint determinant. Singular and non-Singular matrices, Adjoint of a matrix, Inverse of a non-singular matrix and its properties, Orthogonal matrix and its properties, Trace of a matrix, Rank of a matrix and its determination using elementary row and column operations, Solution of simultaneous linear equations by matrix inversion method, Eigen values and Eigen vectors of a square matrix (of order 2 or 3), Eigen values, Caley-Hamilton theorem and its applications, Diagonalisation of a square matrix with real and distinct eigen values (up to 3rd order).

Unit II:

Successive Differentiation: Idea of higher order derivatives of a function of a single variable, Leibnitz‟s theorem (statement only) and its applications, Implicit functions and derivatives.

Complex Analysis: Functions of a complex variable, Limit, continuity and differentiability, Cauchy-Riemann equations, Analytic functions. Harmonic functions and conjugate harmonic functions.

Unit III:

Mean Value Theorems & Expansion of Functions: Rolle‟s theorem (statement only) and its applications, Mean Value theorems – Lagrange & Cauchy (statement only) and their applications, Taylor‟s theorem with Lagrange‟s and Cauchy‟s form of remainders (statement only) and behaviour of remainders, Expansions of functions by Taylor‟s and Maclaurin‟s theorem, Maclaurin‟s infinite series expansion of the functions.

Unit IV:

Integrals: Double and triple integrals and evaluation of plane areas, volume and surface areas. Change of order of integration.
Reduction formulae: Reduction formulae both for indefinite and definite integrals.

D. Teaching/ Learning/ Practice Pattern:

Teaching:	70%
Learning:	30%
Practice:	0%

E. Examination Pattern:

1.Theoretical Examination

F.ReadingList:

Books:

1. H. K. Dass and Er Rajnish Verma “Higher Engineering Mathematics”, S. Chand & Co., 2011, New Delhi.
2. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 42th Edition, 2012, New Delhi
3. Pal & Das ,” Engineering Mathematics, Vol. I”, U.N. Dhar, Fifth Edition, 2011.
4. John Bird ,” Higher Engineering Mathematics”,4th Edition, 1st Indian Reprint 2006, Elsevier

5. L. Rade and B. Westergren," Mathematics Handbook: for Science and Engineering", (5th edition,Indian Edition 2009, Springer)
6. M. J. Strauss, G. L. Bradley and K. L. Smith ," Calculus", 3rd Edition, 1st Indian Edition 2007, Pearson Education)
7. S. S. Sastry ," Engineering Mathematics", Vol I and Vol II, PHI Learning, 4th Edition, 2009.
8. Ravish R Singh and Mukul Bhatt, "Engineering Mathematics", Mc Graw Hill, 2013.
9. Das & Mukherjee, "Differential Calculus", U.N. Dhar & Sons Private Ltd, 51st Edition, 2010.
10. Das & Mukherjee, "Integral Calculus", U.N. Dhar & Sons Private Ltd, 54th Edition, 2010

Magazines:

1. Current Science (Indian Academy of Science)
2. The Mathematics Student (Math Student) (Indian Mathematical Society)
3. Mathematical Spectrum(The University of Sheffield)
4. Mathematics Magazine (Mathematical Association of America)
5. +Plus magazine (University of Cambridge)
6. Ganithavahini (Ramanujan Mathematical Society)
7. Mathematics Today, London Metropolitan University.

Journals:

1. Journal of Engineering Mathematics, Springer.
2. Journal of Computational and Applied Mathematics, London Metropolitan University.
3. The Journal of Indian academy of Sciences.
4. Bulletin of Pure and Applied Sciences.

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Department of Civil Engineering

Name of the Module: Engineering Chemistry
Module Code: CHY 101
Semester: 1st
Credit Value: 1 [P=3, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Imparting theoretical and practical knowledge to the students in the area of Chemistry.
2. Providing teaching and learning to make students acquainting with advanced science and technology in Chemistry.
3. Injecting the future scope and the research direction in the discipline of Chemistry.
4. Making students competent to the research and development in advanced science and technology in Chemistry.

B. Learning Outcomes:

Upon completion of the subject:

1. Students will be adequately trained to become Chemists, Scientist and Chemical Engineers.
2. Students will be skilled both theoretically and practically to do operation, control and maintenance works in Chemistry and Chemical Engineering.
3. Students will be substantially prepared to take up prospective research assignments.

C. Subjects Matter:

Unit-I

Chemical Thermodynamics: Concept of Thermodynamic System: diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property Introduction to first law of thermodynamics: different statements, mathematical form; internal energy: physical significance, mathematical expression (ideal and real gas), Enthalpy: physical significance, mathematical expression. Cp and Cv: definition and relation; adiabatic changes; reversible and irreversible processes; application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lovoisier and Laplace, Hess's law of constant heat summation, Kirchoff's law. Second law thermodynamics; Joule Thomson and throttling processes; inversion temperature; evaluation of entropy: characteristics and expression, entropy change in irreversible process, entropy change for irreversible isothermal expression of an ideal gas, entropy change of a mixture of gases.

Work function and free energy: physical significance, mathematical expression for ideal and real gases obeying Vander Waals' equation, Gibbs Helmholtz equation.
Condition of spontaneity and equilibrium

Unit-II

Electrochemistry Conductance: Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration. Kohlrausch‟s law of independent migration of ions, transport numbers and hydration of ions. Conductometric titrations: SA vs SB & SA vs WB; precipitation titration KCl vs AgNO3.
Electrochemical cell: Cell EMF and its Thermodynamic significance, single electrode potentials and its applications; hydrogen half cell, quinhydrone half cell and calomel half cell. Storage cell, fuel cell. Application of EMF measurement. **Reaction Dynamics:** Reaction laws: rate and order; molecularity; zero, first and second order kinetics. Arrhenius equation. Mechanism and theories of reaction rates (Transition state theory, Collision theory).Catalysis: Homogeneous catalysis and heterogeneous catalysis.

Unit-III

Structure and reactivity of Organic molecule: Electronegativity, electron affinity, hybridization, Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals. Brief study of substitution, eliminations and addition reactions. **Instrumental Methods of Analysis:** Introduction to instrumental methods such as IR, UV, VIS, NMR and Mass spectrometry.

Unit-IV

Polymerization: Concepts, classifications and industrial applications. Polymerization processes (addition and condensation polymerization), degree of polymerization, Copolymerization,stereo-regularity of polymer, crystallinity and amorphicity of polymer. Preparation, structure and use of some common polymers: plastic (PE, PP, PVC, bakelite), rubber (natural rubber, SBR, NBR), fibre(nylon 6.6, polyester). Conducting and semi-conducting polymers.
Industrial Chemistry: Solid, liquid and gases fuels; constituents of coal, carbonization of coal. Coal analysis: Proximate and ultimate analysis. Classification of coal, petroleum (LPG, CNG), gasoline, octane number, aviation fuel, diesel, cetane number. Natural gas, water gas, Coal gas, bio gas. Bio-diesel.

D. List of Experiments:

Acid –base Titration :(Estimation of commercial caustic soda)
Red-ox Titration: (Estimation of iron using permanganometry)
Complexometric Titration: (Estimation of hardness of water using EDTA titration)
Chemical Kinetics :(Determination of relative rates of reaction of iodide with hydrogen peroxide at room temperature (clock reaction).
Heterogeneous equilibrium (Determination of partition coefficient of acetic acid between n-butanol and water)
Viscosity of solutions (determination of percentage composition of sugar solution from viscosity)
Conductometric titration for

Determination of the strength of a given HCl solution by titration against a standard NaOH solution.

Analysis of a mixture of strong and weak acid by strong base.

Preparation of a homo-polymer by free radical initiated chain polymerization and determination of its molecular weight by viscosity average molecular weight method.
pH- metric titration for determination of strength of a given HCl solution against a standard NaOH.

E. Teaching/Learning/Practice Pattern:

Teaching:	40%
Learning:	10%
Practice:	50%

F. Examination Pattern:

1. Theoretical Examination
2. Practical Examination

G. Reading List:

Books:

1. Rakshit P. C., “Physical Chemistry”
2. Dutta R. L. ,”Inorganic Chemistry”
3. Levine.” Physical Chemistry”
4. Finar I. L., “Organic Chemistry.”
5. Glasston Samuel, “ Text Book of Physical Chemistry”
6. Lee J. D., “Concise Inorganic Chemistry”
7. Sykes,P., “Guidebook to Mechanism in Org.Chems”, Orient Longman.
8. Chakraborty D.K. , “Solid State Chemistry”, New Age International.

9. Gupta M.C. , "Atomic & Molecular Spectroscopy", New Age.
10. Gowarikar V.R. , "Polymer Science", New Age.
11. Mishra G.S. , "Introductory Polymer Chemistry", New Age.
12. Nasipuri D. ,"Stereochemistry of Organic Compounds", New Age.
13. Kalsi P.S, "Spectroscopy of Organic Compounds", New Age.
14. Kalsi P.S. ,"Organic Reactions & their Mechanism", New Age.
15. Maity and Maity ," Engingeering Chemistry",U & N Dhar Publisher.
16. Ray, Das, Biswas, "Engingeering Chemistry", New Central Book Agency.

Magazine:

1. Chemistry Today
2. Chemistry World
3 .Chemical Engineering Magazine
4. Chemical Week

Journals:

1. Journal of Organic Chemistry, ACS Publications
2. Journal of American Chemical Society, ACS Publications
3. Angew Chem, Wiley Interscience
4. Chemical Communication, RSC Publications
5. Journal of Physical Chemistry, ACS Publication
6. Journal of Materials Chemistry, RSC Publication

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Department of Civil Engineering

Name of the Module: Engineering Physics - I
Module Code: PHY 101
Semester: 1st
Credit Value: 4 [P=2, T=0, L= 3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:
1.Imparting theoretical & practical knowledge to the students in the area of Engineering Physics.
2.Providing teaching and learning to make students acquainting with modern state-of-art of Engineering.
3.Injecting the future scope and the research direction in the field of Physics with specific specialization.
4.Making students competent to design & development of Engineering Physics.

B. Learning Outcomes:

Upon completion of the subject:

1.Students will be adequately trained to become Engineers.
2.Students will be substantially prepared to take up prospective research assignments.

C. Subject Matter:

UNIT I

Potential and intensity and their relation - gravitational and electrostatic examples, States of equilibrium, Work and Energy, Conservation of energy.

Surface tension, excess pressure inside a soap bubble, capillary rise- Jurin's law. Bernoulli's theorem and its applications.

Simple Harmonic Motion, Damped Vibration, Forced Vibration

UNIT II

Macroscopic and microscopic description, Thermal equilibrium, Zeroth law of thermodynamics, Concept of international practical temperture scale, Heat and Work, First law of thermodymamics and some applications, Reversible and irreversible processes, Carnot cycle, Second law of thermodymamics, Concept of entropy, Thermodynamic relations.

Electric potential and intensity, Flux of electric field, Gauss's law and its application to problems with spherical and cylindrical symmetry, Capacitance- parallel plate and spherical condensers. Biot-Savart law and Ampere's law in magnetostatics, Calculation of magnetic field in simple situations like (i) straight wire (ii) circular wire (at a point on the symmetry axis) and (iii) Solenoid, Time-varying fields, Faraday's law of electromagnetic induction, Self and mutual inductance.

UNIT III

Lens system (combination of thin lenses), eyepieces, microscope, Nature of light waves, Interference of light waves, Young's experiment, Spatial and temporal coherence, Fresnel bi-prism, Interference in thin film, Newton's rings, Measurement of film thickness and wavelength, Diffraction of light waves, Huygen's construction, Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction due to single slit and plane diffraction grating, Polarisation of light waves, Polarisation by reflection, Brewster's law, Double refraction- ordinary extraordinary rays, Polaroid.

UNIT IV

Elementary Solid State Physics: Elementary ideas of crystal structure : lattice, basis, UNIT cell, fundamental types of lattices-Bravis lattice, simple cubic, f.c.c and b.c.c lattices, Miller indices and miller planes, Co-ordination number and atomic packing factor, X-rays: Origin of characteristics and continuous X-ray, Bragg‟s law (no derivation), determination of lattice constant

Energy levels of the hydrogen atom and the Bohr atom model, X-ray spectra, X-ray diffraction, Bragg's law, Compton effect. De-Broglie waves, Particle diffraction, Uncertainty principle and its application.

List of Practical: (Minimum six experiments are required to be performed)

1. Determination of Galvanometer resistance by half - deflection method.
2. Determination of Galvanometer resistance by Thomson's method.
3. To find high resistance by Galvanometer deflection method.
4. To measure mechanical equivalent of heat, J by electrical method (Joule's) using copper calorimeter (radiation correction to be done).
5. To compare to low resistance by drop of potential method.
6. To determine resistance per unit length of wire by using Carey Foster bridge.
7. To estimate strength of a current by using copper voltmeter.
   a) To compare the EMF's of two cells by using a potentiometer
   b) To measure current by using a potentiometer

9. To measure the horizontal components of earth's magnetic field intensity using deflection and vibrating magnetometers.

10. Determination of co efficient of linear expansion by optical lever method.

11. Determination thermal conductivity of metal by Searle's method.

12. To determine co-efficient of viscosity by Capillary flow method.

13 .Determination of Young's modulus by Flexure method.

14. To draw mutual and anode characteristics of triode and hence too fine Rp, μ, and gm

15. To draw the transistor characteristics (NPN/PNP) in the given configuration and hence to find hi, hf

16. Determination of refractive index of the material of the glass prism by prism spectrometer (for at least two ?s)

17. Study of collisions in one dimension using a linear air track

18. Use of an air track for obtaining potential energy curves for magnetic interactions.

19. Study of oscillations under potential wells of various shapes using an air track.

20. Experiments on diffraction in single slit, double slit and plane grating using He- Ne laser a) To find the wavelength of a monochromatic light by single slit. b) To find slit separation of a double slit. c) To find number of rulings per cm of a plane grating

21. To find the wavelength of a monochromatic light by Newton rings.

22. Fabry-Perot interferometry: To find out separation of wavelength of sodium D1 & D2 lines.

23. Determination of thermal conductivity of a good conductor by searle's method.

24. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.

25. Determination the dispersive power of a given prism.

26. Determination of wavelength of light by Newton's ring method.

27. Determination of Young Modulus by flexure method and calculation of bending moment and shear force at a point on the beam.

28. To study the diffraction pattern of a crossed grating using laser source and hence to determine the grating constant.

29. To calibrate a Polarimeter and hence to determine the concentration and the specific rotation of sugar solution.

30. To determine the wavelength of a monochromatic light by Fresnel‟s Biprism or Double slit.

31. To determine the wavelength of monochromatic light by Fabry Perot interferometer.

F. Teaching/ Learning/ Practice Pattern:

Teaching :	40%
Learning :	10%
Practice :	50%

(Teacher is to divide components for T/R/P)

G. Examination Pattern:

1.Theoretical Examination: Open book and on line.
2.Practical Examination: Conducting Experiment and Viva-Voce.

Reading List:

Books:

1. Murrat R. Spiegel, Seymour Lipschutz & Dennis Spellman, " Vector Analysis" Second Edition, Tata McGraw Hill Education Private Limited, New Delhi, 2009.
2. Takwale and Puranic, "Classical Mechanics" Tata McGraw-Hill Publishing
3.Sengupta & Chatterjeee, "A Treatise on General Properties of Matter " New Central BookAgency (P) Limited
4. D. Chattopadhyay and P. C. Rakshit, " Vibrations, Waves and Acoustics" BOOKS and Allied (P)Ltd.
5. N. K. Bajaj, "The physics of Waves and Oscillations" Tata McGraw Hill Education Private Limited, New Delhi.
6. A. Ghatak, "Optics" 4th Edition, Tata McGraw Hill Education Private Limited, New Delhi.
7. Eugene Hecht & A. R. Ganesan "Optics" 4th Edition, Pearson.
8. S. O. Pillai, "Solid State Physics", Wiley Eastern Ltd.
9. Kittel, "Solid State Physics" 7th edition, Wiley India.
10. Richard P. Feynman, Robert B. Leighton and Matthew Sands, " The FEYNMAN Lectures on Physics" Vol. I to Vol. IV, Pearson
11. D. Chattopadhyay and P. C. Rakshit, " An Advanced Course in Practical Physics" New Central Book Agency (P) Ltd.

Journals:

1. Nature
2. Physical Review Letter

3.Physical Review A & B
4.Applied Physics Letters (APL)
5.Proceedings of the National Academy of Sciences
6.Chemical Physics Letters
7.Journal of Physics: (Including A, B, C, D, E, F & G)
8. Journal of Scientific & Industrial Research
9. Indian Journal of Engineering & Material Sciences
10.Indian Journal of Radio and Space Physics

Magazine

1. Resonance
2. American Teacher
3.Scientific Physics
4.Physics Today
5.Physics For You

NATIONAL INSTITUTE OF TECHNOLOGY

(Established by Ministry of Human Resources Development, Govt. Of India) Yupia, District Papum Pare, Arunachal Pradesh – 791112

Fax: 0360 – 2284972, E-mail: nitarunachal@gmail.com

Department of Civil Engineering

Name of the Module: Life Science
Module Code: BIO 101
Semester: 1st
Credit Value: 4 [P=0, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To impart knowledge on the origin of Earth and life forms on Earth, appreciating importance of biological diversity and understanding biomolecules being the main component of life.
2. Understanding "Cell" – the basic unit in different life forms, and structure and function of different tissue systems in plants and animals.
3. To impart knowledge on water relations, nutrient uptake and assimilation, and metabolism in plants.
4. To provide knowledge on Bioenergetics of plant and animal cells, different organelles involved in electron transport systems, nervous, digestive and immune systems in animals.

I. Learning Outcomes:

Upon completion of the subjects:

1. Students will understand the characteristics of living organisms; appreciate the importance of diversity of life and their interaction with the environment.
2. Students will be able to explain the interrelationship between biomolecules and the living system, and influences of bio-molecules upon the structure and function of intracellular components.
3. Students will have a broad knowledge on Bioenergetics of plant and animal cells; and a brief on important biological systems of animal.

J. Subject Matter:

Unit I:

Origin of Life: History of earth, theories of origin of life and nature of the earliest organisms.

Varieties of life: Classification, Five kingdoms, viruses (TMV, HIV, Bacteriophage), Prokaryote (Bacteria-cell structure, nutrition, reproduction), Protista, Fungi, Plantae and Animalia.

Chemicals of life: (Biomolecules)- Carbohydrates lipids, amino acids, proteins, nucleic acids and identification of biomolecules in tissues.

Unit II:

Cell: Cell concept, structure of prokaryotic and eukaryotic cells, plant cells and animal cells, cell membranes, cell organelles and their function, Structure and use of compound microscope.

Histology: Maritimes (apical, intercalary, lateral) and their function; simple tissue (parenchyma, collenchymas, sclerenchyma); Complex tissue (xylem and phloem); Tissue systems (epidermal, ground, vascular); primary body and growth (root, stem, leaf); Secondary growth (root, stem). Animal tissues (Epithelial, connective, muscle and nervous tissues) and their functions in the body.

Unit III:

Transport: Plant water relationships, properties of water, diffusion, osmosis, imbibition, uptake of water by roots and theories of transport of water through xylem (ascent of water in xylem, cohesion- tension theory), apoplast and symplast theory; Transpiration-structure of leaf, opening and closing mechanisms of stomata, factors affecting transpiration and significance of transpiration.

Nutrition: Mineral Nutrition in plants, Heterotrophic nutrition in plants; Photosynthesis (Autotrophic-forms of nutrition), Chloroplast structure, two pigment systems, photosynthetic unit, light absorption by chlorophyll and transfer of energy, phosphorylation and electron transport system, Calvin-Benson Cycle (C_3), Hatch Slack Pathway (C_4), Crassulacan Acid Metabolism (CAM), factors affecting photosynthesis.

Unit IV:

Energy Utilization: (Respiration) - Structure of mitochondria, cellular respiration, relationship of carbohydrate metabolism to other compounds, Glycolysis, fermentation, formation of acetyl co-A, Kreb cycle, Electron Transport System and Oxidative Phosphorylation, ATP, factors affecting respiration;

Elementary canal in humans, nervous and hormonal control of digestive systems, fate of absorbed food materials; Nutrition in humans, Reference values; General characteristics of blood vascular system,

development of blood systems in animals, Composition of blood, circulation in blood vessels, formation of tissue fluids, the heart, functions of mammalian blood, the immune system.

K. Teaching/Learning/ Practice Pattern:

Teaching:	70%
Learning:	20%
Practice:	10% (Through Assignment)

L. Examination Pattern:

1. Theoretical Examination:
2. Practical Examination:

M. Reading List:

Books

1. J.N. Mitra, D. Mitra and S.K. Chowdhuri, "Studies in Botany" Volume I & II, Moulik Library Publisher, Kolkata, 2002.
2. M.J. Pelczar, E.C.S. Chan and N.R. Krieg, "Microbiology", Tata McGraw Hill Education, New Delhi, 1993.
3. B.P. Pandey, "Plant Anatomy", S. Chand & Company Ltd., New Delhi, 1997.
4. H.S. Srivastava, "Plant Physiology", Rastogi Publishers, Meerut, 1998.
5. B.P. Pandey, "College Botany" Volume I & II, S. Chand Publisher, New Delhi, 2012.
6. N.A. Campbell, J.B. Reece, "Biology" Person Education, Inc & Dorling Kinderley Publishing, Inc.
2009.

Magazines

1. National Geographic Chennel, http://science.nationalgeographic.co.in/science/earth
2. Wikipedia, The Free Encyclopedia, http://www.bbc.co.uk/science/earth
3. Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/HIV

Journals

1. Journal of Biology, BioMed Central Ltd, London, England.
2. Annals of Botany, Oxford Journals, USA.
3. Plant and Cell Physiology, Oxford Journals, USA.

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Fax: 0360 – 2284972, E-mail: nitarunachal@gmail.com

Department of Civil Engineering

Name of the Module: Engineering Mechanics
Module Code: ME 101
SEMESTER: 1st
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Ability to utilise scalar and vector analytical techniques for analysing forces in statically determinate structures.
2. Ability to apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
3. Student gets a basic idea of Centre of gravity, moment of inertia, mass moment of inertia, friction.

B. Learning Outcome:

Upon completion of the subject:

1. Should have knowledge of different type of force resolving
2. Should have knowledge of centre of gravity of different size, shape, and solid.
3. Should have knowledge of basic idea of Centre of gravity, moment of inertia, mass moment of inertia, friction.

C. Subject Matter:

UNIT I

Introduction, Idealizations of Mechanics, Fundamentals of Vector Algebra, Application of Vectors in Mechanics, Equiv System, Forces and Moments: Force, Moment and Couple, Resultant of forces, Forces in space. Equilibrium, Free body diagram, Equations of equilibrium, Solution of problems, Analysis of forces in perfect frames.

UNIT II

Friction: Fundamentals of Friction , laws of friction, friction of simple machines, inclined planes, Screw jacks.

Center of gravity and moment of inertia: Center of gravity of axes, volume and composite bodies: Area moment of inertia and mass moment of inertia for plane figures and bodies

UNIT III

Kinetics of rigid bodies: Plane motion, force, mass. acceleration. Work and energy. Impulse and momentum, rotational motion, - Centrifugal force.Torque, angular motion and acceleration, angular momentum, D.Alembert‟s principle. Virtual work.

UNIT IV

Dynamics: Intro to vector calculus, Definition of vectors in Dynamics, Rectilinear Motion, Curvilinear motion of particle and description of different coordinate systems, Kinetics, Newton's Law and D' Alembert's principle and application to rectilinear and curvilinear motion, constrained motion, Energy and Momentum methods.

D. Teaching/Learning/Practice Pattern:

Teachnig:	60 %
Learning :	40 %
Practice :	0%

(Teacher is to divide components for T/R/P)

E. Examination Pattern:

1. Theoretical Examination.

F. Reading List:

Books

1. Engineering Mechanics (Vol-II) Dynamics by Mariam &Kraige,
2. Engineering Mechanics, Vol-I (Statics) by Meriam & Kraige
3. Engineering Mechanics by Timoshenko.
4. Engineering Mechanics by Nelson.
5.Engineering Mechanics by Shames Rao
6. Engineering Mechanics by Suman Chakraborty.
7. Vector Mechanics for Engineers-Beer, Johnson TMH

Magazine

1. Popular Mechanics Everyday
2. Engineering Magazine

Journals

1. International Journal of Applied Mechanics and Engineering
2. Journal of Applied Mechanics, ASME
3. Journal of Engineering Mechanics, ASCE.

Name of the Module: Engineering Drawing-I
Module Code: ME 103
Semester: 1st
Credit Value: 2 [P=3, T=0, L=0]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Increase ability to understand Engineering Drawing.
2. Learn to sketch and take field dimensions.
3. Learn to take data and transform it into graphic drawings..
4. Learn basic engineering drawing formats.
5. Prepare the student for future Engineering positions.

B. Learning Outcome:

Upon completion of the subject:

1. Student‟s ability to hand letter will improve.
2. Student‟s ability to perform basic sketching techniques will improve.
3. Student‟s ability to use architectural and engineering scales will increase.
4. Students ability to produce engineered drawings will improve
5. Student‟s ability to convert sketches to engineered drawings will increase.
6. Students will become familiar with office practice and standards.

C. Subject Matter:

Unit I

Drawing instruments: Handling and use.
Lines and 1ettering: Types, thickness, shades dimensioning, familiarity with relevant IS codes.
Scales: Reducing and increasing scales, representative fraction, types of scales-plain, diagonal, comparative, vernier and scale of chords.

Unit II

Curves used in engineering practices: Conic Section-ellipse, parabola and hyperbola normals and tangents to conic sections, cycloids, trocoid, epicycloids, hypocycloids, epetrochoid. hypotrachoid involutes. archemedian, spiral, logarithmic spiral, helix.

Unit III

Projections: projection of points in different quadrants.
Projection of line: Inclined one plane and parallel to other.,Inclined to both planes, contained by a plane perpendicular to both planes, true length of a line and its inclination to refrence plane, traces of a line.

Projection of a plane: Traces of a plane, projection when a linear edge on the plane makes a given angle, the plane figure makes given angles, a line or edge and plane figure makes object angles. oblique planes.

Projection of solids: Simple solids in different positions, axis perpendicular to a plane axis parallel to planes, axis parallel to one plane and inclined to the other, axis inclined to both planes. Axis or edges makes given angles the face of a solid makes given angles, spheres. Sections of solids.

