Department of Civil Engineering

FACULTY OF ENGINEERING & TECHNOLOGY

B.TECH REGULATION – 2017 (Full Time)

(For students admitted from the Academic Year 2017-18)

SEMESTER – 1

Course Code	Course Title	C	L	T/SLr	P/R	Ty/Lb /ETL
BEN17001	TECHNICAL ENGLISH –I	2	1	0/0	2/0	Ty
BMA17001 BMA17002	MATHEMATICS – I/ BIO MATHEMATICS (FOR BIOTECH)	4	3	1/0	0/0	Ty
BPH17001	ENGINEERING PHYSICS	3	2	0/1	0/0	Ty
BCH17001	ENGINEERING CHEMISTRY –I	3	2	0/1	0/0	Ty
BES17001	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	3	2	0/1	0/0	Ty
BES17002	BASIC MECHANICAL & CIVIL ENGINEERING	3	2	0/1	0/0	Ty
ANNUAL PATTERN (PRACTICALS)*						
BES17ET1	BASIC ENGINEERING GRAPHICS	2	1	0/0	2/0	ETL
BPH17L01	ENGINEERING PHYSICS LAB	1	0	0/0	2/0	Lb
BCH17L01	ENGINEERING CHEMISTRY LAB	1	0	0/0	2/0	Lb
BES17L01	BASIC ENGINEERING WORSHOP	1	0	0/0	2/0	Lb
BES17ET2	C PROGRAMMING AND LAB	2	1	0/0	2/0	ETL
BES17ET3	ENTREPRENEURIAL SKILL DEVELOPMENT & PROJECT LAB	1	0	0/0	2/0	ETL

Credits Sub Total:26

SEMESTER – 2

Course Code	Course Title	C	L	T/SLr	P/R	Ty/Lb/ ETL
BEN17002	TECHNICAL ENGLISH – II	2	1	0/0	2/0	Ty
BMA17003 BMA17004	MATHEMATICS – II / BIO STATISTICS (FOR BIOTECH)	4	3	1/0	0/0	Ty
BPH17002	MATERIAL SCIENCE	3	2	0/1	0/0	Ty
BCH17002	ENGINEERING CHEMISTRY – II	3	2	0/1	0/0	Ty
BES17003	ENVIRONMENTAL SCIENCE	3	3	0	0/0	Ty

Credits SubTotal:15

C: Credits L : Lecture T: Tutorial S.Lr: Supervised Learning P: Problem / Practical R: Research Ty/Lb/ETL : Theory /Lab/Embeddded Theory and Lab * Internal Evaluation

Semester : 3

Theory:

Course Code	Course Title	C	L	T/SLr	P/R	Ty / Lb/ ETL
BMA17005	MATHEMATICS III FOR MECHANICAL AND CIVIL ENGINEERS	4	3	1/0	0/0	**Ty**
BCE17001	MECHANICS OF SOLIDS	4	3	1/0	0/0	**Ty**
BCE17002	MECHANICS OF FLUIDS	4	3	1/0	0/0	**Ty**
BCE17ES1	**BASIC ENGINEERING SCIENCE** BUILDING SCIENCE AND MATERIALS	3	3	0/0	0/0	**Ty**
BAR17I01	**INTER DISCIPLINARY THEORY - I** ENGINEERING GEOLOGY	3	3	0/0	0/0	**Ty**

Practical:

BCE17ET1	ENGINEERING SURVEY -I	3	2	0/0	2/0	**ETL**
BCE17L01	**BUILDING DRAWING PRACTICE**	1	0	0/0	3/0	**Lb**
BCE17L02	SURVEYING FIELD WORK	1	0	0/0	3/0	**Lb**
BAR17IL1	**INTER DISCIPLINARY LAB I** GEOLOGY AND BUILDING MATERIALS LAB	1	0	0/0	2/0	**Lb**

Credits Sub Total: 24

Semester: 4

Theory:

Course Code	Course Title	C	L	T/SLr	P/R	Ty / Lb/ ETL
BMA17010	NUMERICAL METHODS FOR MECHANICAL AND CIVIL ENGINEERS	4	3	1/0	0/0	**Ty**
BCE17003	STRENGTH OF MATERIALS	4	3	1/0	0/0	**Ty**
BCE17004	APPLIED HYDRAULIC ENGINEERING	4	3	1/0	0/0	**Ty**
BCE17005	CONCRETE AND CONSTRUCTION TECHNOLOGY	3	2	1/0	0/0	**Ty**
BAR17I02	**INTER DISCIPLINARY THEORY II** REMOTE SENSING AND GIS	3	2	1/0	0/0	**Ty**

Practical:

BEN17ET2	SOFT SKILL 1	2	1	0/1	0/0	**ETL**
BCE17ET3	ENGINEERING SURVEY - II	3	1	0/1	1/1	**ETL**
BCE17L03	FLUID MECHANICS AND HYDRAULIC MACHINERY LAB	1	0	0/0	2/0	**Lb**
BCE17L04	STRENGTH OF MATERIALS AND CONCRETE LAB	1	0	0/0	2/0	**Lb**
BCS17IL7	**INTER DISCIPLINARY LAB II** BASIC COMPUTER SKILL FOR CIVIL ENGINEERS	1	0	0/0	2/0	**Lb**
BCE17TS1	**TECHNICAL SKILL – I (EVALUATION)** ADVANCED SURVEYING FIELD WORK AND GIS LAB	1	0	0/0	0/2	**Lb**

Credits Sub Total: 27

Semester: 5
Theory:

Course Code	Course Title	C	L	T/SLr	P/R	Ty / Lb/ ETL
BCE17006	STRUCTURAL ANALYSIS-I	4	3	1/0	0/0	**Ty**
BCE17007	DESIGN OF CONCRETE STRUCTURES-I	4	3	1/0	0/0	**Ty**
BCE17008	SOIL MECHANICS	3	2	1/0	0/0	**Ty**
BCE17009	TRANSPORTATION ENGINEERING	3	2	1/0	0/0	**Ty**
BEE17I04	**INTER DISCIPLINARY THEORY – III** ENERGY CONSERVATION TECHNIQUES	3	2	1/0	0/0	**Ty**

Practical:

BCE17ET4	WATER RESOURCES AND IRRIGATION ENGINEERING	3	1	0/1	1/1	**ETL**
BCE17L05	TRANSPORTATION ENGINEERING LAB	1	0	0/0	2/0	**Lb**
BCE17L06	GEOTECHNICAL ENGINEERING LABORATORY	1	0	0/0	2/0	**Lb**
BAR17IL2	**INTER DISCIPLINARY LAB III** **SOFTWARE FOR CIVIL ENGINEERS**	1	0	0/0	2/0	**Lb**
BCE17TS2	**TECHNICAL SKILL II (EVALUATION)** SURVEY CAMP	1	0	0/0	2/0	**Lb**
BCE17L07	**INPLANT TRAINING (EVALUATION)** PRACTICAL TRAINING	1	0	0/0	2/0	**Lb**

Credits Sub Total : 25

Semester: 6
Theory:

Course Code	Course Title	C	L	T/SLr	P/R	Ty / Lb/ ETL
BCE17010	STRUCTURAL ANALYSIS - II	4	3	1/0	0/0	**Ty**
BCE17011	FOUNDATION ENGINEERING	3	2	1/0	0/0	**Ty**
BCE17EXX	**ELECTIVE – 1** *(BASED ON STUDENTS INTEREST)	3	2	1/0	0/0	**Ty**
BAR17I03	**INTER DISCIPLINARY THEORY – IV** DESIGN OF CONCRETE STRUCTURES – II	3	2	1/0	0/0	**Ty**
BCE17OEX	**(OPEN ELECTIVE-INTERDISCIPLINARY)*** *(CHOICE BASED OF STUDENTS INTREST)	3	3	0/0	0/0	**Ty**

Practical:

BEN17ET5	SOFT SKILL- II	2	1	0/0	2/0	**ETL**
BCE17L08	ENVIRONMENTAL AND HYDRAULIC STRUCTURES DRAWING	1	0	0/0	3/0	**Lb**
BCE17L09	ENVIRONMENTAL ENGINEERING LAB	1	0	0/0	3/0	**Lb**
BCE17L10	STRUCTURAL ANALYSIS AND DESIGN BASED ON CIVIL ENGINEERING SOFTWARE	1	0	0/0	3/0	**Lb**
BCE17L11	**MINI PROJECT (EVALUATION)** INNOVATIVE PROJECT	1	0	0/0	0/2	**Lb**
BCE17TS3	**TECHNICAL SKILL – III (EVALUATION)** DETAILING OF R.C. AND STEEL STRUCTURES	1	0	0/0	0/2	**Lb**