Unit IV

Auxiliary views, Sectional views, Orthographic projections, Developments
Orthographic projection: conversion of pictorial views into Orthographic views and vice-versa (1^{st} and 3^{rd} angle projection systems). Sectional views.
Isometric projection: Isometric axes and scales, isometric projection of plane figures, cube prism, pyramids, cylinder, Cone, sphere
Introduction to Autocad

List of Practical:

1. Conventional lines, lettering and Dimensioning
2. Scales-Plain, Diagonal, Vernier, Comparative and Scale of chords full sized scales and compare
3. Conic Sections-Oblong Method, concentric circle method, Tangent Method. Intersection method.
4 .Projection of points at first and third angle projection and their presentation on HP and VP.
5. Projection of lines at first and third angle projection on HP, VP and representing the same 6.
with respect to different views viz. front, top and side view (left and right hand view).
7. Projection of planes

7. Projection of solids
8. Auxiliary views
9. Sectional Views
10. Developments
11. Isometric Views and projections
12. Orthographic Views
13. Introduction to Auto-cad

E. Teaching/Learning/Practice Pattern:

Teaching:	30 %
Learning:	20 %
Practice:	50 %

(Teacher is to divide components for T/R/P)

F. Examination Pattern:

1. Practical Drawing.
2. Assignment.

G. Reading List:

Books

1. N. D. Bhatt, "Machine Drawing",Charotar Publishing House Pvt Ltd
2. Jolhe "Machine Drawing" TMH,
3. Venugopal K and Prabhu Raja V "Engineering Graphics", New age publications.
4. John, K C "Engineering Graphics", PHI learning Pvt. Ltd.
5. Kulkarni, D. M., Rastogi, A. P., Sarkar, A. K. "Engineering Graphics with Autocad", PHI learning Pvt. Ltd.
6. Natarajan, K. V "Engineering Graphics", Dhan Laxmi Publication.
7. French and Vierk, "Fundamentals of Engineering Drawing".
8. M.B Shah and B. C Rana, "Engineering Drawing". Pearson.
9. P.S. Gill, "Engineering Drawing" Katson Books.
10. K.L. Narayana and P.Kannaiah "Text book on Engineering Drawing",Scitech.
11. Agarwal, "Engineering Drawing", TMH.

Journals

1. International Journal of Design Engineering.
2. *Engineering* Design *Graphics Journal*.
3. Journal of Engineering Graphics

NATIONAL INSTITUTE OF TECHNOLOGY
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Fax: 0360 – 2284972, E-mail: nitarunachal@gmail.com
Department of Civil Engineering

Name of the Module: Workshop Practice-I
Module Code: ME 102
Semester: 1st
Credit Value: 2 [P=3, T=0, L=0]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To acquire skills in basic engineering practice.
2. To identify the hand tools and instruments.
3. To acquire measuring skills.
4. To acquire practical skills in the trades.
5. To acquire practical skills in welding, carpentry, Fitting.

B. Learning Outcome:

Upon completion of the subject:

1. Should have knowledge of workshop safety.
2. Should have knowledge of Handling workshop tools, machines.
3. Should have knowledge of different welding types.
5. Should have knowledge of different carpentry joints
6. Should have knowledge of different tools working principle

C. Subject Matter:

Unit I:

Carpentry (Wood Working)

Timber, Seasoning and Preservation, Plywood and Plyboards, Carpentry Tools, Engineering applications. Different Joints.

Unit II:

Metal Joining

Definitions of welding, brazing and soldering processes, and their applications. Oxy acetylene gas welding process, equipment and techniques. Types of flames and their applications. Manual metal arc welding technique and equipment. AC and DC welding, electrodes, constituents and functions of electrodes. Welding positions. Types of weld joint. Common welding defects such as cracks, slag inclusion and porosity.

Unit III:

Bench work and Fitting

Tools for laying out, chisels, files, hammers, hand hacksaw, their specifications and uses.

List of Practical:

1. To prepare various joints (T-Lap, Bridle, mortise- tenon, dovetail and ship overlap joint using a wooden baton and specific tools (Carpentry Shop).
2. To practice Gas welding using a 3mm thick mild steel plate.(Welding Shop)
3. To prepare a Lap joint and Butt joint by Gas Welding from a 3mm thick mild steel plate (Welding Shop).
4. To practice Manual metal arc welding using a 5mm thick mild steel plate (Welding Shop).
5. To prepare various patterns using wood as a pattern material with the help of specific 6. tools. (Carpentry Shop)
6. To perform various bench working operations like sawing, filling and finishing on a 5mm thick mild steel plate using specific tools (Fitting Shop).
7. To prepare jobs (Square, Angular and Semi Circular grooves) using 5mm mild steel plate using specific tools (Fitting Shop).

Teaching/Learning/Practice Pattern:

Teaching:	20%
Learning:	20 %
Practice:	60%

(Teacher is to divide components for T/R/P)

F. Examination Pattern:

Job making.
Viva.

G.Reading List:

Books

1. M.L. Begeman and B.H. Amstead,,"Manufacturing Process" John Wiley, 1968.
2. W.A.J. Chapman and E.Arnold, "Workshop Technology" Vol. 1, 2 & 3.
3. B.S. Rghuwanshi, "Workshop Technolog," Vol. 1 & 2 – Dhanpat Rai and Sons.

4. Hazra and choudhary,"Workshop Technology" Vol. 1, 2. , Media Promoters
5. Virender Narula,"Workshop Technology" .
6. Hazra, Choudhury, , "Elements of Workshop Technology" Vol I & II. MPP.
7. Anderson "Shop Theory" Mc Graw Hill.
8. H.S.Bawa, "Carpentry: A complete guide", TMH.
9. R.Little, "Welding & Welding Technology", TMH.
10. L.M.Gourd, "Principles of welding technology", Edward Arnold Publishers.
11. R.S.Parmer, "Welding processes and technology" Khanna publication.

Magazine

1.International Metal Working News.
2.Industrial Distribution

Journals

1. International Journal of Machine Tools and Manufacture
2. Journal of Manufacturing Science and Engineering, Transactions of the ASME
3. Journal of Manufacturing Technology and Research

Name of the Module: Communication Skill
Module Code: HSS 101
Semester: 1st
Credit Value: 1 [P=2, T=0, L=0]
Module Leader:
Module Tutor(s):

A. Objectives:

The course is design to meet with the objectives of:

1. To increase the Students ability to improve and utilize the skills necessary to be competent interpersonal communicator.
2. To Increase the student"s understands of his or her own communication behavior.
3. To Increase the students understands of others communication behaviours.
4. To improve the students communication skills of both social professional contexts.
5. To improve the students ability to demonstrate effective complete resolution skills.

Learning Outcomes:

Upon completion of the subject:

1. The students will be able to develop their communication skills on the specific subject.
2. After learning communication skills they will be able to direct effectively in their worl place.

C. Subject Matter:

Unit I:

General Principles of Communication and Oral Communication:

The Process of Communication, Principles of Communication (communication barriers, levels of Communication, Communication network, verbal, non-verbal) and Professional Communication. The Speech Mechanism, IPA symbols (vowel and consonant sounds), minimal pairs, word transcription, stress and intonation , active listening, types of listening, traits of a good listener, active versus passive listening,

Unit II:

Constituents of Effective Writing and Vocabulary:

The sentence and its parts, articles, verb phrase, tense and aspect, voice- active and passive, adjectives, interrogative and negative sentences, concord, preposition. Paragraph development, summary writing and reading comprehension. word formation processes: affixation, compounding, converting, use of words in different parts of speech, idioms and phrases.

Unit III:

Business Correspondence and Communication Strategies:

Characteristics of Business Letters, Drafting: Bio-data/Resume/Curriculum vitae (theory). Report Writing: Structure, Types of Reports (theory). Presentation Skills, public speaking and group discussion (theory) and Soft Skills (theory).

List of Practical:

1. Issue Writing
2. Writing Resumes and Applications

3.Writing Memos
4.Reading Comprehension
5.Vocabulary
6.Presentation Skills
7.Group Discussion
8.Extempore
9.Debates

E. Teaching/ Learning/ Practice Pattern:

Teaching:	40%
Learning:	10%
Practice:	50%

F. Examination Pattern:

1.Theoretical Examination

G. Reading List:

Books:

1. Nira Konar, "English Language Laboratory", PHI Publishres
2. Jones, Daniel, Cambridge English Pronouncing Dictionary with CD, New Delhi, 2009.
3. Roach, Peter, English Phonetics and Phonology with CD, CUP, India, 1983.
4. Cambridge Learners Dictionary with CD, CUP, New Delhi, 2009.
5. Rajeevan, Dutt, Sasikumar, A course in Listening and Speaking I & II with CD, CUP, New Delhi, 2007.
6. Rajeevan and Dutt, Basic Communication Skills, CUP, New Delhi, 2007.
7. Software: Orell Digital Language Lab Software.
8. An Approach to Communication Skills: by Indrajit Bhattacharya.
9. Business Correspondence and Report Writing : by R.C. Sharma and Krishna Mohan.
10.Technical Communication: by Meenakshi Raman and Sangeeta Sharma, Oxford.
11. Development Communication Skills: By Krishna Mohan and Meera Bannerji.

Journals:

1. Developing Effective Communication Skills.
2. Cooperative Communication Skills.
3. Improving Communication Skills.
4. Key Communication Skills.

Journal on Communication.

Subject Code	Subject	Model	L	T	P	Credit
HSS – 102	NSS / NCC	J.C Bose	0	0	2	1
HSS – 103	Foreign Language (French / Korean) (Audit)	J.C Bose	0	0	2	0

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Department of Civil Engineering

Second Semester

SECOND SEMESTER
(COMMON TO ALL BRANCHES)

Subject Code	Subject	P	T	L	Credit
MAS -201	Engineering Mathematics - II	0	1	3	4
ME – 201	Basic elements of Mechanical Engineering	0	0	3	3
CE- 201	Basic Civil Engineering	3	0	0	2
ME-202	Workshop Practice-II	3	0	0	2
CSE - 201	Programming in C	8	0	0	4
CHY – 201	Environmental Science	0	0	3	3
PHY - 201	Engineering Physics - II	2	0	3	4
ECE – 201	Digital Electronics & Logic Design	2	0	3	4
HSS – 201	History of Science & Technology	0	0	3	3
HSS – 202	Foreign Language (German / Chinese) (Audit)	2	0	0	0
		20	1	18	29

Name of the Module: Engineering Mathematics-II
Module Code: MAS 201
Semester: 2nd
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1.Imparting theoretical knowledge to the students about three and more dimensional objects in space and to improve their capability of visualising of objects in space.

2.Making student competent enough to construct a differential equation/ mathematical modelling for every real life situation with its solution.

3.Giving students theoretical knowledge of vectors with the flavour of Calculus.

4.Introduce the concepts of Laplace and Fourier transforms and its application to the solution of differential equations (ODE & PDE) to the students.

Learning Outcomes:

Upon completion of the subject:

1.Students will have strong visualising capability in their mind about any object.

2.Students are so trained that they will recognize various real life situation/ problem and able to solve them by constructing a differential equation/ mathematical model.

3.Students will be able to find the Laplace and Fourier representation as well as transforms of functions of one variable.

C. Subject Matter:

Unit I:

Coordinate Geometry of Three Dimensions: Equation of a sphere, plane section of a sphere, tangent plane, definition and equation of right circular cones and right circular cylinders.

Unit II:

Vector Calculus: Differentiation and integration of vector functions, scalar and vector fields, Gradient, Directional derivative, Divergence, Curl. Line integral, Surface integral and Volume integral, Green‟s, Gauss‟ and Stokes‟ theorems (without proofs) and their simple applications.

Unit III:

Ordinary Differential Equations: Formulation of Differential equations, Linear Differential Equation(LDE)s and reducible to a linear form, Exact Equations, Reducible to exact form, Linear differential equations with constant coefficients, Second order ordinary differential equations with variable coefficients, Homogeneous form, Change of dependent variable, Change of independent variable, Normal form, Variation of Parameters, Solution in series of second order LDE with variable co-efficient (C.F. only), Bessel‟s and Legendre differential equations with their series solutions, Recurrence relations relating to Bessel functions and Legendre polynomials.

Partial Differential Equation: Partial Differential equations: First order partial differential equations, Second order partial differential equations with constant coefficients and their classification to elliptic. Parabolic and hyperbolic type. Solution of one dimensional wave and diffusion equations, Laplace equations of two dimensions. Non-linear Partial Differential Equations of order one

Unit IV:

Laplace Transforms: Definition and properties, Inverse transform, convolution, Application to ordinary differential equations.

Fourier Transforms.

D. Teaching/ Learning/ Practice Pattern:

Teaching: 70%
Learning: 30%
Practice: 0%

Examination Pattern:

Theoretical Examination and open book examination

F. Reading List:

Books:

1.Shanti Narayan and P. K. Mittal "Analytic Solid Geometry", S.Chand & Co., New Delhi, 2012.
2.M.D.Raisinghania, "Ordinary & Partial Differential equations", S.Chand & Co., 2013.
3.M.D.Raisinghania, "Advanced Differential equations", S.Chand & Co., 2012.
4.H. K. Dass and Er Rajnish Verma "Higher Engineering Mathematics", S. Chand & Co., 2011, New Delhi.
5.B.S. Grewal , "Higher Engineering Mathematics", Khanna Publishers, 42th Edition, 2012, New Delhi
6.Erwin Kreyszig," Advanced Engineering Mathematics", Wiley Eastern, 8th Edition, 2008.
7.S. L. Ross, "Differential equations", John Wiley, 3rd Edition, 2011.
8.Pal & Das , "Engineering Mathematics", Vol. I", U.N. Dhar, Fifth Edition, 2011.
9.Lipschutz, Spellman, Spiegel, " Vector Analysis and Introduction to Tensor Analysis ", Tata Mc
Graw Hill, 2011.
10.Ghosh and Maity, " Vector Analysis", New Center Book Agency, Kolkata, 2011.
11.Murray Spiegel , " Laplace Transforms", Mc Graw Hill,

Magazines:

1.Current Science (Indian Academy of Science).
2.The Mathematics Student (Math Student) (Indian Mathematical Society).
3.Mathematical Spectrum(The University of Sheffield).
4.Mathematics Magazine (Mathematical Association of America).
5.+Plus magazine (University of Cambridge).
6.Ganithavahini (Ramanujan Mathematical Society).
7.Mathematics Today, London Metropolitan University.
8.The Mathematics Intelligence
9.Mathematical Gazetto (Mathematical Article, UK)

10. Newsletter of Calcutta Mathematical Society (Kolkata)

Journals:

1.Journal of Engineering Mathematics, Springer.
2.Journal of Computational and Applied Mathematics, London Metropolitan University.
3.Indian Journal of Pure and Applied Mathematics,

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Fax: 0360 – 2284972, E-mail: nitarunachal@gmail.com

Department of Civil Engineering

Name of the Module: Basic elements of Mechanical Engineering
Module Code: ME 201
SEMESTER: 2nd
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1.Basic definitions and terminology
2.Special definitions from the thermodynamics point of view.
3.Why and how natural processes occur only in one direction unaided.
4.Comprehension
5.Explain concept of property and how it defines state.
6.How change of state results in a process?
7.Why processes are required to build cycles?
8.Student gets a basic idea of Engineering Mechanics, Fluid Mechanics, Strength of Material and Thermodynamics.

B. Learning Outcome:

Upon completion of the subject:

1.Should have knowledge of different type of force resolving
2.Should have knowledge of centre of gravity of different size, shape, and solid.
3.Should have knowledge of basic idea of Engineering Mechanics, Fluid Mechanics, Strength of Material and Thermodynamics.

C. Subject Matter:

UNIT I

Introduction to Thermodynamics, Concepts of system control volume, state, properties, equilibrium, quasi- static process, reversible & irreversible process, cycle. Zeroeth Law and Temperature, Heat and Work transfer Definition, Sign convention, various P-dV work done (Iso baric ,Isochoric, Polytrophic, adiabatic and isothermal processes) and related problems.

UNIT II

1st Laws of Thermodynamics for closed & open systems (ii) Non Flow Energy Equation (iii) Steady State, Steady Flow Energy Equation and related problems. , Equivalence of two statements, Definition of Heat Engines, Heat pumps, Refrigerators Carnot and related problems. Air Standard cycles – Otto and Diesel cycle and their efficiencies and related Problems.

UNIT III

Properties & Classification of Fluids – ideal & real fluids, Newton‟s law of viscosity, Newtonian &Non Newtonian Fluids, Compressible & Incompressible fluids Pressure at a point, Pascal‟s law. Measurement of Pressure. Continuity equation. Bernoulli‟s equation and its application, Surface Tension.

UNIT IV

Concept of simple stresses and strains. Yield strength, Normal stress Shear stress, Bearing stress, Normal strain, Shearing strain, Hooke‟s law, poisson‟s ratio, Examples.

D. Teaching/Learning/Practice Pattern:

Teachnig:	60 %
Learning :	40 %
Practice :	0%

(Teacher is to divide components for T/R/P)

Examination Pattern:

Theoretical Examination and open book examination.

F. Reading List:

Books

1.Engineering Thermodynamics by P.K. Nag ,2nd Edition
2.Introduction to Fluid Mechanics & Fluid Mechines by S.K. Som& G. Biswas
3.Elements of Strength of Materials by Timo& Young.
4.S.K Bansal , “Fluid Mechanics & Hydraulic Machines”, LaxmiPublications.
5.Y.A.Cengel, “Fluid Mechanics: Fundamentals & Applications”,Tata McGraw-Hill.
6.A.KJain, “Fluid Mechanics”, Khanna Publishers.
7.R.K Rajput, “Fluid mechanics & Hydraulic machines”, S. Chand Publications.

8.S.K. Som and G. Biswas, "Introduction to Fluid Mechanics and Fluid Machines",Tata McGrawHill.

Magazine

1.Popular Mechanics.Everyday
2.Engineering Magazine

Journals

1.Journal of thermodynamics
2.Journal of thermodynamics and catalysis.
3.The Journal of Chemical Thermodynamics – Elsevier.
4.Journal of Thermodynamics & Catalysis - OMICS Group.

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Fax: 0360 – 2284972, E-mail: nitarunachal@gmail.com

Department of Civil Engineering

Name of the Module: Workshop Practice-II
Module Code: ME 202
Semester: 2nd
Credit Value: 2 [P=3, T=0, L=0]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To acquire skills in basic engineering practice.
2. To identify the hand tools and instruments.
3. To acquire measuring skills.
4. To acquire practical skills in the trades.
5. To acquire practical skills in welding, carpentry, Fitting.

B. Learning Outcome:

Upon completion of the subject:

1. Should have knowledge of workshop safety.
2. Should have knowledge of Handling workshop tools, machines.
3. Should have knowledge of different welding types.
4. Should have knowledge of different carpentry joints
6. Should have knowledge of different tools working principle

C. Subject Matter:

Unit I:

Bench work and Fitting

Tools for laying out, chisels, files, hammers, hand hacksaw, their specifications and uses, plumbing, Sheet metal Work.

Unit II:

Metal Joining

Definitions of welding, brazing and soldering processes, and their applications. Oxy acetylene gas welding process, equipment and techniques. Types of flames and their applications. Manual metal arc

welding technique and equipment. AC and DC welding, electrodes, constituents and functions of electrodes. Welding positions. Types of weld joint. Common welding defects such as cracks, slag inclusion and porosity.

Unit III:

Machine Shop: Introduction , Basic Principles of Lathe, Shaper, Milling, Drilling, Grinding,Power Hacksaw etc

D. List of Practical:

1.To practice Gas welding using a 3mm thick mild steel plate.(Welding Shop)
2.To prepare a Lap joint and Butt joint by Gas Welding from a 3mm thick mild steel plate (Welding Shop).
3.To practice Manual metal arc welding using a 5mm thick mild steel plate (Welding Shop).
4.To prepare various patterns using wood as a pattern material with the help of specific tools. (Carpentry Shop)
5.To perform various bench working operations like sawing, filling and finishing on a 5mm thick mild steel plate using specific tools (Fitting Shop).
6.To prepare jobs (Square, Angular and Semi Circular grooves) using 5mm mild steel plate using specific tools (Fitting Shop).

E. Teaching/Learning/Practice Pattern:

Teaching:	20%
Learning:	20 %
Practice:	60%

(Teacher is to divide components for T/R/P)

F. Examination Pattern:

1.Job making.
2.Viva.

G.Reading List:

Books

1.M.L. Begeman and B.H. Amstead,,"Manufacturing Process" John Wiley, 1968.
2.W.A.J. Chapman and E.Arnold, "Workshop Technology" Vol. 1, 2 & 3.

3.B.S. Rghuwanshi, "Workshop Technolog," Vol. 1 & 2 – Dhanpat Rai and Sons.
4.Hazra and choudhary,"Workshop Technology" Vol. 1, 2. , Media Promoters
5.Virender Narula,"Workshop Technology" .
6.Hazra, Choudhury, , "Elements of Workshop Technology" Vol I & II. MPP.
7.Anderson "Shop Theory" Mc Graw Hill.
8. H.S.Bawa, "Carpentry: A complete guide", TMH.
9. R.Little, "Welding & Welding Technology", TMH.
10.L.M.Gourd, "Principles of welding technology", Edward Arnold Publishers.
11. R.S.Parmer, "Welding processes and technology" Khanna publication.

Magazine

1.International Metal Working News.
2.Industrial Distribution

Journals

1. International Journal of Machine Tools and Manufacture
2. Journal of Manufacturing Science and Engineering, Transactions of the ASME
3. Journal of Manufacturing Technology and Research

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Department of Civil Engineering

Name of the Module: Basic Civil Engineering
Module Code: CE 201
Semester: 2nd
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To have the basic idea about the construction materials.
2. To get acquainted with properties and application of the materials used in construction.

B. Learning Outcome:

Upon completion of the subject:
1.Students will acquire the basic knowledge in different fields of civil engineering and materials used in construction.
2.Students will have the ability to identify, formulate and solve engineering problems related to construction technology.

C. Subject Matter:

Unit I

Traditional Materials: stones, bricks, lime, cement, timber
Mortar: sand, cement mortar, mud mortar, special mortar, test on mortar
Concrete: plain concrete, reinforced cement concrete, reinforced brick work Metals as Building materials: Ferrous metals, aluminum, copper
Miscellaneous Building materials: Glass, plastics, bitumen, asbestos, paints, distempers, varnishes, solid and hollow concrete Blocks, Roofing and flooring tile

Unit II

Building Element: Foundation, floors, walls and panels, roofing, wood work. Roof Treatment: Finishing items for floors, walls, panels and woodwork. Plumbing and fixtures, shuttering and staging. Miscellaneous Building materials: Glass, plastics, bitumen, asbestos, paints, distempers, varnishes, solid and hollow concrete Blocks, Roofing and flooring tile, Ready mixed concrete

Unit III

Superstructures: Types of superstructure based on the method of load transfer, walls, stone masonry, brick masonry, plastering, pointing, flooring, roof, doors and lintels, stairs. Reinforced concrete and Steel structures,
Municipality rules and regulations.

Unit IV

Surveying: Introduction to surveying-Object and uses of surveying, primary divisions of surveying, fundamental principles of surveying, classification of surveying, plans and maps, scales
Water Treatment plants. Soil reports.Dam & Barrages.

D. Teaching/Learning/Practice Pattern:

Teaching:	70 %
Learning:	30 %
Practice:	0 %

(Teacher is to divide components for T/R/P)

E. Examination Pattern:

Closed book.
Assignment.

F. Reading List:

Books

1. Rakesh Roshan Beohar, "Basic Civil Engineering", Laxmi Publications.
2. Ramamurtham, "Basic Civil Engineering", Dhanpat Rai and sons
3. S S Bhavikatti "Basic Civil Engineering" New Age international Publishers,

Magazine

1. Civil Engineering and construction Review.

Journals

1. ASCE
2. Springerlink

Name of the Module: Programming in C
Module Code: CSE 201
Semester: 2nd
Credit Value: 4 [P=8, T=0, L=0]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Learning programming language.
2. Efficient in coding.
3. Essential algorithms in computing.

B. Learning outcomes:

Students who successfully complete this module will be able to:

1. Write a programme on C language in DOS as well as in linux.
2. Can manage file system
3. Design, develop, test, and debug programs.

C. Subject Matter:

Unit I:

Basic concept: Some basic concept of binary number, Octal number, hexadecimal number system and there conversion among them. Assembly language, high level language, Compiler and assembler (basic concept).
Keyword & Identifiers: History & Importance of C, Basic structure of C programs, C fundamentals: The C character set identifier, Constants and keywords, data types & size, variable names, declaration, statement , C token, symbolic constent.

Operators and Expression: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment & Decrement operators, Condition Operators, Bitwise Operators, Special operators, precedence of arithmetic operators.
Managing Input & output operations: using of printf( ) &scanf( ).

Unit II:

Decision making: Simple If statement, if-else statement, nested if else statement, Switch statement, nested switch, the operator, goto statement.
Decision making & branching: while statement, do-while statement, for statement. Array

Unit III:

String & pointer: One-dimension array, Two-dimension array and multi dimension array. String: Operation on String without using library function and using library function. Pointer: Declaration of pointer variables, accessing the variable by using pointer, pointer increment and decrement operator, pointer and array.
Functions: Basic functions, function type, function with no argument & no return value, function with no argument but return value, function with argument & return value, Storage class identifier, Call by reference, Recursive function. Pointer to function.

Unit IV:

Structure & Union: Defining a structure, accessing of structure variable, structure and array, array within structure. Nested structure, structure & functions, Pointer & structure, Unions.
File management system: Advantage of using file, Open ,close, read. write in the files, Operation on files.
Dynamic memory Allocation: use of Malloc, calloc, realloc, free. Library functions, Linked list concept.
The pre-processor: macro statements.

List of Practical (Minimum six experiments are required to be performed)

1.DOS System commands and Editors (Preliminaries)
2.UNIX system commands and vi (Preliminaries)
3.Simple Programs: simple and compound interest. To check whether a given number is a palindrome or not, evaluate summation series, factorial of a number, generate Pascal‟s triangle, find roots of a quadratic equation
4.Programs to demonstrate control structure: text processing, use of break and continue, etc.
5.Programs involving functions and recursion
6.Programs involving the use of arrays with subscripts and pointers
7.Programs using structures and files.

E. Teaching/ Learning/ Practice Pattern:

Teaching:	40%
Learning:	10%
Practice:	50%

F. Examination Pattern:

1. Theoretical Examination: Open book and on line.

2. Practical Examination: Conducting Programming and viva voice

G.Reading List:

Books

1.Kerninghan and Ritchie ,"The 'C' programming language", prentice hall
2.Balaguruswamy ," Programming with 'C"', Tata McGraw-Hill
3.Govil, Agrawal, Mathur & Pathak , "Computer Fundamentals and Programming in C", Jaipur Publication House(JPH)
4.Sinha&Sinha ,"Foundations of Computing", BPB.
5. LoisPettersion ,"HTML (Learn Everything you need to guide HTML assist.", SAMS NET.
6.Stephen Kochan Programming in C (3rd Edition), Sams
7.Stephen Prata, "C Primer Plus", Sams
8.K. N. King "C Programming: A Modern Approach ",Norton, W. W. & Company
9.Al Kelley/Ira Pohl "A Book on C"
10.Zed Shaw "Learn C The Hard Way", Addison-Wesley
11.Mike Banahan, Declan Brady and Mark Doran "The C book", Addison-Wesley Pub (Sd)
12.Steve Oualline "Practical C Programming, 3rd Edition ",O'Reilly Media

Magazine:

1.C/C++ Users , CMP Media LLC publication, United States

Journal:

1.Dr. Dobb's Journal, United Business Media publication, United States
2.Journal of C Language, CMP Media LLC publication, United States
3.C vu Journal, ACCU, UK

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Fax: 0360 – 2284972, E-mail: nitarunachal@gmail.com

Department of Civil Engineering

Name of the Module: Environmental Science
Module Code: CHY 201
Semester: 2nd
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

5.Imparting the knowledge to the students in the area of Environmental Engineering.
6.Providing teaching and learning to make students acquainting with advanced science and technology in Environmental Science.
7.Injecting the future scope and the research direction in the discipline of Environmental Engineering.
8.Making students competent to the research and development in Environmental Engineering.