Credits Sub Total: 23

Semester: 7
Theory:

Course Code	Course Title	C	L	T/SLr	P/R	Ty / Lb/ ETL
BCE17012	DESIGN OF STEEL STRUCTURES	4	3	1/0	0/0	**Ty**
BCE17013	CONSTRUCTION MANAGEMENT	4	3	1/0	0/0	**Ty**
BCE17EXX	**ELECTIVE 2** *(BASED ON STUDENTS INTEREST)	3	2	1/0	0/0	**Ty**
BCE17EXX	**ELECTIVE 3** *(BASED ON STUDENTS INTEREST)	3	3	0/0	0/1	**Ty**
BMG17001	**MANAGEMENT PAPER - I** PRINCIPLES OF MANAGEMENT	3	2	0/1	0/0	**Ty**

Practical:

BCE17SEX	**ELECTIVE (SPECIAL - BASED ON CURRENT TECHNOLOGY) ***	3	1	0/1	1/1	**ETL**
BCE17L12	ADVANCED CONCRETE LAB	1	0	0/0	3/0	**Lb**
BCE17L13	ESTIMATION AND EVALUATION PRACTICAL	1	0	0/0	3/0	**Lb**
BCE17L14	PROJECT PHASE – 1	2	0	0/1	0/3	**Lb**
BFL1700X	FOREIGN LANGUAGE (EVALUATION**)**	2	1	0/1	0/0	**Lb**

Credits Sub Total: 26

Semester: 8
Theory:

Course Code	Course Title	C	L	T/SLr	P/R	Ty / Lb/ ETL
BCE17EXX	**ELECTIVE 4** *(BASED ON STUDENTS INTEREST)	3	2	0/1	0/0	**Ty**
BCE17EXX	**ELECTIVE 5 *** *(BASED ON STUDENTS INTEREST)	3	2	0/1	0/0	**Ty**
BMG17003	**MANAGEMENT PAPER - II** TOTAL QUALITY MANAGEMENT	3	2	0/1	0/0	**Ty**

Practical:

BCE17L15	Project (Phase – II)	10	0	0/5	0/10	**Lb**

Credits Sub Total:19

C : Credits L : Lecture T : Tutorial S.Lr : Supervised Learning P : Problem / Practical R : Research Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab.* Internal evaluation (Departmental level Refer Annexure for evaluation methodology) 4 Credit papers should compulsorily have either P/R component.

Credit Summary

Semester : 1 : 18
Semester : 2 : 23
Semester : 3 : 24
Semester : 4 : 27
Semester : 5 : 25
Semester : 6 : 23
Semester : 7 : 26
Semester : 8 : 19

Total Credits : 185

ELECTIVE-I

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb/ ETL
BCE17E01	ENVIRONMENTAL ENGINEERING	3	2	1/0	0/0	Ty
BCE17E02	DESIGN OF COMPOSITE STRUCTURES	3	2	1/0	0/0	Ty
BCE17E03	INDUSTRIAL STRUCTURES	3	2	1/0	0/0	Ty
BCE17E04	SMART STRUCTURES AND SMART MATERIALS	3	2	1/0	0/0	Ty

ELECTIVE-II

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb/ ETL
BCE17E05	ESTIMATION AND QUANTITY SURVEYING	3	2	1/0	0/0	Ty
BCE17E06	HOUSING PLANNING AND DESIGN	3	2	1/0	0/0	Ty
BCE17E07	BUILDING TECHNOLOGY AND HABITAT ENGINEERING	3	2	1/0	0/0	Ty
BCE17E08	COST EFFECTIVE BUILDINGS	3	2	1/0	0/0	Ty

ELECTIVE -III

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb/ ETL
BCE17E09	INDUSTRIAL WASTE MANAGEMENT	3	2	1/0	0/0	Ty
BCE17E10	CLEANER PRODUCTION	3	2	1/0	0/0	Ty
BCE17E11	ARCHITECTURE AND TOWN PLANNING	3	2	1/0	0/0	Ty
BCE17E12	DAM ENGINEERING	3	2	1/0	0/0	Ty

ELECTIVE -IV

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb/ ETL
BCE17E13	STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING	3	2	0/1	0/0	Ty
BCE17E14	BRIDGE STRUCTURES	3	2	0/1	0/0	Ty
BCE17E15	STORAGE STRUCTURES	3	2	0/1	0/0	Ty
BCE17E16	TALL BUILDINGS	3	2	0/1	0/0	Ty