B. Learning Outcomes:

Upon completion of the subject:

4.Students will be adequately trained to become Scientist, trainers and Chemical Engineers.
5.Students will be skilled both to control and maintenance in Environmental pollution, waste water treatment and other related activities in Environmental Engineering.
6.Students will be substantially prepared to take up prospective research assignments.

C. Subjects Matters:

Unit-1

Environment: Concepts of Environment, Environmental gradients, Tolerance levels of environment factor, EU, US and Indian Environmental Law. Chemistry in Environmental Engineering: Chemistry of the atmosphere, combustion related air pollution, global environmental problems - ozone depletion, greenhouse effect, acid rain etc.
Ecological Concepts: Biotic and Abiotic components, Ecosystem Process: Energy transfer, Food Chain and Food Web, Water cycle, Oxygen cycle, Carbon cycle, Nitrogen cycle etc.,
Soil chemistry. Soil composition, properties, identification and classification. Noise pollution Effect of noise on people, rating systems, community noise sources and criteria, traffic noise prediction, n oise control. Noise standards, measurement and control.

Unit – II

Waste Water Treatment: Water Treatment: water quality standards and parameters, Ground water. Water treatment processes, Pre-treatment of water, Conventional process, advanced water treatment process. DO and BOD of Waste water treatment process, primary and secondary treatment of waste water, Activated sludge treatment: Anaerobic digestion, Reactor configurations and methane production. Water resources, characteristics of water, water pollutants, oxygen demanding wastes, surface water quali ty, groundwater quality, water treatment systems, biomedical wastes treatment technologies and disposal options.

Unit-III

Solid waste, Definition and characteristics of industrial and hazardous wastes. Hazardous waste management, Solid Waste Management, Source classification and composition of MSW: Separation, storage and transportation, Reuse and recycling, Waste Minimization Techniques. Hazardous Waste Management, Hazardous waste and their generation, Transportation and treatment: Incinerators, Inorganic waste treatment. E.I.A., Environmental auditing, Hazardous substances and risk analysis: Hazardous substance legislation, risk assessment, hazard deification, potential carcinogens, toxicity testing in animals, human exposure assessment.

Unit-IV

Air quality standards, emission standards,emission standards, criteria pollutants, air pollution and meteoro logy, atmospheric dispersion, emission controls. Air pollution and pollutants, criteria pollutants, Acid deposition, Global climate change –greenhouse gases, non-criteria pollutants, air pollution meteorology, Atmospheric dispersion. Industrial Air Emission Control. Flue gas desulphurization, NOx removal, Fugitive emissions.

Reading List:

Books:

1.Environmental Engineering Irwin/ McGraw Hill International Edition, 1997, G. Kiely,
2.Environmental Engineering by Arcadio P. Sincero & Gergoria A. Sincero PHI
3.Principles of Environmental Engineering and Science, M. L. Davis and S. J. Masen, McGraw Hill International Edition, 2004
4.Environmental Science, Curringham & Saigo, TMH,
5.An Introduction to Environmental Engineering and Science by Gilbert M. Masters & Wendell P. Ela - PHI Publication.
6.Introduction to Environmental Engineering and Science : Gilbert M Masters
7.Environmental Science and Engineering : J. G. Henry and G. W Heinke
8.Introduction to Environmental Engineering : M.L. Davis and D.A. cornwell

Magazine:

1. Applied Environmental Research Foundation
2. Environmental Science and Engineering
3. Climate Wire
4. Down to Earth
5. The Green Economist
6. Green Wire

Journal:

1. Journal of Environmental Science, Elsevier Publication
2. Environmental Science and Technology, ACS Publication
3. Energy and Environmental Science, RSC Publication
4. Environmental International, Elsevier Publication

Name of the Module: Engineering Physics - II
Module Code: PHY 201
Semester: 2nd
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A.Objectives:

The course is design to meet with the objectives of:

1. Imparting theoretical & practical knowledge to the students in the area of Engineering Physics.
2. Providing teaching and learning to make students acquainting with modern state-of-art of Engineering

3.Injecting the future scope and the research direction in the field of Physics with specific specialization.

4. Making students competent to design & development of Engineering Physics.

B. Learning Outcomes:

Upon completion of the subject:

1. Students will be adequately trained to become Engineers.
2. Students will be substantially prepared to take up prospective research assignmentsStudents will be substantially prepared to take up prospective research assignments.

C. Subject Matter:

UNIT I

Electricity: Coulombs law in vector form, Electrostatic field and its curl, Gauss's law in integral form and covension to differential form, Electrostatic potential and field, Poissions's Eqn. Laplace's Eqn (Application to Cartesian, Spherically and Cylindrically symmetric systems-effective 1D problems) electric current, drift velocity, current density, continuity equation, steady state current Dielectrics-concept of polarization.

UNIT II

Magnetosatatics & time varying Field: Lorentz force, force on a small current element placed in a magnetic field, Biot-Savart law and its applications, divergence of a magnetic field, vector potential, ampere's law in integral form and conversion to differential form, Faraday's law of electromagnetic induction in integral form and conversion to differential form.

Electromagnetic theory: conception of displacement current, Maxwell 's field equations, Maxwell's wave equation and its solution for fee space, E.M wave in a charrge free conducting media, skin depth, physical significance of skin depth, E.M. energy flow & poynting vector.

UNIT III

Quantum Mechanics: Wave particle duality, Compton effect, Photo electric effect, Black body radiation, Heisenberg‟s uncertainty relation, concept of wave packet**.** Conception of probability and probability density, operators, commutator, Formulation of quantum mechanics and basic postulates, Time dependent Schrodinger's equation, Formulation of Time independent Schrodinger's equation, physical interpretation of wave function, Free particle and particle in a box.

UNIT IV

Statistical Mechanics: Concept of energy levels and energy states. Microstates, macrostates and thermodynamic probability, equilibrium macrostate. MB, FD, BE statistics (No deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics Fermi distribution at zero & non-zero temperature, Bose-Einstein statistics – Planck‟s law of blackbody radiation.

List of Practical: (Minimum six experiments are required to be performed):

1.Determination of dielectric constant of a given dielectric material.
2.Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
3.Determination of specific charge (e/m) of electron by J.J. Thomson‟s method.
4.Determination of Planck‟s constant using photocell.
5.Determination of Rydberg constant by studying Hydrogen/ Helium spectrum.
6.Determination of Stefan‟s radiation constant.
7.Verification of Bohr‟s atomic orbital theory through Frank-Hertz experiment.
8.Determination of Hall co-efficient of semiconductors.
9.Determination of band gap of semiconductors
10.Use of carry Foster's bridge to determine unknown resistance

E. Teaching/ Learning/ Practice Pattern:

Teaching : 40%
Learning : 10%
Practice : 50%

(Teacher is to divide components for T/R/P)

F. Examination Pattern:

Theoretical Examination: Open book and on line.
Practical Examination: Conducting Experiment and Viva-Voce.

G.Reading List:

Books:

1. Herbert Goldstein, Charles P. Poole and John Safko, " Classical Mechanics" 3rd edition, Pearson.
2. N. C. Rana and P. S. Joag, "Classical Mechanics", Tata McGraw Hill Education Private Limited,New Delhi.
3.D. Chattopadhyay and P. C. Rakshit, "Electricity and Magnetism" , New Central Book Agency (P) Ltd.
4.David J. Griffiths, "Introduction to Electrodynamics," 3rd edition, PHI Learning Private Limited.
5.W. H Hayt and J A Buck, "Engineering Electromagnetics" 7th edition, Tata McGraw Hill Education Private Limited, New Delhi.
6.Eisenberg and Resnick, "Quantum Physics", 2nd edition, Wiley India.
7.F. Reif, "Statistical Physics" Tata McGraw Hill Education Private Limited, New Delhi.
8.S. N. Ghoshal, "Atomic Physics" S. Chand
9.Beiser, Mahajan and Choudhury, " Concepts of Modern Physics" Tata McGraw Hill Education Private Limited, New Delhi.
10 .A. B. Gupta, "Modern Atomic and Nuclear Physics" BOOKS and Allied (P) Ltd.
11.Jeremy Bernstein, Paul M. Fishbane and Stephen G. Gasiorowicz " Modern Physics" Pearson.
12.Richard P. Feynman, Robert B. Leighton and Matthew Sands, " The FEYNMAN Lectures on Physics" Vol. I to Vol. IV, Pearson
13. D. Chattopadhyay and P. C. Rakshit, " An Advanced Course in Practical Physics" New Central Book Agency (P) Ltd.

Jornals:

1.Nature
2.Physical Review Letter
3.Physical Review A & B
4.Applied Physics Letters (APL)
5.Proceedings of the National Academy of Sciences
6.Chemical Physics Letters
7.Journal of Physics: (Including A, B, C, D, E, F & G)
8.Journal of Scientific & Industrial Research
9.Indian Journal of Engineering & Material Sciences
10.Indian Journal of Radio and Space Physics

C. Magazines:

1.Resonance
2.American Teacher
3.Scientific Physics
4.Physics Today
5.Physics For You

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Department of Civil Engineering

Name of The Module: Digital Electronics & Logic Design
Module Code: ECE-201
Semester: 2nd
Credit Value: 4 [P=2, T=1, L=3]
Module Leader:

A. Objectives:

The course is designed to meet the objectives of:

1. To make the students to build a solid foundation about Boolean algebra
2. To make the students to study Degital Logic Gate and Circuits
3. To provide a clear foundation of Modern Digital System

B. Learning outcomes:

1. At the end of this module, students are expected to be able to
2. Clear understanding & utilization of logic gates.
3. Design and develop of advanced TTL logic circuits.
4. Utilization of Combinational and Sequential circuits, Counters, ADC and DAC.

C. Subject Matter:

UNIT I:

Number Systems : Decimal, Binary, Octal and Hexadecimal systems, conversion of a number from one base to another. **Codes :** BCD, Excess- 3, Gray, Reflected, ASCII, EBCDIC. **Algebra for logic circuits:** Logic variables; Logic constants; Logic functions- NOT, AND, OR, NAND, NOR, Ex-OR; **Combinational circuits :** Full Adder / Subtractor, BCD Adder, LAC Adder, Comparator, Decoder, Encoder, Priority Encoder, MUX/DEMUX & there structures , Combinational logic design using ROM array, Applications of MSI designs.

UNIT II:

Integrated Circuits: Difference between combinational and sequential circuits, **Flip Flops**: Triggering of sequential logic circuits. Difference between flip flop and latch – Construction of RS, D, JK, JK master slave, T flip flops using basic gates, preset and clear signal, **Shift Registers**: Serial in serial out – Serial in parallel out, Parallel in serial out, Parallel in parallel out, Universal Shift Registers & their Applications. **Counters:** Asynchronous and synchronous counter, Ripple counter, Mod-N counter, Up-down counter, Ring counter, Johnson counter, Programmable counter – Applications.

UNIT III:

Minimization Techniques & System Design : Basic models of sequential M/C, Analysis of Asynchronous and Synchronous circuits, Synthesis of completely and incompletely specified synchronous sequential M/Cs, Combination & Sequential Circuits. Boolean Algebra (including Shanon's expansion theorem and consensus theorem); ven diagram representation, Canonical representations-min-term, max-term; Karnaugh map simplification, Quine Mc-clusky minimization. Introduction to state machines. Classification of State Machines. State Machine Applications. Analysis of State Machine, State table, State Diagram, State Equation, State reduction and State assignment. Design of Synchronous State Machine (including Counter) and Asynchronous state machine.

UNIT IV:

Logic Families: Comparative studies of different type of logic families like RTL, Diode logic, DTL, TTL, IIL, HTL,ECL, MOS & CMOS etc. with the following characteristics: (a) logic levels, (b) power dissipation, (c) fan in and fan out, (d) propagation delay, and, (e) noise immunity. **Data Converters**: Digital to Analog Converters: Binary weighted resistor type, R-2R ladder type, Specifications and applications of DA converter. Analog to Digital Converter: Comparator type, Successive approximation type, Dual slope AD converter, Specifications and applications of AD converter.

D. LIST OF EXPERIMENTS:

1.Realization of NOT, OR, AND, XOR & XNOR gates using universal gates
2. a.To study Gray to Binary conversion & vice-versa.
   b. To study Code conversion between BCD and EXCESS-3
3. a. Realisation of odd and even parity and checking of Truth Tables.
   b.Design of a 4-bit comparator circuit & verification of its truth tables.
4.Design of combinational circuit to drive seven-segment display
5.Design of combinational circuits using multiplexer to show that MUX is universal logic circuits.
6 .a. Study of Full-Adder/Full-Subtractor using IC and/ or logic gates.
   b.To study BCD Adder circuit using IC and/or logic gates
7. Realization of RS, JK, and D flip flops using Universal logic gates.
8. Realization of Asynchronous up/down counter.
9. Realization of Synchronous Mod-N counter.
10.Construction and Verification of different Shift Registers.
11. Study of different types of ADC and DAC.

E. Teaching/Learning/Practice Practice Pattern:

Teaching:	40%
Learning:	10%
Practice:	50%

F. Examination Pattern:

1. Theoretical Examination: Open book/ Regular examination and on linetest.
2. Practical Examination: Conducting Experiment and Viva-Voice.

G. Reading List:

Books:

1.Taylor L. Booth, "Introduction to Computer Engg", Wiley
2.B. N Jain and R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill, 2006.
3.C. H. Roth (Jr.), "Fundamentals of Logic design", Cengage Engineering, 2003.
4.M. Morris Mano, "Digital Logic Design", PHI.
5.Malvino & Leach, "Digital Principles and Applications", Tata McGraw Hill.
6.A. Anand Kumar, "Fundamentals of Digital Circuits", PHI.

Magazines:

1.Planet Analog,
2.IEEE Spectrum
3.Electronics for you, EFY Enterprises Pvt. Ltd, New Delhi.
4.Electropages

Journals:

1.International Journal of Electronics Devices and Circuits.
2.IEEE Transaction on Computer-Aided Design of Integrated Circuits and System.
3.IEEE Transaction on Computer.

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Fax: 0360 – 2284972, E-mail: nitarunachal@gmail.com

Department of Civil Engineering

Name of the Module: Historiography of Science & Technology
Module Code: HSS 201
Semester: 2nd
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1.Providing teaching with inclusive learning.
2.Imparting theoretical lectures with case discussion.
3.Making students aware about the importance of this subject in their future career.

B. Learning Outcomes:

Upon completion of the subject:

1. Students will be to work with efficiency as they had knowledge of the subject.
2.With the backup knowledge their performance will definitely be much better in their workplace.

Subject Matter:

Unit I

Introduction: An overview: definitions, Different approaches to the scientific explorations, to introduce humanity‟s endeavour behind science and its application over the centuries, characteristics of histography of science and technology.

Unit II

Motivation: Nature of drives, needs and motives, work motives, need of hierarchy theory and two factor theory of motivation, How to motivate the workers at work, factors effecting the morale of workers.

Unit III

Lives of Eminent Scientists: To understand the Background, Opportunities, Achievements and Qualities in their efforts to become Scientist of first order.
Scientific Eras: Course of Civilization and Scientific Endeavour.

Contribution of science: Contribution to the present day World.

Unit IV

Answers to the Criticism that Science has created a World full of Pollutions

D. Teaching/ Learning:

1. Teaching : 50%
2. Learning/ case presentation : 30%
3. Assignment : 10%
4. Attendance : 10%

E. Examination pattern:

1. Theoretical Examination : 50
2. Class test : 30
3. Assignment : 20

F. Reading List:

Books:

1. Agassi, Joseph. Towards an Historiography of Science, Wesleyan University Press. 1963.
2. Kragh, Helge An Introduction to the Historiography of Science, Cambridge University Press. 1990.
3 .Kuhn, Thomas. The Structure of Scientific Revolutions, Chicago: University of Chicago, 1962 (third edn, 1996)
4. Gopalakrishnan, K.V. Inventors Who Revolutionised Our Lives, National Book Trust, India. 1999.

Journal:

1.Historiography in Graduate Technology
2. Innovation, Technology or History
3. Historiography of the Sciences

Subject Code	Subject	Model	L	T	P	Credit
HSS – 202	Foreign Language (German / Chinese) (Audit)	J.C. Bose	0	0	2	0

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Department of Civil Engineering

Third Semester

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Department of Civil Engineering

THIRD SEMESTER

Subject Code	Subject	Model	P	T	L	Credit
MAS -311	Mathematics III	S.N. Bose	0	1	3	4
CE-301	Civil Engineering Materials & Testing	J.C. Bose	3	0	3	4
CE-302	Surveying-I	J.C. Bose	3	0	3	5
CE-303	Structural Mechanics	J. C. Bose	2	1	3	4
CE-304	Water Supply and Sanitation Engineering	S.N. Bose	0	1	3	4
CE-305	Fluid Mechanics	J.C. Bose	3	0	3	4
HSS-301	Behavioral Science	S. N. Bose	0	0	2	2
			11	3	20	27

Name of the Module: Mathematics III
Module Code: MAS 311
Semester: 3rd
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Is to study the development of functions of one complex variable.
2. Students will perform a thorough investigation of the major theorems of complex analysis – the Cauchy-Riemann Equations, Cauchy‟s Theorem, Cauchy‟s Integral Formula, the Maximum Modulus Principle, Liouville‟s Theorem, the Residue Theorem, Rouche‟s Theorem, the Riemann Mapping Theorem – including their proofs.
3. They will also apply these ideas to a wide range of problems that include the evaluation of both complex line integrals and real integrals.

Learning Outcomes:

Upon completion of the subject:

1. Understand how complex numbers provide a satisfying extension of the real numbers.
2. Appreciate how throwing problems into a more general context may enlighten one about a specific context.
3. Learn techniques of complex analysis that make practical problems easy.

Continue to develop proof techniques.

C. Subject Matter:

Unit I:

Complex variables: Function, Limit and continuity of complex functions, Differentiation of complex functions, Analytic function, Cancly-Riemann equations, Harmonic functions,

Unit II:

Line Integrates, Canchy-Gourset theorem (No Proof required). Cancly‟s Integral formula, Derivative of analytic functions, Taylor‟s and Laurent‟s series, Zeroes, Singular points: essential and removable, Poles, Residue, Residue Theorem, Contour Integration (simple cases only).

Unit III:

Vector and Euclidean spaces, Linea dependence, Bases, Vector space and subspaces, Point sets, Convex sets, Boundary Points, Extreme points, Linear system – Basic Solutions, Basic matrix, Feasible solution, Basic feasible solution,

Unit IV:

Boundary value and Initial value problems leading to partial differential Equation: Method of solution by separation of variables Technique.

Unit V:

Elements of Probability theory: Random experiments and events. Classification of probability, Laws of probability, Conditional probability distribution, Binomial , Normal and Poisson distributions. Negative Binomial distribution and applications.
Statistical methods – Collection and graphical representation of data, Measures of central tendency and measures of dispersion. Correlation and regression, Sampling theory, Hypothesis testing. Confidence interval.

D. Teaching/ Learning/ Practice Pattern:

Teaching:	70%
Learning:	30%
Practice:	0%

Examination Pattern:

1.Theoretical Examination:

Reading List:

Books:

1. C.L. Liu, "Elements of Discrete Mathematics", Mc Graw Hill.
2. Kolman B, Busby R. C, Ross S.C, "Discrete Mathematical Structures", Pearson Education.
3. D.S Malik & M.K.Sen, "Discrete Mathematical Structures: Theory & Applications", Thomson India Edition.
4. T. Veerarajan, "Discrete Mathematics", Mc Graw Hill.
5. N. Chandrasekaran, M. Umaparvathi, "Discrete Mathematics", PHI Learning Private Limited.
6. Babu Ram, "Discrete Mathematics", Pearson.
7. S. Lipschutz, Marc L. Lipson, "Discrete Mathematics", Schaum"s outlines.
8. Norman L. Biggs, "Discrete Mathematics", Oxford.
9. S. K. Chakraborty, B. K. Sarkar, "Discrete Mathematics",
10. K. D. Joshi, "Applied Discrete Structures", New Age International Publishers.

Magazines:

1. Current Science (Indian Academy of Science)
2. The Mathematics Student (Math Student) (Indian Mathematical Society)
3. Mathematical Spectrum(The University of Sheffield)
4. Mathematics Magazine (Mathematical Association of America)
5. +Plus magazine (University of Cambridge)
6. Ganithavahini (Ramanujan Mathematical Society)
7. Mathematics Today, London Metropolitan University.

Journals:

1. SIAM Journal on Discrete Mathematics.
2. Open Journal of Discrete Mathematics. Website: http:// www. scirp. org/journal/ojdm/
3. Discrete Mathematics, Elsevier.
4. Journal of Discrete Mathematics, Hindawi Publishing Corporation.

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Department of Civil Engineering

Name of the Module: Building Construction Technology & Material Testing

Module Code: CE 301
Semester: 3rd
Credit Value: 4[L=3, T=0, P=3]
Module Leader:

Objectives:

The course is design to meet the objectives of:

1. Equipping students with the latest knowledge in construction technology.
2. To maintain different part of buildings.
3. To do building diagnosis and repair.
4. To relate and apply this knowledge in problem solving related to building construction.
5. To have idea of function of each component of building.

Learning Outcome:

Upon completion of the subjects:

1. Identify different building components.
2. Identify the defects in the building and able to rectify it.
3. Will know the importance of foundation in building construction technology.
4. Will have knowledge of functional behaviour of different types of building.

Subject Matter:

Unit I:

Principle properties of building materials: Introduction, Physical properties of building materials, Mechanical Properties of building materials, Characteristics behavior under stress

Cement: Introduction, Portland cement, Chemical composition of raw materials, composition of cement clinker, hydration, rate of hydration, manufacturing, physical characteristics, properties of cement compounds

Aggregate: Introduction, classification, characteristics, deleterious substances, soundness, thermal properties, fine aggregate, coarse aggregate, testing of aggregates, Influence of aggregate on the properties of concrete, aggregate selection

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Department of Civil Engineering

Unit II:

Introduction: Types of Buildings, Components of a Building, Design Load.

Foundation: Function of a foundation, requirements of a good foundation, Types of foundations, Shallow foundation, Deep foundations

Masonry : Stone Masonry, Classification of stone masonry, Dressing of stones, safe permissible loads on stones, Brick masonry: Types of bricks, stretcher bond, header bond, English bond, Flemish bond etc. brick laying, tools for brick laying ,bonds in-connections, brick piers, footings, defects in brick masonry, Tools for brick laying, strength of brick masonry, ornamental brick work, Composite masonry, brick-stone composite masonry

Walls: Load bearing Walls-Design considerations, lateral support ,effective height of wall, Cavity walls-features, wall ties, construction of cavity walls, Partition walls-brick partition ,clay block partition walls, concrete partition lass partitions wood slab partition etc.

Floors: Ground floor-Components of a floor, Materials for construction, selection of flooring materials mud flooring ,brick flooring, cement concrete flooring ,terrazzo flooring ,mosaic flooring ,tiled flooring ,timber flooring etc, Upper floor: steel joist and stone or precast concrete slab floors ,jack arch floors ,reinforced cement concrete floors

Unit III:

Lintels and arches: Classification of Lintels, timber lintels, stone lintels, reinforced cement concrete lintels, types of arch, stability of arch, classification of arch

Stairs: Requirements of a good stairs, dimension of steps, classification of stairs

Roof and Roof coverings: Types of roof-pitched roof, double or purlin roofs, trussed roofs, flat terraced roofing

Doors and windows: Location of doors and windows, Size of doors, door frames, types of doors, windows, types of windows, ventilators

Plastering and Pointing: Types of mortars for plastering, tools for plastering, Number of coats for plaster, Methods of plastering, defects in plastering

Painting, Distempering and Whitewashing: Characteristics of an ideal paint, constituents of a paint, classification and type of paints, defects in painting, Varnishing, Distempering, whitewash and colour washing

Damp proofing: Causes of dampness, effect of dampness, methods of damp proofing, materials used for damp proofing courses, D.P.C treatment in buildings.

Unit IV:

Functional Planning of Buildings:

Planning, Principles of Buildings, Orientation of Buildings, Built Environment, Functional Planning – Lighting, Heating, Ventilation, and Climate factors, Building Service – Circulation, Plumbing, Electrification and Sanitation. Layouts – Residential, Auditorium, Cinema Hall, Studio

List of Practical:

1. Laying of bricks in header bond and to draw its elevation, plan and cross section.
2. Laying of bricks in stretcher bond and to draw its elevation, plan and cross section.
3. Laying of bricks in English bond and to draw its elevation, plan and cross section.

4. Laying of bricks in Flemish bond and to draw its elevation, plan and cross section.
5. Laying of bricks in English bond and to draw its isometric view.
6. Introduction to brick bats such as king closer, queen closer, bevelled closer.
7. Field visit –Demonstrative examples in the field from all the units.
8. To determine the initial and final setting time of cement by using the Vicat Apparatus.
9. Determination of the consistency/workability of concrete by Slump test.
10. Determination of the consistency/workability of concrete by Compaction factor test.
11. Determination of the consistency/workability of concrete by flow table apparatus.
12. Determination of the consistency/workability of concrete by Vee Bee test.
13. To determine the water absorption capacity of standard Bricks.
14. Determination of the efflorescence in the Bricks.
15. To determine the fineness of cement by using the air-permeability apparatus.
16. To determine the specific gravity and water absorption of coarse aggregate.
17. To determine the fineness modulus and particle size distribution of coarse, fine, and all in aggregates
18. To determine the compressive strength of cement sample.

Teaching/Learning/Practice Pattern:

Teaching:	60 %
Learning:	30 %
Practice:	10%

(Teacher is to divide components for T/R/P)

Examination Pattern:

Theoretical Examination
Practical Examination

Reading List:

Books

1. S.K. Duggal, **"**Building Materials" second edition, New Age International Publisher, New Delhi, 2009.
2. S.C. Rangwala, "Engineering Materials", Charotar Publishing House.Gujrat, 2011.
3. S. Somayaji, "Civil Engineering Materials", Prentice Hall Publisher, New Jersey,2001
4.Shan Somayaji „Civil engineering materials" Pearson Publication, 2011

Magazine

1. Materials Today
2. Materials Technology
3. International materials Review
4. Materials Research innovations

Journals

1. Journal of American society of Civil Engineering (ASCE)
2. Journal of Materials and Engineering
3. Institution of Civil Engineers (ICE) journals.

Name of the Module: Surveying-I
Module Code: CE 302
Semester: 3rd
Credit Value: 5 [P=4, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Know the fundamental of surveying in the field.
2. Understand the importance of surveying before any construction work.
3. Have the experimental and Theoretical skills for a professional career in surveying
4. To have knowledge of the carrying out Surveying in the field whenever necessity arises.

B. Learning Outcome:

Upon completion of the subjects:

1. Should be able to understand the basic of surveying.
2. Should be aware of the role of surveying in the site investigation before carrying out any construction work.
3. Will be able to understand the methods of chain and compass surveying
4. The concepts of levelling and contouring will be clear.
5. Will have the knowledge of various surveying equipments and their uses such as Theodolite, compass, plane table etc.

Subject Matter:

Unit I:

Introduction to Chain and Compass Surveying

Introduction, Definition of surveying, primary divisions of surveying, object and classification of surveying, principles of surveying, approximate methods of chine and tape surveying, unfolding and folding of a chain, instruments for chaining and taping, measurement by tape and chain, errors in tape measurements and their corrections, testing and adjusting of a chain, chaining on flat and sloping ground, obstacle in chaining, direct and indirect methods of ranging, methods of traversing, principle basic definitions, bearings and meridians, prismatic compass, surveyors compass, azimuthal and quadrantal bearing systems, true north and magnetic north, magnetic declination, local attraction and its correction.

Unit II:

Levelling and contouring Definition of terms, principles of levelling, types of levels, levelling staffs, booking and reduction in field book, balancing of sights, errors curvature and refraction, distance of visible horizon, reciprocal levelling, and its merits, contour, contour interval, horizontal equivalent, contour gradient, factors affecting contour interval, characteristics of contours, direct and indirect methods of contouring, uses of contour maps.

Unit III:
Theodolite
Vernier and microscopic theodolite, construction, temporary and permanent adjustments, measurements of horizontal and vertical angles, methods of repetitions and reiteration, sources of errors, checks in traversing, omitted measurements

Unit-IV:
Plane table surveying
Principles, merits and demerits, instruments and other accessories, methods used, radiation, traversing, resection, intersection and their uses, two and three point problem.
Areas and volume
Measurement of Area, Computation of area by Geometrical Figure, Area of offsets, Area from co-ordinates, Area by planimeter, Digital Planimeter
Measurement of Volumes
Definitions, Methods of measurement of volume. Measurement from cross-sections, Types of cross-sections and areas, prismoidal correction, curvature corrections

List of Practical:
1. Ranging and chaining of a line AB and taking offsets
2. Traversing with compass and error adjustment to local attraction
3. To determine the difference in elevation of two given points.
4. Profile levelling and cross sectioning of a given route.
5. To measure the horizontal angle by the method of reiteration and repetition.
6. Theodolite traversing.
7. To prepare the contour map of an area by the method of radial lines.
8. Plane tabling by the method of radiation and intersection.
9. To point problem in plane tabling.

E. Teaching/Learning/Practice Pattern:

Teaching: 50%
Learning: 20%
Practice: 30%

(Teacher is to divide components for T/R/P)

G.Examination Pattern:

Theoretical Examination
Practical Examination

G. Reading List:

Books

1.K.R. Arora. „Surveying Volume-I" Standard Publishers Distributors, 2010
2. B.C. Punmia, A. K.. Jain & A.K. Jain, „Surveying Volume-I" Laxmi Publications, 2005
3. R.Agor "Surveying and Levelling", Khanna Publishers.New Delhi,1996
4. S.K.Duggal "Surveying Volume-I",Tata McGraw Hill Publisher,New Delhi,2004
5. Kanetkar and Kulkarni "Surveying and Levelling" Pune Vidyarthi Griha Prakashan,Pune,1985

Magazine

1. Civil Engineering Surveyor.
2. Survey Review.

Journals

3. Journal of Surveying Engineering(ASCE)
4. Journal of surveying and mapping Engineering.
5. Applied Materials & Interfaces.
6. Materials Science and Engineering.
7. Journal of Tribology.

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Department of Civil Engineering

Name of the Module: Structural Mechanics
Module Code: CE 303
Semester: 3rd
Credit Value: 4 [P=3, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet the objectives of:

1.To establish an understanding of the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behaviour.
2. To provide students with exposure to the systematic methods for solving engineering problems in solid mechanics.
3. To discuss the basic mechanical principles underlying modern approaches for design of various types of structural members subjected to axial load, torsion, bending, transverse shear, and combined loading.
4. To build the necessary theoretical background for further structural analysis and design courses.

Learning Outcome:

Upon completion of the subjects:

1. Understand the concepts and principles applied to members under various loadings and the effects of these loadings.
2. Analyze and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials.
3. Analyze columns and pressure vessels under various loadings.
4. Conduct himself or herself professionally and with regard to his or her responsibilities toward society, especially with respect to designing machine parts and structures to prevent failure.

C. Subject Matter:

Unit I:

Simple stresses and strains: Stress, strain, types of stresses, elastic limit, Hooke‟s law, Analysis of bars of varying sections, law of superposition, composite bar, thermal stress, thermal stresses in composite bars, elongation of bar due to its own weight, stress-strain diagram.
Elastic constants: Introduction, longitudinal & lateral strain, Poisson‟s ratio, volumetric strain for rectangular bar, Bulk Modulus, Principle of complementary shear stress, Relation between various elastic constants .

Unit II:

Principle stresses and strain: Introduction, Principle planes and principle stresses, methods for determining stresses on oblique section, Analytical method, Graphical method, Mohr‟s circle, use of Mohr‟s circle to find Principle stresses.
Strain Energy and Impact Loading: Introduction, Resilience, proof resilience, Modulus of Resilience, expression for strain energy stored in a body for different loading conditions and shear stress.

Unit III:

Shear force and bending moment: Introduction, different types of beams and loads, S.F & BM diagram for a cantilever, uniformly distributed load, simply supported beam for various types of loading, relation between load, shear force and bending moment diagram.

Unit IV:
Torsion of shafts: Introduction, Basic assumptions, Derivation of shear stress produced in a circular shaft subjected to torsion, Max. Torque transmitted by acicular and hollow circular shaft. Polar modulus, strength of a shaft and tensional rigidity, composite shafts, combined bending and torsion. Strength of a shaft of varying cross section.

Thin and Thick cylinder: Introduction ,Thin cylindrical vessel subjected to internal pressure, expression for circumferential and longitudinal stress in thin cylinder , stresses in thick cylindrical shells, stresses in compound thick cylinder.

List of Practical:

1. To determine hardness of material with the help of the following methods
   i) Rockwell ii) Brinell iii) Vickers etc.
2. To determine the impact strength of materials with the help of pendulum type impact testing machine.
3. To determine tensile properties of ductile material with the help of Universal testing machine (UTM).

4. To determine the compressive properties of non-ductile materials with the help of UTM.
5. To determine the compressive strength of brittle materials with the help of compressive testing machine.
6. To perform various types of non-destructive tests and thus obtain various properties of materials.
7. To determine the creep and fatigue of a material using Creep testing and Fatigue testing machine.

E. Teaching/Learning/Practice Pattern:

Teaching:	60 %
Learning:	20 %
Practice:	20%

(Teacher is to divide components for T/R/P)

F. Examination Pattern:

1.Theoretical Examination
2. Practical Examination

Reading List:

Books

1. S Ramamrutham , "Strength of materials",DhanpatRai Publishing Company.
2. Dr R K Bansal "A Text Book of Strength of Materials",Laxmi Publications (P) Ltd.
3. L C Singal and N D sharma "Strength of materials", Modern Publishers.
4. S Subramanian, "Strength of Materials", Oxford University Press.
5. Beer, Johnston, "Mechanics of Materials", Tata McGraw-Hill Publications.
6. Timosanko, "Strength of materials" ,Van Nostrand .
7. Rattan, "Strength of materials",TMH.
8. G.H.Ryder, Mc Millan, "Strength of Material", ELBS Edition.
9. Nash, "Strength of Materials", Schaum series, MGH.
10. Timoshenko & Young , "Elementary of strength of material ", Tata Mc Graw Hill, New Delhi.

Magazine

1. Popular Mechanics.
2. Everyday Engineering Magazine

Journals

1. Engineering Fracture Mechanics
2. International Journal of fracture.
3. *Strength of Materials* - Springer
4. Strength of Materials | Elsevier

Name of the Module: Water Supply & Sanitation Engineering
Module Code: CE 304
Semester: 3rd
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

Objectives:

1. To identify the sources and quantity of surface and ground water bodies.
2. To understand the various demand of water by the public.
3. To study the quality of water.
4. To have step wise knowledge of the working of water treatment plant.

Learning Outcome:

Upon completion of the subject:

1. Will have understanding on the importance of water supply scheme.
2. Will have knowledge about the various public water demands.
3. Will have knowledge of the various sources of water supply.
4. Will have idea about the quality of water supplied to every household.
5. Will have understanding about the various purification process.

C. Subject Matter:

Unit I:

Public Water Supply Scheme and Quantity of Water: Necessary and objectives of public water supply schemes – planning and financing ,Quantity of water ,water requirements, continuous and intermittent supply, rate of demand, variations in rate of demand ,its effect on design, design periods and capacities of different components, population growth and forecast, estimating the quantity of water required

Unit II:

Hydrological concepts and sources of water
Hydrological concepts, hydrological cycle, precipitation, types of precipitation, rainfall measurements, estimation of surface runoff, Sources of water, types of sources ,lakes, ponds, rivers, infiltration galleries, storage reservoirs, storage capacity by analytical method and mass curve method ,types of wells, sanitary protection of wells, tests for yield of a well, Estimating yield of wells under steady state condition.

Unit III:

Quality of water and transportation of water
Quality of water, portable water, pure water, mineral water, impurities in water sampling analysis of water, water borne diseases, quality standards of water. Transportation of water , Hydraulics of pipe flow, design of pipes, pumps , types of pumps ,selection of pump

Purification of water
Treatment of water- working principles, Purpose and design of all the unit process of water treatment, screening, plain sedimentation, coagulation sedimentation, filtration, disinfection, water softening

Unit IV:

Other treatments and distribution of water
Removal of color, odor and tastes, Removal of Iron and Manganese, Fluoridation and Defluoridation Intakes ,types ,Intake Tower ,Distribution of water, Planning, Methods of Distribution, Distribution (Service) Reservoirs, purpose, types ,locations and height, Design aspects , requirements of good distribution system methods of layout of distribution pipes, preventive methods to reduce wastage of water, Pipe appurtenances ,Impact of water supply schemes

D. Teaching/Learning/Practice Pattern:

Teaching:	80 %
Learning:	20 %
Practice:	0%

(Teacher is to divide components for T/R/P)

Examination Pattern:

1. Theoretical Examination

Reading List:

Books

1. Garg. S.K., "Water Supply Engineering", Khanna Publishers, Delhi, September, 2001.
2. Birdie. G.S., "Water Supply and Sanitary Engineering", Dhanpat Rai and sons, 1991.
3. Mark J. Hammer "Water and Waste Water Technology", Prentice Hall of India Pvt. Ltd, New Delhi, 2008
4. Fair. G.M., Geyer.J.C., "Water Supply and Wastewater Disposal", John Wiley and Sons, 1954.
5. Babbit.H.E, and Donald. J. J, "Water Supply Engineering", Mc Graw Hill book Co, 1984.
6. Steel. E.W.et al., "Water Supply Engineering", Mc Graw Hill International book Co, 1984
7. Duggal.K.N., "Elements of Public Health Engineering", S.Chand and Co, 1985.

Magazine

1. Waste Management & Water Supply Magazines
2. Water World.
3. Water and waste digested
4. Engineering and Technology Magazine

Journals

1 .Journal of Applied Water Engineering and Research (JAWER)
2. Journal of Water Resource and Hydraulic Engineering (JWRHE)
3. Journal of Water Supply: Research and Technology – Aqua
4. Journal of Water and Health
5. Drinking water Engineering and Science

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Fax: 0360 – 2284972, E-mail: nitarunachal@gmail.com

Department of Civil Engineering

Name of the Module: Fluid Mechanics
Module Code: CE 305
Semester: 3rd
Credit Value: 4 [P=3, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. An understanding of fluid mechanics fundamentals, including concepts of mass and momentum conservation.
2 .An ability to apply the Bernoulli equation to solve problems in fluid mechanics.
3. An ability to apply control volume analysis to problems in fluid mechanics.
4. An ability to use potential flow theory to solve problems in fluid mechanics.
5. An ability to perform dimensional analysis for problems in fluid mechanics.
6. Knowledge of laminar and turbulent boundary layer fundamentals.
7. An exposure to recent developments in fluid mechanics, with application to aerospace systems.
8. An ability to apply the concepts developed for fluid flow analysis to issues in aerospace design.

B. Learning Outcome:

Upon completion of the subject:

1. Know, understand and apply the basic concepts of Fluid Mechanics to carry out professional engineering activities in the field of fluids.
2. Apply scientific method strategies to fluid mechanics: analyse qualitatively and quantitatively the problem situation, propose hypotheses and solutions
3. Use specific vocabulary and terminology and the appropriate means to effectively communicate knowledge, procedures, results, skills and aspects inherent to fluid mechanics.
4. Work efficiently in a group, integrating skills and knowledge to make decisions in the performance of fluid mechanics tasks, adopting a responsible and organised attitude to work and a willingness to learn.
5. Plan and carry out designs and processes in the field of fluid mechanics in accordance with the relevant specific technology, applying the quality principles and methods and
analysing and assessing the social and environmental impact of the technical solutions adopted.

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C. Subject Matter:

Unit I

Fluid statics: Properties of fluid, classification of fluid- ideal and real fluids, Newtonian and non Newtonian fluids. Compressible and incompressible fluids. Fluid Statics: Pressure at point, Pascal's law, Variation of pressure within a static fluid - hydrostatic equation, measurement of pressure, total fluid pressure on plane and curved areas, buoyancy, stability of submerged and floating bodies.

Fluid kinematics: Flow characteristics, continuity equation, acceleration of fluid particles, rotational and
irrotational motion, circulation and vortex, velocity potential and stream function, streamlines, equipotential lines, flow net - method, use and limitations.

Unit II

Fluid dynamics: Euler‟s equation, energy equation and Bernoulli's equation, application of Bernoulli's equation-orifice meter, venture meter, pivot tube etc., flow through orifice, mouth piece, weir and notches, impulse momentum equation and its application, pipe junction, bends, stationary flat and curved
vanes, moment of momentum equation.

Unit III

Flow through pipes: Reynolds‟ experiment, laws of fluid friction, Darcy-Weisbach equation, energy losses, equivalent pipe, pipes in series and parallel, branched pipes, time of emptying a reservoir through pipe, pipe networks. Laminar flow through circular pipes, parallel plates.

Turbulent flow: Shear stresses, establishment of flow, types of boundaries, mixing length concept, velocity distribution, mean velocity and resistance to flow in smooth and rough pipes, friction in non-circular conduits.

Unit IV

Dimensional analysis and similitude: Dimensional homogeneity, Non Diomensional parameter, Π theorem, dimensional analysis-chice of variables, Reyleigh methods, examples-Rise in capillary tube, head characteristics of a pump, drag on a ship, Fall velocity of a sphere, velocity in an open channel, pipe
orifice, discharge over a sharp edge weir, celerity of a gravity wave. Model analysis-similitude, types of similarities, force ratios, similarity laws, model classification, scale effects.

List of Practical:

1.Viscometer
2.Surface Tension
3.Metacentric Height
4.Bernoulli's Equation
5.Impact of a Fluid Jet
6.Horizontal Water Jet through an Orifice
7.Orifice Meter
8.Venturimeter
7.Triangular Weir or V-notch
8.Flow through Porous Medium
9.Stokes' Law
10.Transition from Laminar to Turbulent Flow

11. Velocity Distribution in Pipes
12.Frictional Head Losses in Smooth and Rough Pipes
13.Minor Losses in a Pipeline
14.Bend Meter
15.Boundary Layer over a Flat Plate
16.Uniform Flow in a Channel
17.Velocity Distribution in a Channel
18.Broad-Crested Weir
19.Hydraulic Jump
20.Free Overfall
21.Horizontal Expansion in a Channel
22.Ogee (Overfall) Spillway
23.Forced hydraulic jump

Teaching/Learning/Practice Pattern:

Teaching:	60%
Learning:	20%
Practice:	20%

(Teacher is to divide components for T/R/P)

Examination Pattern:

1.Theoretical Examination

2;.Practical Examination

G. Reading List:

Books

1. S.K Bansal , "Fluid Mechanics & Hydraulic Machines", LaxmiPublications.
2. Y.A.Cengel, "Fluid Mechanics: Fundamentals & Applications",Tata McGraw-Hill.
3. A.KJain, "Fluid Mechanics", Khanna Publishers.
4. R.K Rajput, "Fluid mechanics & Hydraulic machines",S. Chand Publications.
5.S.K. Som and G. Biswas, "Introduction to Fluid Mechanics and Fluid Machines",Tata McGrawHill.
6. K.L. Kumar, "Engineering Fluid Mechanics", Eurasia Publishing House.
7. A.K. Jain, "Fluid Mechanics", Khanna Publishers.
8. Streeter and Willy, "Fluid Mechanics", McGraw.
9. B.S Massey, "Mechanics of Fluid", Van Nostrand .
10.Robert W.Fox, "Introduction to Fluid Mechanics", Wiley.

Magazine

1. Pumps & Systems.
2. World Pumps.
3. Hydraulics & Pneumatics

Journals

1. International Journal of Heat and Fluid Flow
2. Journal of Fluids Engineering
3. International Journal of Heat and Fluid Flow

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Department of Civil Engineering

Fourth Semester

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Department of Civil Engineering

FOURTH SEMESTER

Subject Code	Subject	Model	P	T	L	Credit
MAS-401	Stochastic Process	S.N Bose	0	1	3	4
CE-401	Applied Hydraulic Engineering	S.N Bose	0	1	3	4
CE-402	Geotechnical Engineering-I	J.C. Bose	2	0	3	4
CE-403	Civil Engineering Drawing	J.C. Bose	2	0	0	2
CE-404	Structural Analysis-I	S.N Bose	2	1	3	4
CE 405	Engineering Geology	J.C. Bose	2	0	3	4
CE-406	Concrete Technology	J.C. Bose	2	0	3	4
HSS-401	Entrepreneurship and innovation	S.N. Bose	0	0	3	3
			12	2	21	29

Name of the Module: Applied Hydraulic Engineering
Module Code: CE-401
Semester: 4th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

(i) To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines

B. Learning outcomes:

(i) The student should be able to relate the theory and practice of problems in hydraulic engineering

(ii) The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels

C. Subject Matter

Unit I

UNIFORM FLOW

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Velocity distribution in open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow – Computation in Uniform Flow - Specific energy and specific force - Critical depth and velocity.

Unit II

GRADUALLY V ARIED FLOW

Dynamic equations of gradually varied and spatially varied flows - Water surface flow profile classifications: Hydraulic Slope, Hydraulic Curve - Profile determination by Numerical method: Direct step method and Standard step method, Graphical method - Applications.

Unit III

RAPIDLY VARIED FLOW

Foundation: Function of a foundation, requirements of a good foundation, Types of foundations, Shallow foundation, Deep foundations

Teaching/Learning/Practice Pattern:

Teaching:	60 %
Learning:	15 %
Practice:	25 %

(Teacher is to divide components for T/R/P)

Examination Pattern:

1.Theoretical Examination

2. Assignments

Reading List:

A. Books:

1. Jain. A.K., "Fluid Mechanics", Khanna Publishers, Delhi, 2010.
2. Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2002.
3. Subramanya K., "Flow in open channels", Tata McGraw Hill, New Delhi, 2000.
4. Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
5. Rajesh Srivastava, "Flow through open channels", Oxford University Press, New Delhi, 2008.
6. Bansal, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 2008.
7. Mays L. W., "Water Resources Engineering", John Wiley and Sons (WSE), New York, 2005

B. Magazine:

1. Pumps & Systems.
2. World Pumps.
3. Hydraulics & Pneumatics

C. Journals

1. International Journal of Heat and Fluid Flow
2. Journal of Fluids Engineering
3. International Journal of Heat and Fluid Flow

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Department of Civil Engineering

Name of the Module: Geotechnical Engineering-I
Module Code: CE 402
Semester: 4th
Credit Value: 4 [P=2, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To have impart the knowledge about the origin of soil.
2. To know how to classify the soil.
3. To have idea about the soil, air water relationship.
4. To have idea of the different properties of soil.
5. To inject injecting research directions in the field of Geotechnical Engineering.

B. Learning Outcome:

1. Students will have idea about the basic Soil Mechanics.
2. Special terminology related to soil mechanics will be clear.
3. Students will be able to efficiently deal with the problems of seepage.
4. Will have idea about the compressibility, consolidation and shear strength characteristics of soil.
5. Will have idea about the earth pressure and stability of the soil.
6. Will have knowledge of permeability of different type of soil.

C. Subject Matter:

C. Subject Matter:

Unit I: Soil: Origin and types, Identification and classification of soils, Index properties, phase relationship, consistency, sensitivity, clay mineralogy

Unit II: Seepage: Darcy‟s law of permeability, Determination of Coefficient of permeability, Equivalent permeability for stratified soil, Flow nets – principles, construction and application, Effective stress analysis, quick sand condition, piping, filtration criteria.

Compaction: Principle of compaction, Light and heavy compaction, field compaction control, factors affecting compaction.

Unit III: Compressibility and Consolidation: Terzaghi‟s theory of one-dimensional consolidation, Secondary Consolidation, estimation of consolidation settlement.

Unit-IV: Shear Strength of Soil: Strength envelope, total and effective stress paths, pore pressure, evaluation of shear strength parameters, direct shear, triaxial shear, vane shear, unconfined compression test.

D. List of practicals

1. Determination of moisture content
2. Determination of specific gravity
3. Grain size analysis
   a.Sieve analysis
   b.Hydrometer analysis
4. Determination of consistency limits
5. Permeability test
   a.Constant head method
   b.Falling head method
6. Proctor test
7. Direct shear test
8. Unconfined compression test
9. Consolidation test
10. Triaxial test

E. Teaching/Learning/Practice Pattern:

Teaching:	60%
Learning:	15%
Practice :	25%

(Teacher is to divide components for T/R/P)

F. Examination Pattern:

1. Theoretical Examination
2. Practical Examination

G. Reading List:

Books

1. B.M Das, „Fundamentals of Geotechnical Engineering‟,Cengage learning,2010
2. Ranjan and Rao, „Basic and applied soil Mechanics‟New age international,2000
3. B.C. Punmia and Jain „Soil mechanics and foundations‟firewall media,2005

Magazine

1. Material science
2. Geovision
3. Geoenginners

Journals

1. Geotechnique
2. Journals of Geotechnical and Geomaterials
3. Journals on Geotechnical and Geophysical site characterization

Name of the Module: Civil Engineering Drawing
Module Code: CE 403
Semester: 4th
Credit Value: 2[P=2, T=0, L=0]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Increase ability to understand Engineering Drawing.
2. Learn to sketch and take field dimensions.
3. Learn to draw the basic various Civil Engineering Structures.
4. Learn basic engineering drawing formats.
5. Prepare the student for future Engineering positions.

B. Learning Outcome:

Upon completion of the subject:

1. Student will be able to draw various building, bridges, and foundations
2. Student will be able to read the Drawing for estimate purpose.

C. Subject Matter:

Unit- I:
Material Symbol

Masonry: Brick Masonry, Bonds, Tee-Junction, stone masonry-stone masonry joints Foundations: Isolated footings, Raft foundations, Grillage, Pile foundation, Well foundation

Unit –II:
Arches, lintels: Semicircular brick arch, Flat arch, horse shoe-arch, circular arch
Stair cases: Straight Flight Stair, Dog legged stairs, open well stairs or newel stairs, Geometrical stairs, spiral stairs, Bifurcated stairs

Joints in carpentry: Lap joint, fish joint ,tabled Joint, spliced joint, Dove-tail Joint, Double notched joint, Tenon joint, mortice and Tenon Joint, Beveled joint.
Door and windows: Ledged and Battened door, framed and Paneled door
Unit –III:

Building Drawing: Plan, Elevation, Sectional elevation of building & structures

Unit –IV:
Introduction to AUTOCAD and its application.

D. List of Practical:

1. Masonary
2. Foundations
3. Arches
4. stairs
5. Joints
6. Door and window
7. Building drawing

E. Teaching/Learning/Practice Pattern:

Teaching:	20 %
Learning:	10 %
Practice:	70%

(Teacher is to divide components for T/R/P)

F. Examination Pattern:

1. Practical Drawing.
2. Assignment.

G. Reading List:

Books

1. V. B Sikka, "Civil Engineering drawing", Kataria Publishing,2009
2. Rangwala, "Civil Engineering drawing", Charoatar Publishing House
3. Meo And Mallick, "Civil Engineering drawing", Indian publishing house
4. Jolhe "Engineering Drawing" Tata McGraw Hill,
5. Venugopal K and Prabhu Raja V "Engineering Graphics", New age publications.
6. VenuGopal, „Engineering Drawing, Graphics and Autocad, Tata Mc graw Hill.

Journals

1. International Journal of Design Engineering.
2. Engineering Design Graphics Journal.
3. Journal of Engineering Graphics
4. Journal of Visual arts practice

Name of the Module: Structural Analysis-I
Module Code: CE 404
Semester: 4th
Credit Value: 4[P=2, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Understand the role of analysis in the structural design process
2. Understand the theory that underlies the primary classical methods of analysis
3. Become proficient in applying the classical methods of analysis with speed and accuracy
4. Develop an understanding of the most important qualitative aspects of structural behaviour
5. Acquire a foundation of knowledge of completed works of structural engineering.
6. Learn a general framework for structural analysis, which includes modeling, selection of method, Application of method, and checking of results

B. Learning Outcome:

Upon completion of the subjects:

1. Knowledge of various analysis methods in structure.
2. Knowledge of importance of structural analysis.
3. An ability to use analyzes the load of the various members of the structure.
4. Will have an idea about of the deflections of beam.
5. Will be efficient in analyzing the strength in arches and cable.

C. Subject Matter:

Unit I

Introduction to Structural analysis: Forms of structures, Loads and Forces, Free body diagram, conditions of equilibrium of forces, support and connections, Determinate and Indeterminate structures.

Bending moment and shear force diagram of determinate beams, frames and Three hinged arches.

Unit II

Deflection in Beams: Computation of slope and deflection by double integration, moment area method, conjugate beam method, applications to simply supported, overhang and cantilever beams.

Unit III

Strain energy - Axial , Bending, Shear and Torsion.

Castigliano‟s theorems and their applications to find deflection of determinate beams & Trusses, Analysis of Redundant trusses .

Unit IV

Analysis of Determinate trusses - Method of joints and sections, Graphical method, Deflection of trusses, Maxwell‟s reciprocal theorem, Betti‟s theorem and their applications.

Unit IV

Analysis of Two hinge archs. Cable and stiffening girders.

Unit IV

Column and Struts: Buckling load: Euler's theory, Rankine's theory, empirical formulae, column under eccentric load; Beam -Column, Buckling analysis by energy principle.

Unsymmetrical bending; shear flow, shear center problems.

D. Teaching/Learning/Practice Pattern:

Teaching:	60 %
Learning:	15 %
Practice:	25%

(Teacher is to divide components for T/R/P)

E. Examination Pattern:

Theoretical Examination

F. Reading List:

Books

1.C.S.Reddy „Basic Structural Analysis" Tata McGraw-Hill Education, New Delhi, 1994.
2. C.K.Wang „Indeterminate Structural Analysis"
3. J.B.Willbur, C.H. Norris and Utku „Elementary structural analysis"
4. B.G. Neal „Plastic methods of Structural analysis"
5. B.C.Punmia, Ashok Jain, Arun Jain „Theory of Structures"

Magazine

1. Structure magazines
2. Harper"s magazines
3. ANSYS advantage magazine

Journals

1. Journals of structural engineering (ASCE)
2. International journal of structural stability and dynamics
3. International Journal of Advanced Structural Engineering

Name of the Module: Engineering Geology
Module Code: CE 405
Semester: 4th
Credit Value: 4[P=2, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To have knowledge of the origin of the earth and its structure and its position in the solar system.
2. To have idea about the physical, chemical properties and the occurrence of the minerals.
3. To have knowledge about the formation of different types of rock.