ELECTIVE -V

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb/ETL
BCE17E17	HYDROLOGY	3	2	0/1	0/0	Ty
BCE17E18	MUNICIPAL SOLID WASTE MANAGEMENT	3	2	0/1	0/0	Ty
BCE17E19	PRESTRESSED CONCRETE STRUCURES	3	2	0/1	0/0	Ty
BCE17E20	PRE FABRICATED STRUCTURES	3	2	0/1	0/0	Ty

ELECTIVE (SPECIAL –BASED ON CURRENT TECHNOLOGY)

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb/ETL
BCE17SE1	REPAIR AND REHABILITATION OF STRUCTURES	3	1	0/1	1/1	Ty
BCE17SE2	INTELLIGENT BUILDINGS	3	1	0/1	1/1	Ty
BCE17SE3	FINITE ELEMENT ANALYSIS	3	1	0/1	1/1	Ty
BCE17SE4	ENVIRONMENTAL IMPACT ASSESSMENT	3	1	0/1	1/1	Ty

OPEN ELECTIVE

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb /ETL
BCE17OE1	PROFESSIONAL ETHICS	3	3	0/0	0/0	Ty
BCE17OE2	ENVIRONMENT, HEALTH AND SAFETY IN INDUSTRIES	3	3	0/0	0/0	Ty
BCE17OE3	CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT	3	3	0/0	0/0	Ty
BCE17OE4	INTELLIGENT TRANSPORTATION SYSTEMS	3	3	0/0	0/0	Ty

Subject Code : **BEN17001**	Subject Name : **TECHNICAL ENGLISH - I**	C	L	T/SLr	P/R
	Prerequisite : None	**2**	**1**	**0/0**	**2/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Strengthen their vocabulary in both technical and business situations**
2. **Get practice in functional grammar**
3. **Learn the effective way of corresponding with officials**
4. **Learn to give instructions, suggestions, recommendations and comprehend and infer the information from the given passages.**
5. **Strain learners in organized academic and professional writing in LSRW skills**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**Strengthen their active and technical vocabulary**
CO2	**Understand functional grammar and gain proficiency in technical writing**
CO3	**Learn the appropriate technique of writing formal and business letters and prepare oneself to read the advertisement and prepare the resume relevantly**
CO4	**Learn to give instructions, suggestions, recommendations and comprehend and infer the information from the given passages**
CO5	**Focus on academic and technical writing**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				**H**						**H**		**H**
CO2				**H**						**H**		**H**
CO3				**H**		**M**			**H**	**H**		**H**
CO4				**H**					**H**	**H**		**H**
CO5				**H**					**H**	**H**		**H**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
			√						

Approval	

BEN17001 TECHNICAL ENGLISH I 2 1 0/0 2/0

1. Vocabulary, Grammar and Usage - I (6)

Meanings of words and phrases, synonyms and antonyms – affixes: prefixes and suffixes and word formation – nominal compounds, expanding using numbers and approximation – Verb: tense, auxiliary and modal –Voice: active, passive and impersonal passive

2. Vocabulary, Grammar and Usage – II (6)

Infinitives and Gerunds – preposition, prepositional phrases, preposition + relative pronoun-'If' clause, sentences expressing 'cause and effect', 'purpose',
Instructions, suggestions and recommendations

3. Reading (6)

Questions: Wh-pattern, Yes/no questions, tag questions
Comprehension: extracting relevant information from the text, by skimming and scanning and inferring, identifying lexical and contextual meaning for specific information, identifying the topic sentence and its role in each paragraph, comprehending the passage and answering questions - Précis writing

4. Writing (6)

Adjectives: degrees of comparison
Concord: subject-verb agreement
Interpretation of tables and flowcharts: writing a paragraph based on information provided in a table using comparison and contrast, classifying the data and flowchart, describing logical steps involved in specific functions, note - making from a given passage- letter writing, formal: seeking permission to undergo practical training, letter to an editor of a newspaper complaining about civic problems and suggesting suitable solutions

5. Functional English and Practical Components (6)

Listening : Listening to stories, conversation, dialogue, speeches of famous people, and identifying the grammar components
Speaking : Scripting and enacting role plays/ narrating incidents
Reading : Review of books, articles, fiction- Extensive reading/ user manuals, pamphlets, brochures
Writing : paragraph and essay writing using academic vocabulary