B. Learning Outcome:

Upon completion of the subject:

1. Student will have knowledge about the Origin of earth.
2. Students will be confident in preparing the geological map and the use of aerial map in 3. 3. 3.geological surveying.
4. Students will be able to distinguish between the different types of rocks and minerals.

C. Subject Matter:

Unit I

General Geology: Branches and scope of geology, Earth, its position in the solar systems, surface features and internal structure, work of natural agencies like lakes, oceans, atmosphere, wind, streams, sea, glacier, Earth movements. Types of weathering, mountains and mountain building.
Mineralogy: Definition of crystal and a mineral, the study of the physical properties and occurrence of quartz, Feldspar, Mica, kyanite, calcite, tale, corundum, gypsum, fluorite, biotite, mus, covite, graphite, realgar, magnetite, limonite, pyrite, galena, barite, dolomite, garnet, tourmaline,chal-copy-rite, opal, topaz, autite, hornblende, epidate, kaolinite, diamond.

Unit II

Petrology: Formation and classification of rocks into three types, Igneous, sedimentary and metamorphic rocks, description of physical properties for constructional purposes of granite, pegmatite, dolerite, gabbzo, basalt, sandstone, conglomerate, breccias, limestone, shale, schist, marble, quartzite, khondalite, slate, gneiss, andesite, stratigraphy of India (a general idea), principles of correlation, fossils, their preservation and significance

Structural geology: Strike and dip, out crops, volcanoes, overlaps, inliers and outliers, types classification of folds, faults, joints, unconformities

Unit III

Engineering Geology: Ground water, zones of ground water, water table and perched water table, water bearing properties of rocks, occurrence of ground water, springs, selection of a site for well sinking and ground water investigations.

Earthquakes and landslides: Classification, causes and effects of earthquakes and landslides, seismic curve, seismographs, seismograms, accelograms, seismic problems of India, seismic zones of India, remedial measures to prevent damage for engineering structures, case histories.

Geological investigation: Interpretation of geological maps, use of aerial maps in geological surveying, geophysical methods as applied to civil engineering for subsurface analysis (Electrical and Seismic methods).

Unit IV

Geology of dams and reservoirs: Types of dams, requirements of dam site, preliminary and detailed geological investigations for a dam site, important international and Indian examples of failures of dams and their causes, factors affecting the seepage and leakage of the reservoirs and the remedial measures, silting of reservoirs.

Rock mechanics and tunneling: Purposes of tunneling and geological problems connected with tunneling, geological considerations in road alignment, roads in complicated regions, problems after road construction, geology of bridge sites

List of Practical:

1. Study of Crystal Models.
2. Study of Mineral Hands Specimens.
3. Study of Rock Hand Specimens, (Igneous, Sedimentary and metamorphic rocks).
4. Study of Optical Properties of rocks and minerals.
5. Study of Geological maps.
6. Field trip and field report.

Teaching/Learning/Practice Pattern:

Teaching:	60 %
Learning:	15 %
Practice:	25 %

(Teacher is to divide components for T/R/P)

Examination Pattern:

1. Theoretical Examination
2. Practical examination

G. Reading List:

Books

1. Prabin Singh,"Engineering and General Geology" S.K. Kataria and Sons, New Delhi.
2. P.K. Mukherjee, "A text Book of Geology", the world Press Private Limited, Calcutta.
3. S.K. Garg, "Physical and Engineering Geology", Khanna Publishers, Delhi..
4. E.S. Dana, "Mineralogy" Wiley Eastern Ltd., New York, John Wiley & sons,1935
5. M.S. Krishnan, "Geology of India and Burma", CBS publishers and distributors,Delhi,2009
6. N. Chenna Kasavulu, "Engineering Geology" Macmilan , New Delhi

Magazine

1. Earthwise magazines
2. Geological magazines
3. The Geological society of America
4. Geologynet

Journals

1. Geology and Geoscience Journals
2. Open Journal of Geology
3. The Journal of Geology
4. Journal in Geology-Springer
5. Bulletin of engineering geology & environment
6. Journal of the Geological Society

Name of the Module: Concrete Technology
Module Code: CE 406
Semester: 4th
Credit Value: 4[P=2, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To impart knowledge regarding ingredients of concrete and their properties.
2. To have knowledge about the properties of concrete in plastic and hardened stage, water cement ratio and workability.
3. To impart knowledge on proportioning of ordinary concrete, concreting operations, joints in concrete.

B. Learning Outcome:

Upon completion of the subject:

1. Students will be confidence in supervise in the concreting operations involving proportioning, mixing, transporting, placing, compacting and curing of concrete.
2. Will have better understanding of the role of concrete technology in the construction world.

C. Subject Matter:

Unit I:

Cement and Admixtures: Types of Portland cement, hydration, setting and hardening process, special hydraulic cements, Admixtures, accelerators, and retarders, air-entraining agents, plasticizer and super-plasticizers.

Aggregates: Shape & texture, bond, strength, specific gravity, bulk-density and moisture content of aggregates, bulking of sand, deleterious substances in aggregates, alkali-aggregate reaction, sieve-analysis and grading curves, fineness modulus, practical grading, gap grades aggregates.

Unit II:

Fresh Concrete: Rheological aspects such as workability-flow ability, compatibility & mobility of concrete, factors affecting workability and lab determination, segregation, bleeding & laitance.

Strength of Concrete: Compressive strength and factors affecting it, behaviours or concrete under various stress states, testing of hardened concrete-cube and cylinder test, Platen effect, flexure test, non-destructive testing such as rebound hammer, USPV, core-cutting stress-strain relation and modulus of elasticity, shrinkage, creep of concrete and its effect

Unit III:

Durability of Concrete: Corrosion of reinforcing bars, sulphate attack, frost action, deterioration by fire, concrete in seawater, acid attack, carbonation.

Mix Design: Basic consideration-cost, workability, strength and durability grading, method of mix design, acceptance criteria for concrete

Unit IV:

Advances in Construction Materials:

Higher strength concrete, fibre-reinforced concrete, concrete containing polymers, heavy weight and light weight concrete, mass concrete, blended concrete, Ferro-cements & its applications, Geopolymer concrete, Self Compacting concrete.

D. Teaching/Learning/Practice Pattern:

Teaching:	60 %
Learning:	15 %
Practice:	25 %

(Teacher is to divide components for T/R/P)

E. Examination Pattern:

Theoretical Examination
Practical

Laboratory work

Test on Cement & Aggregates
Concrete Mix design
Admixed concrete
Special Concrete
Non-Destructive test on concrete

F. Reading List:

Books

1. K. Mehta „Concrete, Structures, Properties and Materials" Prentices-Hall, Inc., New Jersey, USA.
2. A.M. Neville „Properties of Concrete" Longman, UK.
3. M.L. Gambhir „Concrete Technology" Tata McGraw Hill, New Delhi.
4. J.H. Bungey „Testing of Concrete in Structures" Surrey Univ Press, New York.
5. M.S. Shetty „Concrete Technology" S.Chand & company Ltd., New Delhi,2000

Magazine

1. Concrete technology today magazines
2. Magazines of concrete research

Journals

1. International *Journal of Concrete* Structures and Materials
2. The Indian concrete Journal
3. Journal of advanced Concrete technology
4. Cement and concrete research

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Department of Civil Engineering

Name of the Module: Entrepreneurship and innovation
Module Code: HSS 401
Semester: 4th
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. **Objectives:**

The course is design to meet with the objectives of:

1. Students will be able to involved themselves in the business activities
2. Students will be able to start innovative practices in their entrepreneurial activities.
3. Students will be able to develop their skills on the traits that they want to carry forward.
4. Students will be able to start activities on Forest based Technology.

B. Learning Outcomes:

Upon completion of the subject:

Students will be able to start their venture more scientifically.
Students will be able to start their venture by linking with the financial institutions.

C. Subject Matter:

Unit I:

Introduction to Entrepreneurship: Meaning, Role of Entrepreneur, Entrepreneur Process: different approaches, Motivation for becoming an Entrepreneur.
SME Concept, its role, status, prospects and policies for promotion of SMEs.
Importance of Entrepreneurship: innovations, Qualities of successful Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneur, Issues & Problems Entrepreneurial Practices,

Unit II:

Importance of Entrepreneurship: innovations: Converting Innovation to Economic Value which includes, Growth Strategies, value position, Market Segments, Value Chain Structure, Revenue Model etc., Qualities of successful Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneur, Issues & Problems Entrepreneurial Practices.
Contribution of Entrepreneurs: Towards R&D, creates Wealth of Nation & Self prospect with Challenge.
Entrepreneur Carrier: Different Stages, Entrepreneur Development Programmers (EDPs).

Unit III:

Characteristics of Entrepreneurship: Risk taker, Perceptive, Curious, Imaginative, Persistent, Goal setting, Hardworking, Research & Management Skill, Organising & Controlling, Soft skills and Feasibility.
Women Entrepreneurship: Opportunities, promotion Hurdles and Prospects of women Entrepreneurs.
Factors & Models of Entrepreneurial Development.
Social Entrepreneurial Initiative: Solving social Problems, Business plan, Strategic Plan vs Business Plan

Unit IV:

Forest based Industries: Mobilization of resources from NTFP products, Processing units, Technical and Financial Feasibility study and analysis of projects under self employment scheme including small entrepreneur.
Farm based enterprises for production and post production of Agri-produce:
Crops: Cereals, Legumes, Oilseeds; Horticulture crops : Fruits and vegetables; Livestock production : Poultry, Fishery, Medicinal and Aromatic plants.
Handlooms & Sericulture; Handicraft, coir, jute & leather
Micro entrepreneurial skills development and good production practices

D. Teaching/ Learning/ Practice Pattern:

Teaching:	70%
Learning:	30%
Practice:	0%

Examination Pattern:

Theoretical Examination

Reading List:

Books:

1. Management And Entrepreneurship N. V. R. Naidu, Naidu I. K. International Pvt Ltd, 01-Jan-2008
2.Social Enterprise Developing Sustainable Businesses Frank Martin and Marcus Thompson Palgrave Macmillan
3. Small Business Management and Entrepreneurship David R. Stokes, Nicholas Wilson Cengage Learning EMEA, 2006 - Business & Economics

Entrepreneurship: Theory, Process, Practice Donald F. Kuratko Cengage Learning, 14-Nov-2008 Business & Economics

Essentials of entrepreneurship and small business management Thomas Zimmerer, Norman M. Scarborough, Doug Wilson Pearson/Prentice Hall, 2008 - Business & Economics

Entrepreneurship 6/E Robert D. Hisrich Tata McGraw-Hill Education, 2011 - Entrepreneurship

Journals:

1.International Journal of Entrepreneurship

2. International Journal of Innovation Management

3. Journal of Small business and Entrepreneurship

2.

4. Journal of Human Values.

5. Journal of Management Research

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Department of Civil Engineering

Fifth Semester

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Department of Civil Engineering

FIFTH SEMESTER

Subject Code	Subject	Model	P	T	L	Credit
HSS-501	Industrial Engineering and management	S.N. Bose	0	0	3	3
CE-501	Design of RC Structures	S.N. Bose	0	1	3	4
CE-502	Surveying-II	J.C. Bose	3	0	3	4
CE-503	Transportation Engineering-I	J.C. Bose	3	0	3	4
CE-504	Environmental Engineering-I	J. C. Bose	3	0	3	4
CE-505	Structural Analysis-II	S.N. Bose	0	1	3	4
CE-506	Engineering Hydrology	S.N. Bose	0	1	3	4
			9	3	21	27

Name of the Module: Design of RCC Structures I
Module Code: CE 501
Semester: 5th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Imparting theoretical knowledge in the designing of Reinforced Cement Concrete structures.
2. To have confidence in the analysis of different component of R.C.C structures.
3. Providing confidence to students in analysis and Designing of the R.C.C Structures.
4. Injecting future scope and the research directions in the field Structural Design.

B. Learning outcomes:

Upon Completion of the subjects:

1. Students will know the approach to R.C.C structures design.
2. Will have the Knowledge of various design methodology.
3. Students will have idea about design constraints.
4. Will have idea about the factors affecting the design

C. Subject Matter:

Unit I:
Concrete and structural materials; properties of concrete; codes of practices, working stress and limit state design of reinforced concrete structures: Single and doubly reinforced rectangular, T,L, sections against bending moment and shear forces, bond stress; development length and lap length.

Unit II:
One -way and two -way slabs, staircase, continuous beams.

Unit III:
Design of axially loading columns; design of columns under combined bending and axial load.

Unit IV
Design of Isolated & combined footing , strip and raft foundation.

D. Practical
- Assignments

E. Teaching/Learning/Practice Pattern:
Teaching : 80%
Learning : 20%
Practice : 0%
(Teacher is to divide components for T/R/P)

F. Examination Pattern:

1.Theoretical Examination

G. Reading list:

Books

1. Limit State Design of Reinforced Concrete by P.C. Varghese, Prentice Hall of India, New Delhi
2. Reinforced Concrete by S.K Mallick and A.P. Gupta, Oxford and IBH
3. Reinforced Concrete Design by S.N. Sinha, Tata Mc Graw Hill
4. Reinforced Concrete by A.K. Jain, Nemchand Brothers, Roorkee
5. Reinforced Concrete Fundamental by Farguson, Beru and Jarsa, John Wiley and Sons, N.Y

6. Reinforced Concrete Fundamental by C.K. Wang and C.G. salmon, Harpur International Edition
7. IS:456-2000 by BIS, BIS
8. J.N Banapadhyay,RC Design,PHI
9. SP.16 (Design Aid) by BIS, BIS

Magazines:

1. Alliance magazine
2. Structural magazines

Journals:

1. International Journal of Concrete Structures and Materials

Name of the Module: Surveying-II
Module Code: CE 502
Semester: 5th
Credit Value: 4[P=3, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Know the fundamental of surveying in the field.
2. Understand the importance of surveying before any construction work.
3. Have the experimental and Theoretical skills for a professional career or graduate study in surveying.
4. To have knowledge of the carrying out Surveying in the field whenever necessity arises.

Learning Outcome:

Upon completion of the subjects:

1. Should be able to understand the basic of surveying.
2. Should be aware of the role of surveying in the site investigation before carrying out any construction work.
3. Will be able to understand the methods of chain and compass surveying
4. The concepts of levelling and contouring will be clear.
5. Will have the knowledge of various surveying equipments and their uses such as theodolite, compass, plane table etc.

Subject Matter:

Unit-I
Leveling: Trigonometric leveling, Base of the object accessible, base of an inclined object accessible, R.L of an elevated points with inaccessible bases, Cross-sectioning, profile leveling, Precise Leveling, Reciprocal Leveling

Unit-II
Tachometry: Instrument used, Methods of Tacheometry, fixed hair method, movable hair method, range finding, Omnimeter
Triangulation: Principles of triangulation, Classifications, purpose, layout, Field work, Types of triangulation station

Unit-III

Curves: Types of curves, elements of curve, different methods of setting out-simple circular curves, compound curves, reverse curves, transition curves, types of transition curves, super-elevation, suitability of a circular curve, vertical curves.

Unit-IV
Introduction to total station: Features of total station, setting up and orientation of total station, electronic data recording, field procedures.
Introduction to GIS, GPS and remote sensing.

D. List of Practical:
1.Profile Levelling
2.Precise Leveling
3.Cross-sectioning
4.Reciprocal Levelling
5.Total Station survey

E.Teaching/Learning/Practice Pattern:

Teaching: 50%
Learning: 20%
Practice: 30%
(Teacher is to divide components for T/R/P)

F. Examination Pattern:

1. Theoretical Examination
2. Practical Examination

Reading List:

Books

1. *K.R. Arora. „Surveying Volume-I" Standard Publishers Distributors, 2010*
2. *B.C. Punmia, A. K.. Jain & A.K. Jain, „Surveying Volume-I" Laxmi Publications 2005*
3. *R.Agor "Surveying and Levelling", Khanna Publishers.New Delhi,1996*
4. *S.K.Duggal "Surveying Volume-I",Tata McGraw Hill Publisher,New Delhi,2004*
5. *Kanetkar and Kulkarni "Surveying and Levelling" Pune Vidyarthi Griha Prakashan,Pune,1988*

Magazine

Civil Engineering Surveyor.
Survey Review.

Journals

Journal of Surveying Engineering(ASCE)
Journal of surveying and mapping Engineering.
Applied Materials & Interfaces.
Materials Science and Engineering.
Journal of Tribology.

Name of the Module: Transportation Engineering-I
Module Code: CE 503
Semester: 5th
Credit Value: 4[P=3, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

Provide a systematic understanding of the causes and motivations of Highway location, planning and geometric design.
To have idea about road planning and development.
To have idea about the pavement design.
To have idea about the hill roads and highway maintenance

B. Learning Outcome:

Upon completion of the subject:

Students will be confident in pavement designing.
Students will have idea about the construction of highways.
Students will be able to do road planning and development.

C. Subject Matter:

Unit I:

Road development and planning: Brief history of road development, Road cross section, necessity of transportation planning, classification of roads, road patterns, planning surveys, saturation system, highway planning in India, road development plans.

Highway location and alignment: Basic requirements of an ideal alignment and factors controlling, engineering survey for highway location, drawing and reports, highway projects.

Highway geometric design: Highway cross section elements, sight distances, Design of horizontal alignment, Transition curves and vertical alignment.

Unit II:

Traffic engineering: Traffic characteristics, traffic studies and their uses, traffic flow characteristics, traffic control devices, intersections, traffic planning, Trip generation models, trip distribution models, modal split analysis.

Unit III:

Pavements design: Design factors, Design of flexible pavements, CBR, GI and Bur mister methods, Design of rigid pavements.

Pavement materials: Soils, Aggregates and their characteristics, bituminous materials and mixtures, Portland cement concrete.

Construction of roads: Construction of water bound macadam roads, bituminous pavements, cement concrete pavements, design and construction of joints in cement concrete pavements.

Unit IV:

Hill roads: General considerations, alignment, geometric design and construction, drainage and maintenance problems in hill roads.
Highway maintenance: Pavement failures, maintenance of highway pavement , evaluation and strengthening of existing pavements.

D. List of Practical:

1 To determine the impact value of aggregates
To determine the crushing value of aggregates
To determine the flakiness and elongation index of aggregates.
To perform Los Angeles and test on aggregates.
To determine the CBR value of a given soil sample.

E. Teaching/Learning/Practice Pattern:

Teaching: 60%
Learning: 20 %
Practice: 20 %

(Teacher is to divide components for T/R/P)

Examination Pattern:

Theoretical Examination
Practical Examination

Reading List:

Books

Patha Chakraborty and Animesh Das, "Principles of Transportation Engineering"
Satish Chandra and M.M Agarwal, "Railway Engineering"
S.C. Rangwala, ,,Railway Engineering"
B.L Gupta and Amit Gupta, ,,Railway Engineering"
Norman J. Ashford, Saleh Mumayiz, Paul H. Wright, "Airport Engineering: Planning, Design and Development of 21st Century Airports"
Rangwala, "Airport Engineering"Chorator publishing house,2013
IRC code

Magazine

Traffic Engineering & *Control* Magazine
Transport Engineer magazine
Civil engineering magazines

Journals

Journal Of transportation engineering (ASCE)
International Journal of system and Engineering (Science direct)
Journal of advanced transportation
Transportation research record

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Department of Civil Engineering

Name of the Module: Environmental Engineering-I
Module Code: CE 504
Semester: 5th
Credit Value: 4[P=3, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet the objectives of:

1 .To impart basic knowledge of Environmental Engineering
2. To develop graduates that function successfully in areas of environmental engineering, such as air pollution, water and wastewater treatment, and solid and hazardous waste engineering
3. To promote the safety, health, and welfare of the public and environment through professional practice and civic leadership.

B. Learning Outcome:

Upon completion of the subjects:

1. Students will be able to work understand the hygienic, safety and healthy environment.
2. Students will be able to design the various wastewater conveyance and the distribution systems.
3. Students will be able to deal with the various rural and urban sanitation system.

C. Subject Matter:

Unit I:

Water environment:
Environment, water resources of hydrosphere, different water pollutants and their impacts on human being, sources of supply, yield, design of intakes, estimation of demand, design period.

Water and waste water characteristics:
Water quality criteria and standards for potable and industrial uses, control of water borne diseases, Physical, chemical and biological characteristics of domestic and industrial waste waters, significance of pollutant parameters and effluent discharge standards.

Unit II:

Treatment objective and methods: Unit operations and processes and selection of treatment mode and sequence.

Primary treatment: screening, neutralization, equalization, flocculation, sedimentation, floatation, stripping.
Secondary treatment: suspended and attached biological growth systems for aerobic, anaerobic, and anoxic processes, lagoons and stabilization ponds.
Tertiary treatment: Oxidation/reduction, precipitation, adsorption, ion exchange and membrane (R) O/UF) Processes, disinfection.

Unit III:

Conveyance and distribution systems:

Conductors: different pipe systems, design considerations, laying, testing and effects of pipe corrosion and its preventive measures.
Sewers: hydraulic design, construction and appurtenances, operation and maintenance.
Pumps and pumping: necessity, types of pumps, characteristics curves, selection criteria, economical diameter of pumping/transmission main, problems in sewage pumping.
Distribution network: methods, layout, storage, and distribution reservoir, analysis of distribution systems.

Unit IV:

Plumbing systems:

General principles, materials for service pipe, service connection, water meters, and valves, Principles of house drainage, pipes, traps, sanitary fittings, systems of plumbing, house drainage plans.

Rural and Semi urban sanitation:
Collection and disposal of dry refuse, sullage, excretal waste, night soil disposal without water carriage, latrines,
chemical toilets, precast units for low cost sanitation.

D. List of Practical:

1. To find the turbidity and colour of a given sample of water.
2. To determine the pH value of a given sample of water.
3. To determine the carbonate, bicarbonate, and hydroxide alkalinity of a sample.
4. To find out the concentration of chlorides in the given sample of water.
5. To estimate the hardness of the given sample of water by standard EDTA method.
6. To determine residual chlorine in a given sample of water.
7. To find out total dissolved solid, Settleable solids and suspended solids of the given sample.
8. To find the quantity of dissolved oxygen (DO) present in the given sample.
9. To determine biochemical oxygen demand (BOD) exerted by the given waste water sample.
10. To find the optimum amount of coagulant required to treat the turbid water by Jar Test.
11. To find out total bacterial count present in a given sample (SPCT).
12. To determine MPN of Coliforms of the given sample.

E. Teaching/Learning/Practice Pattern:

Teaching:	60%
Learning:	20%
Practice:	20 %

(Teacher is to divide components for T/R/P)

F. Examination Pattern:

Theoretical Examination
Practical Examination

G. Reading List:

Books

1. *B.C. Punmia „Environmental Engg. (Vol. I)" Laxmi Publications.*
2. *S.K. Garg „Water Supply Engg. (Vol. I)" Khanna Publications, 2003.*
3. *Peavy & Raow „Environmental Engineering" McGraw Hill Publications.*
4. *G.S. Birdi „Water Supply".*

Magazine

1. *Environmental* Science & *Engineering Magazine*
2. *Environmental Engineer Magazine*
3. *Environmental Engineering* Science

Journals

1. *Journal of Environmental Engineering* (ASCE)
2. International *Journal of Environmental Engineering* (IJEE)
3. *Journal of Environmental Engineering* and Science

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Department of Civil Engineering

Name of the Module: Structural Analysis-II
Module Code: CE 505
Semester: 5th
Credit Value: 4[P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To learn about different types of beams.
2. To learn about different method of analysis of structures.
3. To learn how to analyse the masonry dam and retaining walls.

B. Learning Outcome:

Upon completion of the subjects:

1. Student will know different analysis method of structures.
2. Student will know different types of beams.
3. Student will have confidence in analyzing the masonry dams and retaining units.

B. Subject Matter:

Unit I

Introduction to indeterminate structures, Static and Kinetic indeterminacy.

Theorem of three moments: Fixed, Propped and continuous beams., Sinking of support, temperature effect.

Unit II

Slope deflection method, Moment distribution method, Kanis Method –analysis of indeterminate Beams and Building frames, Analysis of Multistoried frames using approximate methods- Portal & Cantilever methods – Substitute frame analysis.

Unit III

Trusses and rigid frames by consistent deformation method , Column analogy method and elastic centre method.

Unit IV

Moving loads and Influence lines: Influence line diagram for determinate beams, trusses and three hinged arches, suspension bridges.

Muller, Breslau‟s Principle for indeterminate Structures.

D. Teaching/Learning/Practice Pattern:

Teaching:	70%
Learning:	30 %
Practice:	0 %

(Teacher is to divide components for T/R/P)

E.Examination Pattern:

Theoretical Examination
Assignments

F. Reading List:

Books

1. *Arun Jain „S.Reddy „Basic Structural Analysis" Tata McGraw-Hill Education, New Delhi, 1994.*
2. *C.K.Wang „Indeterminate Structural Analysis"*
3. *J.B.Willbur, C.H. Norris and Utku „Elementary structural analysis"*
4. *B.G. Neal „Plastic methods of Structural analysis"*
5. *B.C.Punmia, Ashok JainTheory of Structures"*

Magazine

1. *Structure magazines*
2. *Harper"s magazines*
3. *ANSYS advantage magazine*

Journals

1. *Journals of structural engineering (ASCE)*
2. *International journal of structural stability and dynamics*
3. *International Journal of Advanced Structural Engineering*

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Department of Civil Engineering

Name of the Module: Engineering Hydrology
Module Code: CE 506
Semester: 5th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

i)To impart Knowledge about the Hydrology

ii) To understand the various Precipitation, runoff and Floods

B. Course outcome

i) Students will be have thorough knowledge about the hydrologic cycle

ii)Students will understand the changes related to weather conditions

C. Subject Matter

Unit-I

Introduction to Hydrologic cycle,water budget equation,
Precipitation: Weather system for precipitation, Characteristics of precipitation, Raing Gauge Network, preparation of Data, Depth-Area duration relationship, rainfall data in India

Unit-II

Stream flow measurement: measurement of stage, measurement of velocity, area-velocity method, Stage-discharge relationship, extrapolation of rating, hydrometry stations,
Runoff: Hydrograph. Runoff characteristics of streams, flow-duration curve, flow-mass curve, Droughts

Unit-III

Factors affecting flood hydrograph, Components of a hydrograph, Base Flow separation, effective rainfall, unit hydrograph, derivation of unit hydrograph, unit hydrograph of different durations, use and limitations of different hydrograph, Distribution graph

Unit-IV

Flood routing: Basic Equations, hydrologic storage routing, attenuations, hydrologic channel routing, hydraulic method of flood routing, flood control, Nash conceptual model,
Groundwater: Forms of subsurface water, Aquifer properties Geologic formation as Aquifer, equation of motions, wells, steady flow in a well, open wells, confined and unconfined aquifer, well loss, specific capacity, recharge

D. Teaching/Learning/Practice Pattern:

Teaching:	70%
Learning:	30 %
Practice:	0 %

(Teacher is to divide components for T/R/P)

E.Examination Pattern:

1.Theoretical Examination
2.Assignments

F.Reading List:

Books

1. K Subramanya, „Enginnering Hydrology" TMH
2. Ojha „Engineering hydrology" Oxford

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Department of Civil Engineering

Name of the Module: Industrial Engineering and Management
Module Code: HSS 506
Semester: 5th
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Imparting theoretical lectures with case discussion.
2. Providing teaching with inclusive learning.
3. Making students aware about the importance of this subject in their future career.