Total No of Periods : 30

Text Book

1. Pushkala. R, PadmasaniKannan.S, Anuradha. V, Chandrasena Rajeswaran. M: **Quest:**A Textbook of Communication Skills, Vijay Nicole

References

1. Pushkala R, P.A.Sarada, El Dorado: A Textbook of Communication Skills, Orient Blackswan, 2014
2. PadmasaniKannan.S., Pushkala.R. : Functional English
3. Hancock, Mark, English Pronunciation in Use; Cambridge Univ. Press, 2013
4. McCarthy, Michael et.al,, English Vocabulary in Use, Advanced, Cambridge Univ. Press, 2011
5. Wren and Martin: Grammar and Composition, Chand & Co, 2006

Web Resources

1. https://learnenglish.britishcouncil.org
2. www.englishpage.com
3. www.writingcentre.uottawa.ca/hypergrammar/preposit.html
4. www.better-english.com/grammar/preposition.html
5. http://www.e-grammar.org/infinitive-gerund/
6. www.idiomsite.com/

Subject Code : **BMA17001**	Subject Name : **MATHEMATICS – I**	C	L	T/SLr	P/R
	Prerequisite : None	**4**	**3**	**1/0**	**0/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Apply the Basic concepts in Algebra**
2. **Use the Basic concepts in Matrices**
3. **Identify and solve problems in Trigonometry**
4. **Understand the Basic concepts in Differentiation**
5. **Apply the Basic concepts in Functions of Several variables**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**Find the summation of the given series of binomial, exponential & logarithmic**
CO2	**Transform a non – diagonal matrix into an equivalent diagonal matrix using orthogonal transformation.**
CO3	**Find expansion of trigonometric function into an infinite series and to separate a complex function into real and imaginary parts.**
CO4	**Apply knowledge and concepts in finding the derivative of given function and to find the maxima / minima of the given function.**
CO5	**Evaluate the partial / total differentiation and maxima / minima of a function of several variables.**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**			**M**	**M**			**H**	**H**		**H**
CO2	**H**	**H**			**H**	**L**						**H**
CO3	**H**	**H**			**M**				**M**	**H**		**L**
CO4	**H**	**H**			**L**				**M**	**H**		**M**
CO5	**H**	**H**				**M**			**M**	**M**		**H**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
	√								

Approval	

BMA17002 **MATHEMATICS – I** **4 3 1/0 0/0**

1. ALGEBRA (12)

Binomial, Exponential, Logarithmic Series (without proof of theorems) – Problems on Summation, Approximation and Coefficients.

2. MATRICES (12)

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley - Hamilton theorem(without proof) – Orthogonal reduction of a symmetric matrix to Diagonal form.

3.TRIGONOMETRY (12)

Expansions of Sin nθ, Cos nθ in powers of Sinθ and Cosθ – Expansion of Tan nθ – Expansions of $\text{Sin}^n\theta$ and $\text{Cos}^n\theta$ in terms of Sines and Cosines of multiples of θ – Hyperbolic functions – Separation into real and imaginary parts.

4. DIFFERENTIATION (12)

Basic concepts of Differentiation – Elementary differentiation methods – Parametric functions – Implicit function –Leibnitz theorem(without proof) – Maxima and Minima – Points of inflection.

5. FUNCTIONS OF SEVERAL VARIABLES (12)

Partial derivatives – Total differential – Differentiation of implicit functions – Taylor's expansion – Maxima and Minima by Lagrange's Method of undetermined multipliers – Jacobians.

Total no. of periods : 60

Text Books

1. Kreyszig E., *Advanced Engineering Mathematics (10 th ed.),* John Wiley & Sons, (2011).
2. Veerarajan T., *Engineering Mathematics (for first year),* Tata McGraw Hill Publishing Co., (2008).

References

1. Grewal B.S., *Higher Engineering Mathematics*, Khanna Publishers, (2012).
2. John Bird, *Basic Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2010).
3. P.Kandasamy, K.Thilagavathy and K. Gunavathy, *Engineering Mathematics Vol. I (4th Revised ed.)*, S.Chand& Co., Publishers, New Delhi (2000).
4. John Bird, *Higher Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2006).