Learning Outcomes:

Upon completion of the subject:

1 .Students will be work with efficiency as they had knowledge of the subject.
2. With the backup knowledge their performance will definitely much better in their workplace.

Subject Matter:

Unit I

Concept of Management: Various approaches to Management, Management as–anart, a Science, and a Profession, Managerial skills, Process o management, Planning-Mission, Goals, Strategy, Program and Procedure; Decision making-process ,decision making under risk and uncertainty, Models of decision making.

Unit–II

Principles of Organization: Organizational Structure, span of control, Staffing function with emphasis on, Performance Appraisal, Training and Development.

Unit–III

Direction and coordination: Motivation and Leadership, control function-Process and Techniques.

Unit–IV

Production Management: Types of Production, Locational Decisions, Plant layout and design, Production Planning scheduling and control: work study, method Study, and Wage Payment s chemes and Bonus, Productivity–concept and measurement. Material Management Inventory Planning, P r o c u r e m e n t - functions, procedures and control , storing-planning procedure and control, issue and pricing , Inventory control Techniques, Value analysis and Engineering.

D. Teaching/ Learning Pattern:

1.Teaching : 50%
2.Learning/ case presentation : 30%
3.Assignment : 10%
4.Attendance : 10%

E. Examination pattern:

1. Theoretical Examination : 50
2. Class test : 30
3. Assignment : 20

F. Reading List:

Books:

1. Badiru ,A (ed),2005, Hand Book of Industrial and System Engineers, CRC press.
2. Blanch 1and, B& Fabrycky,W. 2005. System Engineering Analysis (4th Ed.). Prentice Hall.
3. Salvendy, G.(Ed.)2001.Hand Book Of Industrial Engineering: Technology &Operations Management, Wiley-Inter service.
4. Turner, W.et.al.1992 Introduction to Industrial and System Engineering (3rd ed.) Prentice Hall.

Journals:

1. Group and Organization Management
2. Journal of Organizational Behaviour
3. Journal of Managem.

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Department of Civil Engineering

Sixth Semester

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Department of Civil Engineering

SIXTH SEMESTER

Subject Code	Subject	Model	P	T	L	Credit
CE 601	Geotechnical Engineering-II	J.C. Bose	3	0	3	4
CE 602	Design of Structures	S.N. Bose	0	1	3	4
CE 603	Irrigation and Hydraulic Structure	S.N. Bose	0	1	3	4
CE 604	Transportation Engineering-II	J.C. Bose	3	0	3	4
CE 605	Design of steel Structures	S.N. Bose	0	1	3	4
MAS 602	Numerical Methods in Engineering	J.C. Bose	3	0	3	4
HSS-601	Engineering Ethics and IPR	S.N Bose	0	0	3	3
HSS- 602	Disaster Management	S.N. Bose	0	0	2	2
			9	3	23	29

Name of the Module: Geotechnical Engineering-II
Module Code: CE 601
Semester: 6th
Credit Value: 4[P=3, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet the objectives of:

1. Fully understand the concept of Geotechnical Engineering.
2. Be able to understand the bearing capacity of the soil and to have knowledge of the various tests which can calculate the bearing capacity of soil.
3. Be able to settlement of foundations
4. Be able to do the site investigation and subsurface exploration.

B. Learning Outcome:

Upon completion of the subjects:

1. Students will be expert in bearing capacity calculation.
2. Student will know the method to solve the settlement problems in foundations.
3. Ability to do site investigations and subsurface explorations.

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Department of Civil Engineering

C. Subject Matter:

Unit I: Subsurface Investigation: Purpose of site investigation ,Borings method, Auger Boring, Wash boring Percussion boring, Area ratio, Soil report, Soil profiling

Unit II: Earth Pressure: Types of Earth pressure. Rankine's Active and passive earth pressure, Smooth Vertical wall with horizontal backfill. Extension to Soil, Coulombs wedge theory, Culman's and Rebhann's graphical method for active earth pressure. Bulkheads Classifications, Cantilever sheet Piles

Unit III: Slope Stability: Infinite slope, finite slope-form of slip surfaces, Limiting equilibrium method, C-φ analysis, Method of slices, location of most critical circle, stability of earth dam slope, friction circle method, Taylor's stability number, Bishop's method of stability analysis, use of stability coefficients, effect of earthquake forces

Bearing Capacity: Safe bearing capacity and allowable bearing pressure, Terzaghi's bearing capacity equations, its modifications for square, rectangular and circular foundation, General and local shear failure conditions, Factors affecting bearing capacity of Soil. Allowable bearing pressure based on values, Bearing capacity from plate load tests.

Unit-IV Shallow Foundations: Factors effecting locations of foundation and design considerations of shallow Foundations, Choice of type of foundations, Foundations on expansive soils. Settlement analysis: causes of settlement, Computation of settlement, allowable settlement. Measures to reduce settlement

Pile Foundations: Types, Construction, load carrying capacity of single pile Dynamic Formula, Static formula, Pile load tests, Load carrying capacity of pile groups, settlement of pile groups, Negative skin friction.

D. List of practical

1. Determination of the shear strength of soil sample by vane shear test
2. Determination of relative density of soil by vibration table method
3. Determination of field density of soil by sand replacement meyhod
4. Determination of soil resistivity
5. Determination of liquid limit of soil by cone penetration method
6. Determination of SPT value
7. Determination of shear strength parameters of soil by direct shear test (Digitised)
8. Determination of shear strength parameters by triaxial test
   i) UU test
   ii) CU test
   iii) CD

E. Teaching/Learning/Practice Pattern:

Teaching:	70 %
Learning :	20 %
Practice :	10 %

(Teacher is to divide components for T/R/P)

F.Examination Pattern:

1. Theoretical Examination
2. Practical Examination

G.Reading List:

Books

1. *B.M Das, „Fundamentals of Geotechnical Engineering",Cengage learning,2010*
2. *Ranjan and Rao, „Basic and applied soil mechanics"new age international,2000*
3. *B.C. Punmiaand Jain „Soil mechanics and foundations"firewall media,2005*

Magazine

1. *Material science*
2. *Geovision*
3. *Geoenginners*

Journals

1. *Geotechnique*
2. *Journals of Geotechnical and Geomaterials*
3. *Journals of Geotechnical and Geophysical site characterization*

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Department of Civil Engineering

Name of the Module: Design of Structures
Module Code: CE 602
Semester: 6th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To teach students the various design aspects in concrete structures designing.
2. To teach students advanced of concrete structure designing
3. To have idea of advanced methodology of design.

B. Learning Outcome:

Upon completion of the subject:

1. Students will know the advanced approach to R.C.C structures design.
2. Will have the Knowledge of various design methodology.
3. Students will have idea about design constraints.

4 .Will have idea about the factors affecting the design

C. Subject Matter:

Unit I:

Retaining Walls: Types of retaining walls, lateral earth pressure on retaining walls, Rankine's theory, Design of cantilever and ounterfort type retaining walls.

Unit II:

Earthquake & Wind resistance Design of RCC high rise building Structures
Slab, Beam, Column and different types of foundation i. e pile foundation, raft, strip etc.

Unit III:

Design of beams curved in plan
Rectangular and Circular water tanks resting on ground, Underground tanks and Overhead water tanks

Unit-IV

Design of Bunkers and Silos, Jansen's and Airy's theories.
Design of Pre-stressed concrete structure

D. Teaching/Learning/Practice Pattern:

Teaching:	80 %
Learning:	20 %
Practice:	0 %

(Teacher is to divide components for T/R/P)

D. Teaching/Learning/Practice Pattern:

Teaching:	80 %
Learning:	20 %
Practice:	0 %

(Teacher is to divide components for T/R/P)

E.Examination Pattern:

Theoretical Examination and Open book examination.
Assignments

F. Reading List:

Books

1. *Duggal S K „Design of Steel Structures" Tata McGraw-Hill Education, 2000.*
2. *Punmia „Design of Steel Structures" Firewall Media, 1998.*
3. *S.Ramamrutham „Design of Steel Structures" Dhanpat Rai Publishing Company (p) Ltd., 1975.*
4. *N. Subramanian „Steel Structures" Oxford University Press, 2011.*
5. *S.S. Bhavikatti „Design of Steel Structures" I.K. International Publishing House Pvt. Ltd. (2012)*

Magazine

1. *Modern steel construction*
2. *Steel construction news*

Journals

1. *International Journal of steel design-springer*
2. *Journal of constructional steel*
3. *Journal of steel and composite structures*

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Department of Civil Engineering

Name of the Module: Irrigation Engineering & Hydraulic structures

Module Code: CE 603

Semester: 6th

Credit Value: 4 [P=0, T=1, L=3]

Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Advise developers, system managers and water users on the operation and maintenance of irrigation, drainage and flood protection systems.
2. Understand the economic, social and environmental aspects of land and water development concepts
3. Monitor and evaluate the technical, managerial and institutional performance of irrigation and drainage systems.

B.Learning Outcome:

Upon completion of the subject:

1. Students will be able to understand the basic concept of hydrology.
2. Confidence in Precipitation and Runoff calculation.
3. Idea about the various Irrigation structures
4. Knowledge of the Groundwater flow.

C. Subject Matter:

Unit I

Unit I

Water requirement of crops

Crop period or base period, delta of a crop, delta on a field, relation between duty and delta, food and nonfood crops, kharif and rabi crops, gross command area, cultivable command area, intensity of irrigation, net and gross sown areas

Irrigation engineering:

Flow irrigation: Types of irrigation, methods of applying water to the crops, surface, subsurface irrigation, sprinkler‟s irrigation, best method of irrigation, uncontrolled or wild floods, free flooding

Furrow irrigation system, deep percolation losses, runoff losses, irrigation application efficiency, design of furrow irrigation system,

Sprinkler irrigation: Advantages and disadvantages of nozzles, types of sprinkler system, nozzle-line systems, rotating sprinkler system

Unit II:

Canals

Canals and classification of canals, layout and design of canals, considerations for alignment, Alignment of a water course, inundation canals, most economical sections, Design of non-scouring channels, channel or channel losses, empirical formula for losses, Economics of lining, advantages of lining,
Water logging: causes and control, drainage system design, salinity

Design of stable channels

Limitation of Kenedy"s theory, Lacey"s regime theory, Lacey"s regime equations, modern simplified equations for optimal design of alluvial canals, Actual design for irrigation

Unit III:

Cross drainage works: Introduction, Types of cross drainage works-Aqueduct, siphon aqueduct, superpassage, canal-syphon or siphon, level crossing ,inlets and outlets, selection of cross-drainage works

Canal falls: Location of falls, types of falls, classification of falls, Design of straight glacis fall, design of sarda type fall

Canal regulations: Canal escapes types of canal escapes, canal regulator, distributor head regulator

Canal outlets: Types of outlets, performance of modules, types of non-modular outlets-open sluice and submerged pipe outlet, rigid modules

Unit IV:

River training works: Introduction, different methods

Spillway: Introduction, types, design of spill way, energy dissipation structures

Reservoirs: types, stability analysis

Water power engineering: Introduction, components in hydroelectric plant, different turbines

D. Teaching/Learning/Practice Pattern:

Teaching:	70 %
Learning:	30 %
Practice:	0 %

(Teacher is to divide components for T/R/P)

E. Examination Pattern:

1. Theoretical Examination

F. Reading List:

Books

1. *G L Asawa „Irrigation and Water Resources Engineering" New Age International, 2006.*
2. *R K Sharma T K Sharma „Irrigation Engineering (Inculding Hydrology)" S Chand & Company.*
3. *Punmia, Brij Lal, Jain, „Irrigation and Water Power Engineering" Laxmi Publication Ltd., 2009*
4. *N Balasubramanya, K Raghupathi „Hydrology & Irrigation Engineering" Sapna Book House, 2013.*
5. *Basak „Irrigation Engineering" Tata McGraw-Hill Education, 1999*
6. *Irrigation and hydraulic structures, „V.C Agarwal" kataria publications*

Magazine

1. *Alliance magazine*

Journals

1. *Journal of hydraulic structures*
2. *International Journal of irrigation structures*

Name of the Module: Transportation Engineering-II
Module Code: CE 604
Semester: 6th
Credit Value: 4[P=3, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To have a wide idea of the urban transportation system.
2. To have knowledge of basic concept of Airport Engineering.
3. To have knowledge of basic concept of Railway Engineering.

B. Learning Outcome:

Upon completion of the subjects:

1. An ability to transport system management.
2. An ability to design runaway and to calculate the airport capacity.
3. A knowledge of airport pavement design
4. An ability to know the railway tracks, stresses in rails, track alignment

C. Subject Matter:

Unit I:

Urban Transportation planning: Introduction, Transportation system management, Transportation plan, Travel forecasting, Trip generation models – Multiple linear regression analysis, Category analysis, Trip Distribution – Fratar method, Gravity model, Mode usage – Trip interchange mode choice models, Trip assignment-Minimum path techniques.

Unit II:

Airports: Introduction, ICAO, Aircraft characteristics, Airport Planning, Regional planning, development of new airports, airport site selection, Airport obstructions, Zoning, classification of obstructions, imaginary surfaces, approach zone and turning zones, Runway design, airport capacity, loading apron, service hanger, taxiway design, introduction to airport pavement design.

Unit III:

Railways: Component parts of railway track, gauges, resistances to traction and stresses in track, various resistances and their evaluation, hauling capacity and tractive effort, stresses in rail, sleepers, Coning of wheels, creep, wear, joints in rails, sleeper types, rail fittings and fixtures, ballast, Geometric Design, Track alignment, horizontal curves, super elevation, equilibrium cant and cant deficiency, transition curves, vertical curves-gradients and grade compensation, points and crossings, Design of simple turn out, various types of track junctions, Principles and classification of signals, functions and methods of interlocking.

Unit IV:

Highway Engineering – Design & specification
Bridge Engineering: Introduction to bridge Engineering, Standard specification of road bridges.

Bridge Engineering: Introduction to bridge Engineering, Standard specification of road bridges.

E. Teaching/Learning/Practice Pattern:

Teaching:	70 %
Learning:	30%
Practice:	0 %

(Teacher is to divide components for T/R/P)

F. Examination Pattern:

Theoretical Examination

G. Reading List:

Books

1. Patha Chakraborty and Animesh Das, "Principles of Transportation Engineering"
2. Satish Chandra and M.M Agarwal, "Railway Engineering"
3. S.C. Rangwala, ,,Railway Engineering"
4. B.L Gupta and Amit Gupta, ,,Railway Engineering"
5. *Norman J. Ashford, Saleh Mumayiz, Paul H. Wright, "Airport Engineering:*
6.Planning, Design and Development of 21st Century Airports"
7. Rangwala, "Airport Engineering"Chorator publishing house,2013

Magazine

1. *Traffic Engineering* & Control *Magazine*
2. Transport Engineer magazine
3. Civil engineering magazines

Journals

1. Journal Of transportation engineering (ASCE)
2. International Journal of system and Engineering (Science direct)
3. Journal of advanced transportation
*4. Transportation research recor*d

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Department of Civil Engineering

Name of the Module: Design of Steel Structures

Module Code: CE 605

Semester: 5th

Credit Value: 4[L=0, T=1, P=3]

Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To teach students the various design aspects in steel structures designing.
2. To teach students basic of steel structure designing
    2. To have idea of welded, bolted and riveted connections in steel structures.
    3.

B. Learning Outcome:

Upon completion of the subject:

1. Students will be confident in designing the steel structures.
2. Capable to analyze the load on the structures.
3. Will have clear idea about the welded, bolted, riveted connections
4. Students should be capable of designing structures in steel and understand its structural behaviour.
5. Students will have idea about the steel roof trusses.
6. Students will know the role of steel in the Construction works.

C. Subject Matter

Unit I:

Mechanical properties of metals and their specifications for structural use; Advantages ad disadvantages of steel structures, Loads and load combination, Design considerations, Limit state method (LSM) of design, Failure criteria for steel, codes, specification and section classification

Plastic behaviour of steel- introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, theory of plastic collapse, Methods of plastic analysis, Plastic analysis of continous beams, Effect of normal and shear forces on plastic moments, lateral buckling and local buckling of beam.

Unit II:

Connections -Riveted , bolted and welded joints and connections, Design of tension and compression members, Design of lug angles and tension splices, compound columns with lacing and batterns using both elastic and limit state method.

Unit III:

Design of beams, plated beams and built-up beams, Design of members under combined axial load and moment. Plate Girder and Gantry Girder, Design of column bases- Slab base, Gusseted base, and column bases subjected to axial forces & moment using both elastic and limit state method.

Unit IV

Roof trusses- Introduction, Selection of the roof trusses, loads on roof truss, design procedure
Steel buildings and bridges- using both elastic and limit state method

D. List of Practical:

Nil

E. Teaching/Learning/Practice Pattern:

Teaching:	70 %
Learning:	30 %
Practice:	0 %

(Teacher is to divide components for T/R/P)

F. Examination Pattern:

Theoretical Examination
Practical Drawing

G.Reading List:

Books

1. *Duggal S K „ Limit state Design of Steel Structures" Tata McGraw-Hill Education, 2000.*
2. *Punmia „Design of Steel Structures" Firewall Media, 1998.*
3. *S.Ramamrutham „Design of Steel Structures" Dhanpat Rai Publishing Company (p) Ltd.,*
4. *N. Subramanian „Steel Structures" Oxford University Press, 2011.*
5. *S.S. Bhavikatti „Design of Steel Structures" I.K. International Publishing House Pvt. Ltd.(2012)*

Magazine

1. *Modern steel construction*
2. *Steel construction news*

Journals

1. *International Journal of steel design-springer*
2. *Journal of constructional steel*
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Department of Civil Engineering

Name of the Module: Numerical Methods in Engineering
Module Code: MAS 602
Semester: 6th
Credit Value: 4 [P=3, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Introducing the basic concepts of round off error, truncation error, numerical stability and condition, Taylor polynomial approximations; to derive and apply some fundamental algorithms for solving scientific and engineering problems: roots of nonlinear equations, systems of linear equations, polynomial and spline interpolation, numerical differentiation and integration, numerical solution of ordinary differential equations.
2. Application of computer oriented numerical methods which has become an integral part of the life of all the modern engineers and scientists. The advent of powerful small computers and workstation tremendously increased the speed, power and flexibility of numerical computing.
3. Injecting future scope and the research directions in the field of numerical methods.

B. Learning outcomes:

Upon Completion of the subject:

1. Students will be skilled to do Numerical Analysis, which is the study of algorithms for solving problems of continuous mathematics.

4. Students will know numerical methods, algorithms and their implementation in „C" for solving scientific problems.
3. Students will be substantially prepared to take up prospective research assignments.

C. Subject Matter:

Unit I:

Errors in computation: Overflow and underflow; Approximation in numerical computation; Truncation and round off errors; Propagation and control of round off errors; Chopping and rounding off errors; Pitfalls (hazards) in numerical computations (ill conditioned and well conditioned problems).

Unit II:

Interpolation: Lagrange‟s Interpolation, Newton‟s forward & backward Interpolation Formula. Extrapolation; Newton‟s Divided Difference Formula; Error; Problems.

Unit III:

Numerical Differentiation: Use of Newton‟s forward and backward interpolation formula only.
Numerical Integration: Trapezoidal formula (composite); Simson‟s 1/3rd formula (composite); Romberg Integration (statement only); Problems.

Unit IV:

Numerical Solution of System of Linear Equations: Gauss elimination method; Matrix Inversion; Operations Count; LU Factorization Method (Crout‟s Method); Gauss-Jordan Method; Gauss-Seidel Method; Sufficient Condition of Convergence.

Numerical Solution of Algebraic and Transcendental Equations: Iteration Method: Bisection Method; Secant Method; Regula-Falsi Method; Newton-Raphson Method.

Numerical solution of Initial Value Problems of First Order Ordinary Differential Equations: Taylor‟s Series Method; Euler‟s Method; Runge-Kutta Method (4th order); Modified Euler‟s Method and Adams-Moulton Method.

List of Practical:

1. Assignments on Interpolation: Newton forward & backward, Lagrange.
2. Assignments on Numerical Integration: Trapezoidal Rule, Simson‟s 1/3rd Rule.
3. Assignments on Numerical solution of a system of Linear Equations: Gauss elimination, Gauss Jordan, Matrix Inversion, Gauss Seidel.

4. Assignments on Solution of Algebraic Equations: Bisection, Secant, Regula-Falsi, Newton-Raphson Methods.
5. Assignments on Ordinary Differential Equations: Taylor Series, Euler‟s Method, Runge-Kutta (4^{th} Order).

Teaching/Learning/Practice Pattern:

Teaching : 40%
Learning : 10%
Practice : 50%
(Teacher is to divide components for T/R/P)

F. Examination Pattern:

1. Theoretical Examination : Open book and on line.

G. Reading list:

Books

1. *D. Kincaid and W. Cheney, Numerical Analysis: Mathematics of Scientific Computing, 3rd Ed., AMS, 2002.*
2. *K. E. Atkinson, An Introduction to Numerical Analysis, Wiley, 1989.*
3. *S. D. Conte and C. de Boor, Elementary Numerical Analysis - An Algorithmic Approach, McGraw-Hill, 1981.*
4. *C.M. Bender and S.A. Orszag, Advanced Mathematical Methods for Scientists and Engineers, McGraw-Hill Book Co., 1978.*
5. *John H. Mathews, Numerical Methods for Mathematics Sciences and Engineering 2^{nd} ed. Prentice Hall of India, New Delhi 2003.*
6. *M.K.Jain, S.R.K. Iyengar and R.K. Jain, Numerical method for Scientific and Engineering Computation, New Age International Pvt. Ltd. 3^{rd} edition, 1993,*
7. *V Rajaraman, Computer Oriented Numerical Methods, Pearson Education 3^{rd} edition , 2013*
8. *Steven C. Chapra, Numerical Methods for Engineers, 4th Ed., McGraw Hill, 2002.*
9. *Brian Bradie, A Friendly Introduction to Numerical Analysis, Pearson Prentice Hall, 2006.*
10. *Günther Hämmerlin and Karl-Heinz Hoffmann, Numerical Mathematics, Springer-Verlag, 1991.*

Magazines:

1. *Current Science (Indian Academy of Sciences)*
2. *The Mathematics Student (Math Student) (Indian Mathematical Society)*
3. *Mathematical Spectrum(The University of Sheffield)*

4. Mathematics Magazine (Mathematical Association of America)
5. +Plus magazine (University of Cambridge)
6. Ganithavahini (Ramanujan Mathematical Society)

Journals:

1. Numerische Mathematik, Springer Link.
2. Acta Numerica, Cambridge University Press.
3. SIAM Review, University of Bristol, UK.
4. Journal of Computational Physics, Elsevier.
5. SIAM Journal on Numerical Analysis, University of Bristol, UK.
6. SIAM Journal on Scientific Computing, University of Bristol, UK.
7. IMA Journal of Numerical Analysis, Oxford Journals.
8. Mathematics of Computation, American Mathematical Society.
9. Foundations of Computational Mathematics, Springer Link.

Name of the Module: Engineering Ethics &IPR
Module Code: HSS 601
Semester: 6th
Credit Value: 3 [P=0, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Imparting theoretical lectures with case discussion.
2. Providing teaching with inclusive learning.
3. Making students aware about the importance of this subject in their future

B.Learning outcomes:

Upon completion of the subject:

1. Students will be able to work with efficiency as they had knowledge of the subject.
2. With the backup knowledge their performance will definitely be much better in their workplace.

C. Subject Matter:

Unit I:

Engineering Ethics and Communications is designed to introduce

engineering graduate students to the concepts, theory and practice of ethics in academic, professional, and personal life environments and means to effectively and persuasively communicate through ethical quandaries with various stakeholders. Students will obtain a strong individual and team-based, hands-on, learning experience through a course curriculum consisting of lectures; supporting seminars and workshops; case studies; and team-based activities. The course will generally be delivered along the following outline:

Unit II:

Classical Moral Theory as Applied to Science and Engineering - The Importance of Ethics in Science and Engineering; Philosophy, Religion, and Ethics; Moral Analysis; The Role of Codes of Ethics, Virtues and the Psyche; Habits and Morals; Distinguishing Exterior and Interior Morality; The Importance of Intention; Hierarchy of Moral Values; Virtuous Imprinting

Unit III:

Evaluating Ethical Judgments - Evaluating Exterior Acts; Factors Limiting Moral Responsibility and Degrees of Responsibility; Truth in Actions and Words; Harm from Deception, Withholding Truth and Spreading Truth; Whistleblowing; Privacy Issues; Recognition from Scientific Publication; Plagiarism; Black and Gray in Scientific Practice and Publication; Responsible Conduct of Research; Conflict of Interest; Credit and Blame in Team Projects; Authorship

Unit IV:

Introduction to IPR, Overview & Importance, IPR in India & abroad, Patent & their definations , granting , infringement, searching & filing, Utility models an introduction; copy right; their definations granting , infringement, searching & filing. Distinction between related and copy rights , Trademarks, role in commerce, importance,protection & registration, licencing, legal issue, enforcement – case studies

D. Teaching/ Learning:

1. Teaching : 50%
2. Learning/ case presentation : 30%
3. Assignment : 10%
4. Attendance : 10%

E. Examination pattern:

1. Theoretical Examination : 50

2. Class test : 30
3. Assignment : 20

F. Reading list:

Books:

1. Chowdhury, Subir, Blending the best of the East & West, EXCEL
2. Ghosh, Vikas, Ethics and Mgmt. & Indian Ethos,
3. Pherwani, Business Ethics, EPH
4. Balachandran Raja, Nair, Ethics, Indian Ethos and Mgmt

Magazine:

1. *Industry Week*

Journals:

1. Journal of Business Ethics
2.The Journal of Ethics
3. Ethics, University of Chicago Press
4. Kennedy Institute of Ethics Journal
5. Journal of Global Ethics

Name of the Module: Disaster Management

Module Code: HSS 602
Semester: 6th
Credit Value: *2 [P=0, T=0, L=2]*

A. Objectives:

The course is design to meet with the objectives of:

1. Imparting theoretical lectures with case discussion.
2. Providing teaching with inclusive learning.
3. Making students aware about the importance of this subject in the future prospect

B. Learning outcomes:

Students successfully completing this module will be able to :

1. Students will be able to work with efficiency as they had knowledge of the subject.
2. With the backup knowledge their performance will definitely be much better in their workplace.

C. Subject Matters:

Unit I:

Introduction: Disaster preparedness, Goals and objectives of ISDR Programme, Risk identification, Risk sharing.

Disaster and development: Development plans and disaster management. Alternative to dominant approach, disaster-development linkages, Principle of risk partnership

Unit II:

Disaster management and risk reduction in garment industry: Types of disasters and disaster plans: Processing machines and utilities. Sustainable livelihoods and their Protection – Recovery from disaster –fire, boiler mishap. Garment Industry health monitoring and Disaster aids.

Unit III:

Awareness of risk reduction: Trigger mechanism, constitution of trigger mechanism, risk reduction by education, disaster information network, risk reduction by public awareness.

Unit IV:

Development planning on disaster: Implication of development planning, financial arrangements, areas of improvement, disaster preparedness, community based disaster management, emergency response.