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Department of Civil Engineering

Subject Code : **BMA17002**	Subject Name :**BIO MATHEMATICS**	C	L	T/SLr	P/R
	Prerequisite : None	**4**	**3**	**1/0**	**0/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Use the Basic concepts in Matrices**
2. **Understand the Basic concepts in Differentiation**
3. **Understand the Basic concepts in Integration**
4. **Apply the Basic concepts in Interpolation**
5. **Analyze the Basic concepts in Numerical Differentiation and Integration**

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	**Find the sum, difference, product and inverse of matrixes**
CO2	**Find the derivative of the given function and to find the maxima / minima of the given function.**
CO3	**Integrate the given function by using the methods of integration and to find area under the given curve and the volume of the solid by revolution.**
CO4	**Evaluate the value of function at the given point and to find the polynomial expressions of the given function.**
CO5	**Find the differentiation of a function at the given point and to find the integration of the given function at the given point**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**			**M**	**M**			**H**	**H**		**H**
CO2	**H**	**H**			**H**	**L**						**H**
CO3	**H**	**H**			**M**				**M**	**H**		**L**
CO4	**H**	**H**			**L**	**M**			**M**	**H**		**H**
CO5	**H**	**H**				**M**			**M**	**M**		**H**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
	√								

Approval	

BMA17002 **BIO MATHEMATICS** **4 3 1/0 0/0**

1.MATRICES (12)

Elementary operations on Matrices – Inverse of a Matrix – Solving simultaneous equations (atmost three equations with three unknowns) using Cramer's rule.

2. DIFFERENTIATION (12)

Basic concepts of Differentiation – Elementary differentiation methods – Parametric functions – Implicit function – Maxima and Minima (simple problems).

3.INTEGRATION (12)

Basic concepts of Integration – Methods of Integration– Integration by substitution – Integration by parts – Definite Integrals – Properties of Definite Integrals – Problems on finding Area using single integrals (simple problems).

4.INTERPOLATION (12)

Interpolation: Newton's forward, Newton's backward formulae – Newton's divided differences – Lagrange's polynomial (simple problems).

5. NUMERICAL DIFFERENTIATION AND INTEGRATION (12)

Numerical differentiation with interpolation polynomials (Newton's forward and backward only) – Numerical integration by Trapezoidal and Simpson's (both $1/3^{rd}$& $3/8^{th}$) rules (simple problems).

Total no. of periods: 60

Text Books

1. Veerarajan T., *Engineering Mathematics (for first year)*, Tata McGraw Hill Publishing Co., (2008).
2. H.K.Das, Engineering Mathematics, S.Chand Publishers
3. Veerarajan T., *Numerical Methods*, Tata McGraw Hill Publishing Co., (2007).

References

1. Shanti Narayanan, *Differential Calculus*, S.Chand& Co., New Delhi, (2005).
2. Shanti Narayanan, *Integral Calculus*, S.Chand& Co., New Delhi, (2005).
3. John Bird, *Basic Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2010).

Subject Code : **BPH17001**	Subject Name : **ENGINEERING PHYSICS**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Outline the relation between Science, Engineering & Technology.**
2. **Demonstrate competency in understanding basic concepts.**
3. **Apply fundamental laws of Physics in Engineering & Technology.**
4. **To identify & solve applied Physics problems.**
5. **Produce and present activities associated with the course through effective technical communication**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing this course were able to

CO1	**Demonstrate competency in understanding basic concepts.**
CO2	**Utilize scientific methods for formal investigations & demonstrate competency with experimental methods and verify the concept to content knowledge.**
CO3	**Identify and provide solutions for engineering problems.**
CO4	**Relate the technical concepts to day to day life and to practical situations.**
CO5	**Think analytically to interpret concepts.**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**			**M**	**M**		**L**		**M**		
CO2	**H**	**H**	**M**		**M**	**M**		**L**		**M**		**L**
CO3	**H**	**H**	**H**	**M**		**M**				**M**		**L**
CO4	**H**	**H**	**M**		**M**			**M**				**M**
CO5	**H**	**M**	**L**	**H**								

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
	√								

Approval	

BPH17001 ENGINEERING PHYSICS 3 2 0/1 0/0.

1. PROPERTIES OF MATTER & ACOUSTICS (9)

Elasticity – Twisting couple on a Wire (derivation) – Shafts – Comparison of Solid and Hollow Shaft – Bending moment – Depression of a Cantilever – Determination of Young's modulus by Depression of a Cantilever – Uniform and non uniform bending (Experiment) – I form of Girders.

Viscosity – Definitions – Lubrication – Properties & Types of Lubricant. Acoustics of Buildings – Reverberation – Reverberation time –Sabine`s formula for Reverberation Time – Absorption Coefficient and its Determination – Factors affecting Acoustics of Buildings and its Remedial Measures.