Seismicity: Seismic waves, Earthquakes and faults, measures of an earthquake, magnitude and intensity ground damage, Tsunamis and earthquakes

D. Teaching/ Learning/Practice Pattern:

1. Teaching : 50%
2. Learning/ case presentation : 30%
3. Assignment : 10%
4. Attendance : 10%

E. Examination pattern:

1. Theoretical Examination : 50
2. Class test : 30
3. Assignment : 20

F.Reading List:

Books:

1. White, Gilbert F. and J. Eugene Hass, 1975, Assessment of Research on Natural Hazards, Cambridge, the MIT Press, MA.

2. White, G.F, 1974, Natural Hazards: Local, National, Global, Oxford University Press, New York.. Taori, K (2005) Disaster Management through Panchayati Raj, Concept Publishing Company, New Delhi.

3. Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.

4. Kasperson, J.X., R.E. Kasperson, and B.L. Turner III (Eds.), 1995, Regions at Risk: Comparisons of Threatened Environments, United Nations University Press, Tokyo

5. Singh Satendra (2003): Disaster Management in the Hills, Concept Publishing Company, New Delhi.

6. Pardeep Sahni, Madhavi Malalgoda and Aariyabandu, Disaster risk reduction in south Asia, PHI, 2009
7. Amita Sinvhal, Understanding Earthquake Disasters, TMH, 2010.
8. MHA, GOI-UNDP, Disaster Management in India, 2009
9. NDMA, „Incident Response Guidelines", 2009
10. Disaster Management Act, 2005.

Magazines:

1. Crises and Disaster Management Magazine
2. Emergency Management

Journals:

1. Asian Journal of Environment and Disaster Management
2. International Journal of Disaster management
3. IDRIM Journal
4. Journal of Disaster Risk Studies
5. Emergency Management Review

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Department of Civil Engineering

Seventh Semester

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Department of Civil Engineering

SEVENTH SEMESTER

Subject Code	Subject	Model	P	T	L	Credit
HSS 701	Mass Communication for Technology	S.N. Bose	0	0	3	3
XXX-701	Research paper Communication	J.C. Bose	2	0	0	1
CE 701	Construction Planning and Management	S.N. Bose	0	0	3	3
CE 702	Environmental Engineering-II	S.N. Bose	0	1	3	4
CE 703	Numerical Analysis and Computer Applications in Civil Engineering	J.C. Bose	3	0	0	3
CE 704	Estimation and Valuation	J.C. Bose	3	0	3	4
CE-71X	Elective I	S.N. Bose	0	1	3	4
CE-72X	Elective II	S.N. Bose	0	1	3	4
			8	2	18	26

Name of the Module: Mass Communication for Technology
Module Code: HSS 701
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Imparting theoretical lectures with case discussion.
2. Teaching with inclusive learning.
3. Making students aware about the importance of this subject in their future career.

B. Learning Outcomes:

Upon completion of the subject:

1. Students will be able to work with efficiency as they had knowledge of the subject.
2. With the backup knowledge their performance will definitely much better in their workplace.

C. Subject Matter:

Unit I:

Basic concepts and type of Mass communication, Nature of media, Mass communication in India

Unit II:

Role of media in society, impact of media on audience, media effects, limitations, Mass campaigns , different forms of media

Unit III:

Role of Journalist , ethics, career & training, Media management, Media law, freedom

of press History of different forms of media , newspaper, Radio, TV etc.

Unit IV:

Mass communication research –techniques , process & tools

Grammer and formats of various types of communications.

Unit V:

Advertising & Public relations

Printing technology & Production methods

D. Teaching/ Learning/ Practice Pattern:

1. Teaching : 50%
2. Learning/ case presentation : 30%
3. Assignment : 10%
4. Attendance : 10%

E. Examination pattern:

1. Theoretical Examination : 50
2. Class test : 30
3. Assignment : 20

F. Reading List:

Books:

1. *Murthy, D.V.R. Development of Journalism, Dominant Publishers, 2001*
2. *Naarula, Uma. Development Communication Theory and Practice, Har-Anand Publication Ltd 3. New Delhi; 1990.*
3. *Sharma, Suresh Chandra, Media Communication and Development, Rawat Publication, 1987.*
4. *UNESCO, „Different Theories and Practice", 1982.*

Journals:

1. *Mass Review*
2. *Journal of Communication Studies*
3. *Mass Communication and Society*
4. *Journal of Mass Communication*
5. *Communicator*
6. *Journal of Communication*

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Department of Civil Engineering

Name of the Module: Construction Planning and Management
Module Code: CE 701
Semester: 7th
Credit Value: 3[P=0, T=0, L=3]

A. Objectives:

To inculcate the fundamental principles of construction planning and management as applicable in Civil Engineering Projects.

B. Learning Outcome:

1. To introduce a concepts of projects formulation
2. To impart the idea about planning and scheduling of activities.
3. To introduce the concepts of resource planning and allocation and control.
4. To provide a bird‟s eye view of optimization techniques.

C. Subject Matter:

Unit-I:

CONSTRUCTION PROJECT FORMULATION

Introduction-Principles of Management – different types of construction projects –Project Life Cycle-phases in project life cycle- Pre-feasibility report and clearance- project estimate – Techno Economic feasibility report- detailed project report.

Unit-II:

CONSTRUCTION PLANNING AND SCHEDULING

Introduction – work breakdown structure- plan development process- scheduling-definition –types of construction schedules-scheduling techniques-CPM – Terms and definitions –Earliest and Latest times – different types of floats – significance- calculation of critical path method-PERT – terms and definitions – network and solving problems using PERT – standard deviation and probability calculation in PERT.

Unit-III:

RESOURCE PLANNING ALLOCATION AND CONTROL

Materials: Quantity of materials – time of purchase- inventory control – terms and definitions – types of inventory –EOQ –reasons for maintain inventory – different tools for inventory.

Equipment: Classification of major construction equipment- planning and selecting of equipment- task consideration – cost consideration.

Labour: Classes of labour – cost of labour- labour schedule – optimum use of labour. Introduction-resource allocation-resource leveling-resource loading graph – cost control – earned value concepts- “S” curve technique in cost control – Risk cost management- stages in risk management- controlling the risk.

Unit IV

OPTIMISATION TECHNIQUES

Introduction to optimization- Linear programming – formulation of LP problems- solving LP problem using graphical method-Transportation problems-Assignment problems – replacement model (Value of money does not change with time) –Time cost trade off – crashing- computer application in construction management.

D. Teaching/Learning/Practice Pattern:

Teaching:	50%
Learning:	30 %
Practice:	20 %

(Teacher is to divide components for T/R/P)

E.Examination Pattern:

1. Theoretical Examination

F. Reading List:

Books

1.Chitkara.K.K, Construction Project Management: planning, Scheduling and control, Tata McGraw Hill Publishing Company, New Delhi, 1998.
2.Joy.P.K, Total Project Management –The Indian context, Macmillan India Ltd, New Delhi,1992
3.Vohra.N.D., Quantitative Techniques in Management, Tata Mcgraw Hill Publishing Company, New Delhi, 1998.

Magazine

1. *Construction financial and management association*
2. *Construction business owner*

Journals

1. *Journal of Construction Engineering and Management-ASCE*
2. *International Journal of Construction Management*
3. *International Journal of Construction Project Management*

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Fax: 0360 – 2284972, E-mail: nitarunachal@gmail.com

Department of Civil Engineering

Name of the Module: Environmental Engineering-II
Module Code: CE 702
Semester: 7th
Credit Value: 4[P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To learn waste management in the society.
2. To learn safe disposal of the Hazardous and Biomedical waste.
3. To learn about the Environmental Legislations

B. Learning Outcome:

Upon completion of the subject:

1. Have knowledge about the environmental impact assessment (EIA).
2. Ability to know the control standards of air and noise pollution.
3. To aware about the role of ecology in environment.

C. Subject Matter:

Unit I:

Solid waste management: Solid waste generation, onsite handling, storage and processing, collection, transfer and transport, processing techniques and equipments, recovery of resources, conversion products and energy, disposal

Unit-II

Hazardous waste management: Exposure and risk assessment, environment legislation, characterization and site assessment, waste minimization, incineration, transportation, storage, landfill disposal, facility sitting, site remediation.

Biomedical waste management and handling: Biomedical waste management issues, waste generation, current practices in health care facilities, environmental concerns, labeling and colour coding for waste storage, collection, transportation, treatment, common treatment facility, disposal.

Unit III

Ecology and environment: Role of ecology in environmental issues, salient features of major eco-systems, energy transfer, local, regional and global impacts, ecological chain and balance, quantitative ecology in the context of environmental impact assessment of development projects

Unit IV

Air pollution: Sources, emission of gases, suspended particulate matter, classification dynamics of pollutant dispersion and disposal, effects on environment including living and non-living matter, remedial measures and their effectiveness, environmental assessment, acts relating to air pollution, standards.
Noise pollution: Properties of sound waves, characterization of noise, kinetics of noise, rating systems, measurement and control standards

D. Teaching/Learning/Practice Pattern:

Teaching:	70 %
Learning:	30 %
Practice:	0%

(Teacher is to divide components for T/R/P)

E. Examination Pattern:

Theoretical Examination and Open book examination.

F. Reading List:

Books

1. *Gilbert M Masters „Introduction to Environmental Engineering and Science" Prentice Hall, 2007.*
2. *J. G. Henry and G. W Heinke „Environmental Science and Engineering" Prentice Hall, 1989.*
3. *M.L. Davis and D.A. Cornwell „Introduction to Environmental Engineering" McGraw-Hill Education, 2012.*
4. *CPHEEO (Ministry of Urban Development), "Manual on Municipal Solid Waste Management"*

Magazine

1. *Environmental* Science & *Engineering Magazine*
2. *Environmental Engineer Magazine*
3. *Environmental Engineering* Science

Journals

1. *Journal of Environmental Engineering* (ASCE)
2. International *Journal of Environmental Engineering* (IJEE)
3. *Journal of Environmental Engineering* and Science

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Department of Civil Engineering

Name of the Module: Computer applications in Civil Engineering
Module Code: CE 703
Semester: 7th
Credit Value: 3[P=3, T=0, L=0]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To have knowledge of use of the different types software in Civil engineering.
2. To identify the problems faced by civil engineers in drawings and analysis and to solve the same in the shorter duration with the aid of softwares.
3. To be expert in modelling, analysis, Designing and programming.

B. Learning Outcome:

Upon completion of the subject:

1. Student should have a clear idea to use the civil engineering related softwares.
2. Drawings can be made with the help of autocad in shorter duration.
3. Students will be expert in modelling, analysis, Designing and programming.

C. Subject Matter:

UNIT I

Application of Auto CAD:

Setting up Commands: Limits, units, Grid, Snap, Osnap.
Standard tool bars: Match properties, pan, zoom.
Draw: Line, Pline, mline, Rectangle, polygard, Arc, Circle, Donut, Spline, Ellipse, Boundary, Hatch, Text, mtext.
Modify/Edit: Erase, copy, Mirror, offset, array, move, rotate, scale, stretch, lengthen, trim, Extend, Break, Chamfer, fillet, Explode.
Dimensioning: linear, aligned, Baseline, Continue, Radius, diameter, Angular, Style. **Layer:** New layer, current layer, freeze, lock, colour, line type, line weight, delete. **View:** UCS, view, View ports.
3-D: Solid editing, Shade, render, 3d – orbit.Preparation of a Building Plan, elevation and Section in Detail.

UNIT II
Intoduction to STAAD Pro software:
Model generation, Analysis & Steel & Concrete design.

UNIT-III

Introduction to SAP & Bridge software
Modelling, Analysis and Design of structures.

UNIT-IV

Introduction to MATLAB & ANSYS
Matrix Operations, Colon Generators and submatrices, Common MATLAB commands, Programming in MATLAB, formatting output, Handling Graphics, Control flow statements-Decisions and Loops

Modeling & Analysis , using ANSYS

D. Teaching/Learning/Practice Pattern:

Teaching:	20 %
Learning:	20 %
Practice:	60 %

(Teacher is to divide components for T/R/P)

E. Examination Pattern:

1. Practical examination

F. Reading List:

Books

1. *James M. Kirkpatrick, "The AutoCAD Book: Drawing, Modeling, and Applications, Merill, 1992*
2. *Terry T. Wohlers, "Applying AutoCAD", McGraw Hill, 1995*
3. *George Omura, "Mastering AutoCAD 2012 and AutoCAD LT 2012" John Wiley & Sons, 2011*
4. *Sivakumar Naganathan, "Learn Yourself STAAD.Pro V8i: Structural Analysis and Design using STAAD.Pro V8i, Lambert academic publication, 2012*
5. *Munir Hamad, "Using STAAD Pro 2006"Shroff, 2006*
6. *Kogent Learning Solutions Inc., "Sap Abap/4, Covers Sap Ecc 6.0, Black Book: 2009 Ed"Dreamtech press, 2009*
7. *Desmond J. Higham & Nicholas J. Higham, "MATLAB Guide"*

Magazine

1. *CAD tutor*
2. *Tenlinks*
3. *CaD.*
4. *Essential MATLAB for engineers and scientist*
5. *STAAD manuals*
6. *SAP manuals*
7. *Autocad manuals*

Journals

1. *MATLAB Journal*
2. *The journal*
3. *International Journal of high performance computing applications.*

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Department of Civil Engineering

Name of the Module: Estimation and Valuation.
Module Code: CE 704
Semester: 7th
Credit Value: 4[P=3, T=0, L=3]
Module Leader:

A. Objectives:

The course is design to meet the objectives of:

1. The Course emphasizes on advancement in the different types of estimates made in civil work.
2. To understand the basic of estimating and costing, types of estimates and purpose of estimates.
3. To be able to read and interpret civil engineering drawings.
4. To understand the preparation of different kind of approximate estimates for various civil engineering works.
5. To prepare rate analysis for different civil engineering works.

B. Learning Outcome:

Upon completion of the subjects:

1. Will be able to handle the Estimates of the Civil Engineering Works.
2. Students will be able to prepare the detailed estimates of residential buildings.
5. Students will be able to read the various civil engineering drawings and will be able to prepare a checklist of each item.

Subject Matter:

Unit I:

Procedure of Estimating: Methods of Estimating, items of works, long-wall, short wall method of estimate, centre-line method, Types of estimate-preliminary, approximate, plinth area estimate, detailed estimate, revised estimate, supplementary estimate, Building Cost Index, Administration Approval, Expenditure sanction, Technical sanction, Schedule of rates & Measurement Book.

Estimate of Building: Different items of works as per CPWD schedule such as earthwork, brickwork, cement-concrete, RCC-floors, roofs, openings, painting, white & colour washing, plastering etc.

Unit II:

RCC Works & structures: Different items of RCC work – RCC, shuttering, measurement of reinforcing bars, standard hooks & bends, Bar-bending schedule, Estimate of RCC beam, slab column, footing & staircase.

Roads & Bridges: Introduction to the different items as per CPWD/APWD schedule, estimate of earthwork of road, estimate of metalled road, estimate of RCC slab culvert, T-beam decking, Pier & well foundation, Pipe Culvert.

Unit III:

Analysis of Rates: Analysis of Rates of Building works-RCC, PCC, Brickwork, Plastering, flooring, colour wash, Distempering, cement painting, woodwork, DPC, Doors & Windows, Roofing.

Specifications: General specifications for building works-RCC, Brickwork, Plastering, Flooring, Painting, white & colour wash, Woodworks, Doors & windows, DPC, terracing, rainwater exclusion, specifications for Roadwork.

Unit IV:

Valuations: The mathematics of valuation, valuation of freehold & leasehold properties, Fixation of Rent, Methods of valuation, Investment Method, Comparison Method, Residual Method, rein-statement Method, Contractors Method. Methods of valuation of land-comparative method, abstractive method & belting method.

D. Practical class

Estimation of material quantity and cost of RCC / Brick Buildings and Steel factory sheds.

E. Teaching/Learning/Practice Pattern:

Teaching:	60%
Learning:	15%
Practice:	25%

(Teacher is to divide components for T/R/P)

Examination Pattern:

1. Theoretical Examination.
2. Practical Examination

Reading List:

Books

1. B.N.Dutta „Estimating And Costing in Civil Engineering" UBS Publisher"s Distributor Pvt.Ltd. 2007

2. B.S. Patil „Civil Engg. Contracts & Estimates" orient-Longman Ltd., New Delhi.

3. S.C. Rangwala „Valuation of Real Properties" Charoter Publisher, Pune.

4. CPWD „CPWD specifications Vol-I, II, III, &IV" Join Book Agency, New Delhi.

5. M. Chakraborty „Estimating and Costing" Culcutta.

Magazine

1. ASCE civil engineering magazines

Journals

2. *ASCE*
3. *Springerlink*

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Department of Civil Engineering

Eighth Semester

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Department of Civil Engineering

EIGHTH SEMESTER

Subject Code	Subject	Model	P	T	L	Credit
XXX-801	Industrial Training	J.C. Bose	2	0	0	2
XXX 802	Project works	J.C. Bose	12	0	0	8
XXX 803	Seminar	J.C. Bose	2	0	0	2
XXX 804	Grand Viva	J.C. Bose	4	0	0	4
			20	0	0	16

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Department of Civil Engineering

Electives

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Department of Civil Engineering

List of Electives

CE 71X (any one)

CE 71XA: Foundation Engineering
CE 71XB: Bridge Engineering
CE 71XC: Traffic Engineering
CE 71XD: Environmental Impact Assessment and Modelling
CE 71XE: Structural Dynamics
CE 71XF: Theory of Plates and shells
CE 71XG: Earthquake Resistance Design
CE 71XH: Municipal Solid Waste Management

CE 72X(any one)

CE 72XA: Soil Dynamics
CE 72XB: Ground Improvement technique
CE 72XC Advanced Structural Analysis
CE 72XD: Advanced Surveying
CE 72XE: Remote Sensing and GIS
CE 72XF Structure Optimization
CE 72XG: Ground Water Engineering

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Department of Civil Engineering

Name of the Module: Foundation Engineering
Module Code: CE 71XA
Semester: 7th
Credit Value: 4[P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Understanding the basics of foundation Engineering.
2. To be efficient in designing the foundations.
3. To realize the importance of foundation in the construction works.

B. Learning Outcome:

Upon completion of the subjects

1. A strong background in Foundation engineering.
2. Strong in Designing the foundation and able to analyse the load on the foundation from the superstructures.
3. Understand the importance of machine foundation and well foundation.

C. Subject Matter:

Unit I:

Stability of slopes:

Stability of finite and infinite slopes, types of failures, different factors of safety, determination of factor of safety by method of slices, swedish circle, friction circle, Bishop‟s method, Morgenstern-Price method, Taylor‟s stability number, location of critical circle, stability analysis of earth dam slopes for different conditions. Design of filters and rock toe.

Earth pressure:

Different types of earth pressures, states of plastic equilibrium Rankine‟s theory and Coulomb‟s theory, influence of water table, surcharge, wall friction and deformation on the earth pressure, application of Rankine‟s and Coulomb‟s theory to cohesion less and cohesive soils, Culmann‟s graphical method, stability considerations for retaining walls, effect or earthquakes. Design of retaining walls.

Unit II:

Sheet plies:

Different types of sheet pile walls-free and fixed earth support, anchored bulk heads, design principles, arching in tunnels, open cut strutting and sheeting.

Foundations:

Different types of loads on foundations, types of shallow and deep foundations, footing-rafts-piles-wells-selection of foundation type-dewatering of foundations-type of explorations, methods of boring, soil samples and samples.

Unit III:

Shallow foundations:

Definition, bearing capacity, factors affecting bearing capacity, Terzaghi‟s theory of bearing capacity, effect of foundation size and shape, Effect of ground water table, determination of bearing capacity from building codes, plate load test, penetration test, static and dynamic cone tests, Housel‟s approach, bearing capacity of sands and clays, settlements of foundation. Elastic settlements, consolidation settlements, differential settlements, permissible settlements, design principles of depth of foundation, spread footing, combined footing, raft foundations, principles of floating frats, foundations on non-uniform soils.

Deep foundation:

Types of piles based on function, materials and methods of construction, friction and end bearing piles, static formulae-Engineering News and Hiley‟s formula, group action in piles, block failures, settlement of pile groups in sands and clays pile load test negative skin friction, under reamed piles.

Unit IV:

Well foundation:

Elements, forces acting on well, lateral stability analysis, problems in sinking of wells and remedial measures.

Machine foundations:

Model study, natural frequency of block foundation system, block foundation under vertical vibration.

Reinforced earth:

Introduction, analysis and design of reinforced earth wall, reinforced earth base.

D. Teaching/Learning/Practice Pattern:

Teaching:	70 %
Learning:	30 %
Practice:	0%

(Teacher is to divide components for T/R/P)

E. Examination Pattern:

Theoretical Examination

F. Reading List:

Books

1. *P. C. Varghese „Foundation engineering" phi learning pvt. Ltd, 2005.*
2. *Braja M. Das „Principles of foundation engineering" Cengage learning, 2010.*
3. *S. Hansbo „Foundation Engineering" newness, 1994.*
4. *P. Purushothama Raj „Soil mechanics & foundation engineering" Pearson education India, \ 2008*

Magazine

1. Foundations and Earth Structures.
2. Foundation Engineering & Equipment
3. Geotechnical directory

Journals

1. *Soil Mechanics and* Foundation Engineering - *Springer*
2. Foundation Engineering-Elsevier.
3. *International Society for Soil Mechanics and Geotechnical* Engineering

Name of the Module: Bridge Engineering
Module Code: CE 71XB
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To develop an understanding of and appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.

2. To help the student develop an intuitive feeling about the sizing of bridge elements, ie. develop a clear understanding of conceptual design.

3. To understand the load flow mechanism and identify loads on bridges.

4. To carry out a design of bridge starting from conceptual design, selecting suitable bridge, geometry to

B. Learning Outcomes:

Upon completion of the subject:

1. Students will Learn there are different types of bridges
2. Students will Learn the forces that act on bridges
3. Students will Design and build a bridge

C. Subject Matter:

Unit I:

Introduction:
Definitions, components of a bridge, classification, importance and standard specifications.
Investigation for bridge:
Site selection, data drawing, design discharge linear water way, economical span, location of piers and abutments, vertical clearance above HFL, scour depth. Traffic projection, investigation report choice of bridge type.

Unit II:

Standard specification for Road Bridge:
IRC bridge code, determination of dead loads and live loads, wind loads, longitudinal forces, centrifugal forces, horizontal forces due to water current buoyancy effect, earth pressure, temperature effect, deformation stresses, Secondary stresses, erection stresses, seismic forces.

Unit III:

Culverts: Design of slab culvert and box culvert. Design of T beam reinforced concrete bridges.
Unit IV:

Design of prestressed concrete bridges.
Design of sub structure: Design of piers and masonry abutments.

D. Teaching/ Learning/ Practice Pattern:

Teaching:	70%
Learning:	30%
Practice:	0%

E. Examination Pattern:

Theoretical Examination

F. Reading List:

Books:

1. *D.Jhonson Victor „Essentials of bridge engineering" Oxford & IBH Publishing Company, 1980.*
2. *Aswani, Vaziani, Ratwani „Design of concrete bridge" Khanna Publishers, 2004.*
3. *V.K.Raina „Concrete bridges"Shroff Publishers and Distributors Pvt. Ltd., 2007.*
4. *Ponnuswamy „Bridge Engineering" McGraw Hill-Education, New Delhi.*

Magazines:

1. *Harper magazines*
2. *Bridge Design and Engineering Magazine*

Journals:

1. *Journal of Bridge Engineering*
2. *The Baltic* Journal *of Road and* Bridge Engineer*ing*

Name of the Module: Traffic Engineering
Module Code: CE 71XC
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To appreciate the traffic engineering as application of engineering techniques to achieve the safe and efficient movement of people and goods.
2. To understand the relationship between different parts of traffic engineering

B. Learning Outcomes:

Upon completion of the subject:

1. To design the cross-section and alignment of highway
2. To use an appropriate traffic flow theory for traffic characteristics
3. To practice the traffic count methods
4. To comprehend the capacity and signalized intersection analysis
5. To understand the basic knowledge of ITS

C. Subject Matter:

Unit I:

Properties of traffic engineering elements:
Introduction to Traffic Engineering, Vehicle Characteristics, Human factors and driver Characteristics, Road Characteristics.

Traffic engineering studies and analysis:
Introduction to traffic studies, Traffic volume studies, speed studies, origin and destination studies. Travel time and delay studies, parking studies, accident studies.

Unit II:

Traffic flow characteristics:
Nature of Traffic flow, Approaches to understand Traffic Flow, Parameters connected with Traffic flow, Categories of Traffic flow, Uninterrupted traffic flow model. Analysis of speed, flow and density relationship, Empirical studies of traffic stream Characteristics

.

Unit III:

Fundamentals of interrupted traffic flow:
Shock waves, Traffic flow at signalized intersections, Traffic flow at unsignalized intersections.

Intersection control and design:
Introduction, Types of intersections, Design considerations, Traffic control devices, Conflict areas at intersections, Types of Intersection controls, Traffic signals, warrants for interchanges, Design of interchanges.

Unit IV:

Highway capacity:
Introduction, Highway capacity, Level of service, basic freeway capacity studies, Multilane, Highway capacity, two lane Highway capacities

D. Teaching/ Learning/ Practice Pattern:

Teaching:	70%
Learning:	30%
Practice:	0%

E. Examination Pattern:

Theoretical Examination

G. Reading List:

Books:

1. *Adolf D.May „Traffic Flow fundamentals" Prentice Hall, 1989.*
2. *Mcshane and Roess „Traffic Engineering" Prentice Hall, 1998.*
3. *L.R. Kadyali „Traffic Engineering and Transport Planning" Khanna Publishers, 2008.*
4. *Patha Chakraborty and Animesh Das „Principles of Transportation Engineering" PHI Learning,2009*
5. *Nicholas J. Garber, Lester A. Hoel „Traffic & Highway Engineering" Cengage Learning, 2009.*

Magazines:

1. *Traffic Engineering and control management*
2. *Transport Engineer Maga*zine

Journals:

1. *Journal of Transportation Engineering*
2. *Journal of advanced transportation*

Name of the Module: Environmental Assessment and Modelling
Module Code: 71XD
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Describe the structure and function of major environmental systems Identifying the basic principles of various ground improvement techniques.
2. Use scientific reasoning to identify and understand environmental problems and evaluate potential solutions.

Learning Outcomes:

Upon completion of the subject:

1. Critically evaluate arguments regarding environmental issues.
2. Students will see the impact their own lives have on their environment.
3. Apply their understanding of environmental issues to their own choices

C. Subject Matter:

Unit I:

Environmental assessment: Evolution of environmental impact assessment (EIA), EIA at project, regional and policy level; strategic EIA, EIA process, screening and scoping criteria, rapid and comprehensive EIA, specialized areas like environmental health impact assessment, environmental risk analysis, economic valuation methods, cost benefit analysis, expert system and GIS applications, uncertainties.

Unit-II:

Environmental policies and legislation: Legislative and environmental clearance procedures in India and other countries, sitting criteria, public participation, resettlement and rehabilitation.