2. THERMAL PHYSICS (9)

Thermal conduction – Thermal Expansion – Expansion joints – Bimetallic strips – Thermal conductivity (k) – Lee's Disc method (theory and experiment) – Radial flow of heat –Thermal conductivity of Glass – Thermal conductivity of Rubber Tube – Flow of heat through Compound Media – Thermal Insulation of buildings – Thermal radiation – Concept of Black body radiation – Fundamentals of Low Temperature Physics.

3. ULTRASONICS AND ITS APPLICATIONS (9)

Properties & Production of Ultrosonics – Piezoelectric method – Magnetostriction method – Acoustic Grating – Industrial Applications – Ultrasonic flaw detection (Block Diagram) – Medical Application: Velocity Blood Flow Meter – PhonoCardiography – Ultrasound imaging – Hazards and safety of Ultrasound – NDT of Materials using Ultrasonics.

4. LASER & ITS APPLICATIONS (9)

.Nature of Light – Laser Principle & Characteristics–Ruby laser – Nd- YAG Laser – He-Ne Laser – Co_2 Laser – Semiconductor laser – Homo junction & Hetero Junction Laser – Engineering applications – Holography, Surveying – Industrial applications – Cutting, Welding – Medical applications – Surgery

5. FIBER OPTIC COMMUNICATION (9)

Total Internal Reflection – Propagation of Light in Optical Fibres – Numerical aperture and Acceptance Angle – Types of Optical Fibres (material, refractive index, mode) – Fibre Optical Communication system (Block diagram) – Attenuation–Transmitter, Receiver, Dispersion, Modulation/Demodulation Advantages of Fibre Optical Communication System – IMT, PMT, Wavelength Modulated & Polarization Modulated Sensors – Endoscope Applications.

Total No. of Periods : 45

Text Books

1. M. Arumugam, "Engineering Physics", Anuradha Publication (2004)
2. Dr. Senthil Kumar "Engineering Physics I" VRB Publishers (2016)
3. N.S.Shubhashree&R.Murugesan., "Engineering Physics", Sreelakhsmi Publishers(2008)

References

4. K. Gaur & S.L. Gupta, "Engineering. Physics", Dhanpat Raj & Sons, VI Edition, (1988)
5. Palanisamy, P.K., "Engineering Physics", Scitech Publications (P) Ltd., (2006)

Subject Code : **BCH17001**	Subject Name : **ENGINEERING CHEMISTRY – I**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Providing an insight into basic concepts of chemical thermodynamics.**
2. **To create awareness about the water quality parameters, water analysis and softening of water from industrial perspective.**
3. **Imparting fundamentals of emf, storage and fuel cells.**
4. **Creating awareness about corrosion and its control methods.**
5. **Introducing modern materials such as composites along with basic concepts of polymer chemistry and plastics.**

COURSE OUTCOMES (Cos) : (3 – 5)

CO1	**Gain a clear understanding of the basics of chemical thermodynamics which include concepts such as Enthalpy, Entropy and Free energy.**
CO2	**Obtain an overall idea of Water quality parameters, Boiler requirements, problems, Water softening and Domestic Water treatment.**
CO3	**Improving the basic knowledge in electrical conductance and emf and also understand the chemical principles of storage devices.**
CO4	**Observe the information about corrosion and understand the mechanisms of corrosion and the methods of corrosion control.**
CO5	**Articulate the science of polymers and composites.**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**L**	**M**										**M**
CO2	**M**	**L**	**M**	**L**		**L**	**H**					**M**
CO3	**L**	**M**	**L**				**L**					**L**
CO4	**M**		**L**	**L**								**L**
CO5	**M**		**L**									**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
	√								

Approval	

BCH17001 ENGINEERING CHEMISTRY – I 3 2 0/1 0/0

1. CHEMICAL THERMODYNAMICS (8)

Introduction, Terminology in thermodynamics –System, Surrounding, State and Path functions, Extensive and intensive properties. Laws of thermodynamics – I and II laws-Need for the II law. Enthalpy, Entropy, Gibbs free energy, Helmholtz free energy - Spontaneity and its criteria. Maxwell relations, Gibbs - Helmholtz equation (relating E & A) and (relating H & G), Van't Hoff equations.