Unit-III:

Methodologies: Practical applications of EIA, EIA methodologies, baseline data collection, prediction and assessment of impacts on physical, biological and socio-economic environment,
environmental management plan, post project monitoring, EIA report and EIS, review process

Unit- IV:

Environmental systems Modelling: Principles of modelling, classification; introduction to air quality models, meteorology, atmospheric stability and turbulence, Gaussian plume model and modification, numerical models, Transport and fate of pollutant in aquatic system, introduction to river, estuarine and lake hydrodynamics, stratification and eutrophication of lakes, dissolved oxygen model for streams, temperature models

Environmental systems Modelling: Principles of modelling, classification; introduction to air quality models, meteorology, atmospheric stability and turbulence, Gaussian plume model and modification, numerical models, Transport and fate of pollutant in aquatic system, introduction to river, estuarine and lake hydrodynamics, stratification and eutrophication of lakes, dissolved oxygen model for streams, temperature models

D. Reading List:

Books:

1. *Asit K. Biswas, "Environmental Impact Assessment for Developing Countries"United Nation University press.1999*
2. *G.J. Rau and C.D. Wooten, "Environmental Impact Analysis Handbook"Mcgraw Hills publishers 1980*
3. *L. Canter, "Environmental Impact Assessment" Mcgraw Hill publishers,USA,1996*

Magazine

1. *Environmental* Science & *Engineering Magazine*
2. *Environmental Engineer Magazine*
3. *Environmental Engineering* Science

Journals

1. *Journal of Environmental Engineering* (ASCE)
2. International *Journal of Environmental Engineering* (IJEE)
3. *Journal of Environmental Engineering* and Science

Name of the Module: Structural Dynamics
Module Code: CE 71XE
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

Vibration analysis of structures

B. Learning Outcome:

Upon completion of the subject:

1. Know, understand and apply the basic concepts of Structural dynamics to carry out professional engineering activities in the field of Civil Engineering.
2. Apply scientific method strategies to Structural dynamics: analyse qualitatively and quantitatively the problem situation, propose hypotheses and solutions
3. Use specific vocabulary and terminology and the appropriate means to effectively communicate knowledge, procedures, results, skills and aspects inherent to Structural dynamics

4. Work efficiently in a group, integrating skills and knowledge to make decisions in the performance of fluid mechanics tasks, adopting a responsible and organised attitude to work and a willingness to learn.
5. Plan and carry out designs and processes in the field of Structural dynamics in accordance with the relevant specific technology, applying the quality principles and methods and analysing and assessing the social and environmental impact of the technical solutions adopted.

B. Subject Matter:

Unit I

Introduction to Dynamic analysis - Elements of vibratory systems and simple Harmonic Motion-Mathematical models of SDOF systems - Principle of Virtual displacements - Evaluation of damping resonance. Fourier series expression for loading - (blast or earthquake) - Duhamel‟s integral - Numerical methods - Expression for generalised system properties - vibration analysis Rayleigh‟s method - Rayleigh - Ritz method.

Unit II

Multiple degree of freedom systems,, solution beams and frames,

Evaluation of structural property matrices - Natural vibration - Solution of the Eigen value problem - Iteration due to Holzer and Stodola. Idealisation of multi-storeyed frames - analysis to blast loading - Deterministic analysis of earthquake response - lumped SDOF system.

Unit III

Differential equation of motion - Beam flexure including shear deformation and rotatory inertia - Vibration analysis using finite element method for beams and frames

Plate vibration, vibration control. Machine foundation

Unit IV

Introduction to Random vibration

Review of probability: probability space, random variables, functions of random variables, sequence of random variables and limit theorems for sums, products and extremes. Review of random processes: stationarity, ergodictiy, power spectrum and autocovariance. Calculus of random processes. Input-output relations for linear systems. Stochastic steady state. Level crossing and first passage problems. Extreme value distributions. Reliability index based analyses: FORM and SORM. Monte Carlo simulations and variance reduction. Reliability of existing structures.

Wind & Earthquake analysis

C. List of Practical: No Practical

D. Teaching/Learning/Practice Pattern:

Teaching:	80%
Learning:	20%
Practice:	0%

(Teacher is to divide components for T/R/P)

E. Examination Pattern:

1. Theoretical Examination

F. Reading List:

Books

1. Mario Paz, and William Leigh, Structural Dynamics, CBS, Publishers, 1987.

2. Roy R Craig, Jr., Structural Dynamics, John Wiley & Sons, 1981.

3. A.K. Chpora "Dynamics of Structures Theory and Application to Earthquake Engineering" Pcarson Education, 2001.

4. N C Nigam, 1983, Introduction to random vibrations, MIT Press, Boston.
5. A Papoulis, 1993, Probability, random variables and stochastic processes, McGraw-Hill, NY.
6. R E Melchers, 1999, Structural reliability analysis and prediction, John Wiley, Chichester.

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Department of Civil Engineering

Name of the Module: Theory of Plates and Shells
Module Code: CE 71XF
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

To understand the basic principles of theory and plates

B. Learning outcomes:

Students will be able to design different types of plates and shell.

C. Subject Matter

Unit I
Prismatic folded plate systems, governing equations, analysis and design,
Unit II
Numerical method and energy procedures, finite difference method, plates of various shapes;
Unit III
Shell types and characteristics, classification, membrane analysis, bending analysis of shells of revolution and cylindrical shells, shell equations, solutions.,
Unit IV

Analysis and design of cylindrical shells, approximate design methods for doubly curved shells.

E. Teaching/Learning/Practice Pattern:

Teaching:	80%
Learning:	20%
Practice:	0%

(Teacher is to divide components for T/R/P)

G. Examination Pattern:

1. Theoretical Examination

D. Books

1. *Theory of Plates and Shells By Timoshenko and Woinowsky-Krieger*
2. *Design of Thin Shells By Hass A. M.*
3. *Design and Construction of Concrete Shell RoofBy Ramaswamy G. S*

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Department of Civil Engineering

Name of the Module: Earthquake resistant design of buildings
Module Code: CE 71XG
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objective:

i)To learn the basic of earthquake engineering.

ii) To learn the basic of earthquake resistant design

iii) To learn the ductility requirement in Earthquake Engineering design

B. Learning Outcome:

i) Ability to design the earthquake resistant structures.

C. Subject Matter

Unit I

Engineering Seismology: Earthquake phenomenon cause of earthquakes-Faults- Plate tectonics-Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales-Energy released-Earthquake measuring instruments-Seism scope, Seismograph, accelerograph-Characteristics of strong ground motions- Seismic zones of India.

Conceptual design: Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical members-Twisting of buildings-Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials-unconfined concrete-confined concrete-masonry-reinforcing steel. Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method-dynamic analysis-response spectrum method-Time history method.

Unit II

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members- Structural models for frame buildings- Seismic methods of analysis- Seismic deign methods- IS code based methods for seismic design- Seismic evaluation and retrofitting- Vertical irregularities- Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces-Equivalent lateral force procedure- Lateral distribution of base shear. Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

Unit III

Structural Walls and Non-Structural Elements: Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of non-structures- Effects of non-structural elements on structural system- Analysis of non-structural elements-Prevention of non-structural damage- Isolation of non-structures.

Unit IV

Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact ofDuctility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920. Behaviour of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquakes. Capacity Based Design: Introduction to Capacity Design, Capacity Design for Beams and Columns-Case studies.

BOOKS:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press

2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

3.Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons

4.Masory and Timber structures including earthquake Resistant Design –Anand S.Arya, Nem chand & Bros

5. Earthquake –Resistant Design of Masonry Building –Miha Tomazevic, Imperial College Press.

6.Earthquake Tips – Learning Earthquake Design and Construction C.V.R. Murty

Journals

1. Geo-technique

2. Science direct

3. ASCE

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Department of Civil Engineering

Name of the Module: Municipal Solid Waste Management
Module Code: CE 71XH
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. **Objectives:**

The course is design to meet with the objectives of:

(ii) Students will understand different aspects of the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste.

B. Learning outcomes:

(iii) Students will be able to understand the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management

(iv) Students will get the ability to plan waste minimisation and design storage, collection, transport, processing and disposal of municipal solid waste

C. Subject Matter

Unit I

SOURCES AND TYPES

Sources and types of municipal solid wastes-waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization; Effects of improper disposal of solid wastes-Public health and environmental effects. Elements of solid waste management –Social and Financial aspects – Municipal solid waste (M&H) rules – integrated management-Public awareness; Role of NGO‟s.

Unit II

ON-SITE STORAGE, PROCESSING, COLLECTION AND TRANSFER

On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – waste segregation and storage – case studies under Indian conditions – source reduction of waste – Reduction, Reuse and Recycling. Methods of Residential and commercial waste collection – Collection vehicles – Manpower– Collection routes Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems- solving.

Unit III

OFF-SITE PROCESSING

Objectives of waste processing – Physical Processing techniques and Equipments; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

Unit IV

DISPOSAL

Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor– Dumpsite Rehabilitation

D. Teaching/Learning/Practice Pattern:
Teaching: 70%
Learning: 30 %
Practice: 0 %
(Teacher is to divide components for T/R/P)

E. Examination Pattern:
1. Theoretical Examination
2. Assignments

F. Reading List:
Books

1. Tchobanoglous, G., Theisen, H. M., and Eliassen, R. "Solid. Wastes: Engineering Principles and Management Issues". McGraw Hill, New York, 1993.
2. Vesilind, P.A. and Rimer, A.E., "Unit Operations in Resource Recovery Engineering", Prentice Hall, Inc., 1981
3. Paul T Willams, "Waste Treatment and Disposal", John Wiley and Sons, 2000
4. Government of India, "Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Urban Development, New Delhi, 2000.
5. Bhide A.D. and Sundaresan, B.B. "Solid Waste Management Collection", Processing and Disposal, 2001
6. Manser A.G.R. and Keeling A.A.," Practical Handbook of Processing and Recycling of Municipal solid Wastes", Lewis Publishers, CRC Press, 1996
7. George Tchobanoglous and Frank Kreith"Handbook of Solidwaste Management", McGraw Hill, New York, 2002

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Department of Civil Engineering

Name of the Module: Soil Dynamics
Module Code: CE 72XA
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. To know the dynamics of soil and to determine its dynamic property.
2. To know about the liquefaction, earthquakes and the origin of tsunamis
3. To inject research interest in student in the field of geotechnical engineering

B. Learning Outcomes:

Upon completion of the subject:

1. Students will be able to know the various dynamic property of soil.
2. The test to determine the dynamic properties will be clear.
3. There will be clear idea about the basic of foundation.

C. Subject Matter:

Unit I:

Introduction and fundamentals of vibration: Soil mechanics and soil dynamics, Nature of dynamic loads, Stress conditions on soil elements under earthquake loading, Problems of dynamic loading of soil and soil structures. Earthquakes causes, origin, classification and effects.

Theory of vibrations: Undamped and damped vibrations, Forced vibrations with harmonic excitation, System under transient vibrations, Rayleigh‟s method, Logarithmic decrement, Determination of viscous damping, Transmissibility, Principles of vibration measuring instruments, Systems with two degree of freedom (vibration absorber), Systems with multi degree of freedom, Spectral response.

Unit II:

Wave propagation in an elastic medium: Wave propagation in an elastic rod, Wave propagation in an elastic infinite medium, Wave propagation in a semi infinite elastic half space, Waves generated by a surface footing.

Stress strain characteristics of soil under dynamic loads: Introduction to dynamic tests, Pendulum loading apparatus, Behaviour of saturated sands under transit loading, Effects of static stress level and number of pulses on strength of cohesive solids, Oscillatory simple shear, Resonant column apparatus, Wave propagation methods, Block resonance test, Cyclic plate load test.

Unit III:

Dynamic earth pressure: Behaviour of retaining walls during earthquakes, Modification on Coulomb‟s theory Modified Culmann‟s construction, Analytical solution of c Φ soils, displacement analysis, Indian standard code of practice.

Dynamic bearing capacity: Earthquake load on footing, Effect of horizontal load and moment, Provision of relevant standards, Dynamic analysis for vertical and horizontal loads.

Unit IV:

Liquefactions of soil: Theory and criterion of liquefaction, Factors affecting liquefaction characteristics, Liquefaction studies in triaxial shear and oscillatory simple shear, Evaluation of liquefaction potential, Liquefaction analysis from standard penetration test data, Introduction to shake table and field test.

Machine foundations: Degrees of freedom of a machine foundation, Vertical sliding, Rocking, Yawing vibrations of a block, Simultaneous rocking sliding and vertical vibrations of a block, India standards for design of foundations for reciprocating machines and impact type of machines.

D. Teaching/ Learning/ Practice Pattern:

Teaching:	70%
Learning:	30%
Practice:	0%

E. Examination Pattern:

1. Theoretical Examination

G. Reading List:

Books:

1. *Shamsher Parkash „Soil Dynamics" Mcgraw-Hill (Tx), 1981.*
2. *D.D.Barken „Dynamics of bases and foundations" McGraw-Hill, 1962.*
3. *Swami Saran „Soil Dynamics and Machine Foundations" Galgotia Publications Pvt Ltd.*
4. *Braja M. Das, G. V. Ramana „Principles of Soil Dynamics" Cengage Learning, 2009.*

Magazines:

1. *Geovision*
2. *Geoengineers*

C. Journals:

1. *Geotechnique*
2. *Journal on Geotechnical Engineering*

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Department of Civil Engineering

Name of the Module: Ground Improvement Technique
Module Code: CE 72XB
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Understanding the geotechnical site investigation aims and objectives, and introducing the geotechnical in-situ testing methods.
2. Identifying the basic principles of various ground improvement techniques
3. How to select the most appropriate ground improvement technique in specific circumstances
4. Understanding the design procedure of various ground improvement techniques
5. Introducing an overview of the observational method and instrumentation used in Geotechnical Engineering

Learning Outcomes:

Upon completion of the subject:

4. Locate criteria to determine the applicability of each ground improvement method for a specific project and soil condition under consideration
5. Describe advantages, disadvantages, and limitations for each ground improvement method discussed
6. Prepare conceptual and basic designs, and be able to check contractor-submitted designs
7. Discuss appropriate QA/QC methods for each type of ground improvement method
8. Summarize key elements of a preferred contracting method for each technique
9. Develop a preliminary cost estimate based on a preliminary design

C. Subject Matter:

Unit I:

Compaction:

Principles of compaction, Engineering behaviour of compacted clays, field compaction techniques static vibratory, impact, Earth moving machinery, Compaction control, application to granular soils, cohesive soils, depth of improvement, environmental considerations, induced settlements, compaction using vibratory probes, vibro techniques, vibro equipment, vibro compaction and replacement process, vibro systems and liquefaction, soil improvement by thermal treatment, preloading techniques, surface compaction, introduction to bio technical stabilization, dewatering systems.

Unit II:

Grouting:

Chemical grouting, commonly used chemicals, grouting systems, grouting operations, applications, compaction grouting, application and limitations, plant for preparing grouting materials, jet grouting, jet grouting process, geometry and properties of treated soils and applications.

Stabilization:

Introduction to soil improvement by adding materials, lime, flyash, cement and other chemicals and bitumen, sand column, stone column, sand drains, prefabricated drains, electro- osmosis, lime column, soil- lime column, stabilization of soft clay or silt with lime, bearing capacity of lime treated soils, settlement of lime treated soils, improvement in slope stability, control methods.

Unit III:

Soil reinforcement:

Soil improvement using reinforcing elements, introduction to reinforced earth, load transfer mechanism and strength development, soil types and reinforced earth, anchored earth nailing, reticulated micro piles, soil dowels, soil anchors, reinforced earth retaining walls.

Unit IV:

Geosynthetics:

Polymer type geotextiles, woven geotextiles, non woven geotextiles, geo grids, physical and strength properties, behaviour of soils on reinforcing with geotextiles, effect on strength, bearing capacity, design aspects for slopes, clay embankments, retaining walls and pavements.

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D. Teaching/ Learning/ Practice Pattern:

Teaching:	70%
Learning:	30%
Practice:	0%

E. Examination Pattern:

1. Theoretical Examination

Reading List:

Books:

1. *Dr. P. Purushothama Raj „Ground Improvement Techniques" Laxmi Publications Pvt Limited, 1999.*
2. *R.A.Jewell „Text Book on Soil Reinforcement with Geotextiles"*
3. *G.V. Rao and G.V.S.Rao „Text Book on Engineering with Geosynthetics"*
4. *American Society of Civil Engineers, 1996.*
5. *Raj Purushothama „Ground Improvement Techniques" Laxmi Publications, 2005.*
6. *Korener „Construction and Geotechnical Methods in Foundation" McGraw-Hill Inc., US. 1984.*

Magazines:

1. *Geovision*
2. *Geoengineers*

Journals:

1 .*Geotechnique*
2. *Journal on Geotechnical Engineering*

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Department of Civil Engineering

Name of the Module: Advanced Structural Analysis
Module Code: CE 72XC
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. Analysis of plates, folded plates. curved shell.
2. Analysis of structures by stiffness matrix method.
3. Analysis of beams and frames.
4. Prediction and control of movements in buildings
5. Analysis of thin-walled structures

B. Learning Outcomes:

Upon completion of the subject:

1. An ability to apply knowledge of mathematics, science and engineering in structural analysis.
2. Ability to identify, formulate, and solve structural engineering problem

C. Subject Matter:

Unit I:

Introduction: Stiffness, flexibility, flexibility and stiffness matrices.

Unit II:

Matrix Methods in skeletal structural analysis: force and displacement methods, analysis of beams, frames and trusses including analysis using substructures.

Unit III:

FEM analysis

Unit IV:

Theory of Plates and Shells:
Analysis of plates, folded plates and singly curved shells: conventional and approximate methods.

D. Teaching/ Learning/ Practice Pattern:

Teaching:	70%
Learning:	30%
Practice:	0%

E. Examination Pattern:

Theoretical Examination

F. Reading List:

Books:

1. *Jan J. Tuma „Advanced Structural Analysis" McGraw-Hill, New Delhi, 1971.*
2. *Igor A. Karnovsky, Olga Lebed „ Advace Method of Structural Analysis" Springer.*
3. *Sidney F. Borg, Joseph J. Gennaro „Advanced Structural Analysis" Van Nostrand, 1959.*
4. *Devdas Menon „Advanced Structural Analysis" Narosa, 2009.*

Magazines:

1. *Structural magazines*
2. *Harpers magazines*

Journals:

1. *Journal of structural Analysis*
2. *International journal of advanced structural analysis*

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Department of Civil Engineering

Name of the Module: Advanced Surveying
Module Code: CE 72XD
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

The course is design to meet with the objectives of:

1. In this subject students will be presented with a real world surveying problem
2. They will be required to solve through the integration, application and advancement of the theoretical and practical knowledge they have acquired throughout their study.
3. The subject is of particular relevance to students wishing to establish a career in engineering, mining or cadastral surveying.
4. It is also relevant to a range of mapping, spatial, land surveying and engineering disciplines where the capture and processing of spatial or survey measurements to meet a specific performance specification should be considered.

Learning Outcomes:

1. Plan, schedule, cost and complete an advanced, high precision survey job.
2. Critically assess and apply the appropriate field methodology, equipment and processing techniques for a specific survey task.
3. Use a range of techniques for managing survey errors and biases including results verification, quality control.
4. Design and develop innovative techniques and approaches to solving complex survey problems.
5. Maintain a balance between survey accuracy and the overall cost of the work.
6. Manage a large survey project.

C. Subject Matter:

Unit-I

Triangulation: Classification of triangulation system, operation in triangulation survey, reconnaissance, selection of site for base line, its measurement and extension, correction to base line measurement, selection of stations, triangulation figures, scaffolds and signals, marking of stations, inter-visibility, strength of figures, reduction to centre, derivation of relations when observations are taken from the satellite station and towards the station.

Unit-II

Trigonometric Levelling: Introduction, determination of the level of the top of an object when its base is accessible and not accessible, determination of height of object when two instrument stations are not in the same vertical plane, indirect levelling on a rough terrain, indirect levelling on a slopes, effect of refraction and curvature, axis signal correction, signal correction, difference in elevation in single observation, difference in elevations by reciprocal observation.

Unit-III

Theory of Errors: Definitions, law of weight, probable errors, most probable value, normal equations, method of least square, triangle station adjustment, figure adjustment, quadrilateral and polygon adjustment of closed traverse and level nets.

Photogrammetry: Basic concepts, type of photographs, geometry of aerial photographs, measurement of parallax and height determination.

Unit-IV

Astronomy: Solution of an astronomical triangle, co-ordinate systems time solar, sidereal and standard equation of time, conversion of time, sun dial, determination of time, azimuth, latitude and longitude, correction for astronomical observations.

Introduction to Remote Sensing

D. Reading List:

Books

1. *K.R. Arora. „Surveying Volume-I" Standard Publishers Distributors, 2010*
2. *B.C. Punmia, A. K.. Jain & A.K. Jain, „Surveying Volume-I" Laxmi Publications, 2005*
3. *R.Agor "Surveying and Levelling", Khanna Publishers.New Delhi,1996*
4. *S.K.Duggal "Surveying Volume-I",Tata McGraw Hill Publisher,New Delhi,2004*
5. *Kanetkar and Kulkarni "Surveying and Levelling" Pune Vidyarthi Griha*
6. *Prakashan,Pune,1985*
7. *R.Agor. "Advanced Surveying" Khanna publishers New Delhi,2000*

Magazine

1. *Civil Engineering Surveyor.*
2. *Survey Review.*

Journals

1. *Journal of Surveying Engineering(ASCE)*
2. *Journal of surveying and mapping Engineering.*
3. *Applied Materials & Interfaces.*
4. *Materials Science and Engineering.*

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Department of Civil Engineering

Name of the Module: Remote Sensing and GIS
Module Code: CE 72XE
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

To impart Knowledge about the remote sensing and GIS

B. Learning outcomes:

Ability to understand the apply the remote sensing and GIS**.**

C. Subject Matter

Unit I

REMOTE SENSING:

Elements involved in remote sensing, electromagnetic spectrum, Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellites

Unit II

Visual interpretation techniques, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, digital data products and analysis.

UNIT III

GEOGRAPHIC INFORMATION SYSTEM:

Spatial databases and database management systems, coordinate systems and georeferencing, spatial analysis, statistical modeling, interpolation methods,

UNIT IV

Application of digital elevation models, case studies on use of GIS selected from various civil engineering areas, projects of small GIS modules.

D. Books

1. Concepts & Techniques of GIS : C.P.Lo Albert, K.W. Yonng,
2. Remote sensing and Image interpretation: T. M. Lillesand and R. W. Keifer
3. GIS for land resource assessment : P.A. Baurrough

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Department of Civil Engineering

Name of the Module: Optimization Techniques in Structural Engineering
Module Code: CE 72XF
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objective:

i) To learn the optimization technique in structural Engineering.

ii) To have the ability to know the use of optimization in different software.

Learning Outcomes:

1. Student will be able to use optimization technique in structural Engineering
2. Skill in programming will increase.

Subject Matter

UNIT I

Introduction to Optimization: Introduction - Historical developments - Engineering applications of

Optimization - Statement of an Optimization problem - Classification of Optimization problems - Optimization Techniques. Optimization by calculus: Introduction - Unconstrained functions of a single variable - Problems involving simple constraints - Unconstrained functions of several variables treatment of equality constraints - Extension to multiple equality constraints - Optimization with inequality constraints - The generalized Newton-Raphson method.

UNIT II

Linear Programming: Introduction - Applications of linear programming - standard form of a linear programming problem - Geometry of linear programming problems - Definitions and theorems - Solution of a system of Linear simultaneous equations - Pivotal reduction of a general system of equations - Motivation of the Simplex Method - Simplex Algorithm - Two phases of the simplex method. non-Linear Programming: Introduction - Unimodal Function - Unrestricted search - Exhaustive search - Dichotomous search - Interval Halving method - Fibonacci method - Golden section method - Comparison of elimination methods - Unconstrained optimization techniques - Direct search methods - Random search methods - grid search method – Uni variate method - Powell's method - Simplex method - Indirect search methods - Gradient of a function - Steepest descent method - Conjugate gradient - Newton's method.

UNIT III

Dynamic Programming: Introduction - Multistage decision processes - concept of sub-optimization and the principle of optimality - computational procedure in dynamic programming - example

illustrating the Calculus method of solution - example illustrating the Tabular of solution - conversion of a final value problem into an initial value problem - continuous dynamic programming - Additional applications.

UNIT IV

Network Analysis: Introduction - Elementary graph theory - Network variables and problem types Minimum-cost route - Network capacity problems - Modification of the directional sense of the network. Application of Optimization techniques to trusses, Beams and Frames.

D. Books

1. *Optimization: Theory and Applications by S.S.Rao.*
2. *Numerical Optimization Techniques for Engineering Design with applications by G.N.Vanderplaats.*
3. *Elements of Structural Optimization by R.T.Haftka and Z.Gurdal.*
4. *Optimum Structural Design by U.Kirsch.*
5. *Optimum Design of Structures by K.I.Majid.*
6. *Introduction to Optimum Design by J.S.Arora.*

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Department of Civil Engineering

Name of the Module: Groundwater Engineering
Module Code: CE 72XG
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. Objectives:

- To learn about water movement in Groundwater and characteristics of different aquifers,
- To understand the techniques of development and management of groundwater.

B. Learning outcomes:

- Students will be able to understand aquifer properties and its dynamics
- Student will be able to analyze the groundwater flow
- Students will be able to understand the importance of artificial recharge and groundwater quality concepts.

C. Subject Matter

Unit I

HYDROGEOLOGICAL PARAMETERS

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, transmissivity and storage coefficient – Methods of Estimation - Ground water table fluctuation and its interpretations – Groundwater development and Potential in India – GEC norms

Unit II

WELL HYDRAULICS

Objectives of Groundwater hydraulics – Darcy's Law – Groundwater equation - steady state flow - Dupuit Forchheimer assumption - Unsteady state flow - Theis method - Jacob method -Slug tests - Image well theory – Partial penetrations of wells.

Unit III

GROUNDWATER MANAGEMENT

Need for Management Model – Database for groundwater management –groundwater balance study - Introduction to Mathematical model – Conjunctive use - Collector well and Infiltration gallery, Artificial recharge techniques

Unit IV

GROUNDWATER QUALITY AND CONSERVATION

Ground water chemistry - Origin, movement and quality - Water quality standards – Health and aesthetic aspects of water quality, Contamination source inventory, remediation schemes - Ground water Pollution and legislation - Saline intrusion – Environmental concern and Regulatory requirements, Remediation of Saline intrusion

D. Teaching/Learning/Practice Pattern:

Teaching: 70%
Learning: 30 %
Practice: 0 %
(Teacher is to divide components for T/R/P)

E. Examination Pattern:
1. Theoretical Examination
2. Assignments

F. Reading List:
Books
1. Raghunath H.M., " Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.
3. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002.

Name of the Module: INDUSTRIAL STRUCTURES
Module code: CE 72XH
Semester: 7th
Credit Value: 4 [P=0, T=1, L=3]
Module Leader:

A. **Objectives:**
This course deals with some of the special aspects with respect to Civil Engineering structures in industries.

B**. Learning outcomes:**
Student will be able to design various types of important industrial structures commonly used in Power plant, Steel plant, Cement Plant.

C. Subject Matter

UNIT 1
PLANNING & FUNCTIONAL REQUIREMENTS
Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

Lighting – Ventilation – Accounts – Fire safety – Guidelines from factories act**.**

UNIT II INDUSTRIAL BUILDINGS
Industrial buildings – Steel and RC – Folded plates and Shell roofs – Gantry girder

UNIT III POWER PLANT STRUCTURES
Chimneys and Cooling Towers – Bunker and Silo

UNIT IV POWER TRANSMISSION STRUCTURES
Cables – Transmission Line Towers – Substation structures – Tower foundations–Testing Towers.

D. Teaching/Learning/Practice Pattern:

Teaching: 70%
Learning: 30 %

E. Examination Pattern:

1. Theoretical Examination
2. Assignments