2.TECHNOLOGYOF WATER (9)

Water quality parameters – Definition and expression. Analysis of water – alkalinity, hardness and its determination (EDTA method only). Boiler feed water and Boiler troubles-Scales and sludges, Caustic embrittlement, Priming and Foaming and Boiler corrosion. Water softening processes – Internal and external conditioning – Lime soda, Zeolite, Demineralisation methods. Desalination processes-RO and Electrodialysis .Domestic water treatment.

3. ELECTROCHEMISTRY AND ENERGY STORAGE DEVICES (10)

Conductance – Types of conductance and its Measurement. Electrochemical cells – Electrodes and electrode potential, Nernst equation – EMF measurement and its applications. Types of electrodes-Reference electrodes-Standard hydrogen electrode- Saturated calomel electrode-Quinhydrone electrode – Determination of P^H using these electrodes.

Reversible and irreversible cells– Fuel cells- H_2–O_2 fuel cell, Batteries-Lead storage battery,Nickel–Cadmium and Lithium-Battery.

4. CORROSION AND PROTECTIVE COATING (9)

Introduction–Causes of Corrosion–Consequences- Factors affecting corrosion. Theories of corrosion-Chemical corrosion and Electrochemical corrosion. Methods ofcorrosion control – corrosion inhibitors, Sacrificial anode and Impressed current cathodic protection.

Protective coatings- Metallic coatings- Chemical conversion coatings-paints-Constituents and functions.

5.POLYMERS AND COMPOSITES (9)

Monomers – Functionality – Degree of polymerization-Tacticity.Polymers – Classification, Conducting Polymers,Biodegradable polymers- Properties and applications.Plastics – Thermoplastics and thermosetting plastics,Compounding of plastics – Compression moulding, injection moulding and extrusion processes.

Polymer composites-introduction-Types of composites-particle reinforced-fiber reinforced-structural composites-examples. Matrix materials, reinforcement materials-Kevlar, Polyamides, fibers, glass, carbon fibers, ceramics and metals .

Total number of periods : 45

Textbooks

1. S.Nanjundan & C.SreekuttanUnnithan, "Applied Chemistry", Sreelakshmi Publications, (2007)
2. Dr.R.Sivakumar and Dr.N.Sivakumar" Engineering Chemistry" Tata McGraw Hill Publishing Company Ltd, Reprint 2013.

References

1. P.C. Jain & Monika Jain, "Engineering Chemistry", Dhanpat Rai publishing Co., (Ltd.) (2013).
2. J. C. Kuriacose & J. Rajaram, "Chemistry in Engineering & Technology", Tata Mc Graw Hill (1996).
3. B.R.Puri, L.R.Sharma & M.S.Pathania, "Principles of Physical Chemistry", Vishal publishing co., (2013).

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(An ISO 9001 : 2008 Certified Institution)

Department of Civil Engineering

Subject Code : **BES17001**	Subject Name : **BASIC ELECTRICAL & ELECTRONICS ENGINEERING**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Understand the concepts of circuit elements, circuit laws and coupled circuits.**
2. **Acquire knowledge on conventional &non conventional energy production.**
3. **Gain information on measurement of electrical parameters.**
4. **Identify basic theoretical principles behind the working of modern electronic gadgets.**
5. **Demonstrate digital electronic circuits and assemble simple devices.**

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	**Students understand Fundamental laws and theorems and their practical applications**
CO2	**Predict the behavior of different electric and magnetic Circuits.**
CO3	**Identify conventional and Non-conventional Electrical power Generation, Transmission and Distribution.**
CO4	**Identify & Apply schematic symbols and understand the working principles of electronic devices**
CO5	**Analyze basics of digital electronics and solving problems and design combinational circuits**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**	**H**	**H**							**M**	**L**
CO2	**H**	**H**	**H**	**M**	**M**		**M**				**M**	
CO3	**H**	**M**	**H**	**M**	**H**		**M**		**M**			**L**
CO4	**H**	**M**		**M**			**M**				**M**	**L**
CO5	**H**	**M**	**H**	**M**	**H**				**M**		**M**	**L**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
		√							

Approval	

BES17001 BASIC ELECTRICAL & ELECTRONICS ENGINEERING 3 2 0/1 0/0

1. ELECTRIC CIRCUITS (9)

Electrical Quantities – Ohms Law – Kirchhoff's Law – Series and Parallel Connections – Current Division and Voltage Division Rule - Source Transformation – Wye (Y) – Delta (Δ) , Delta (Δ) – Wye (Y) Transformation – Rectangular to Polar and Polar to Rectangular.

2. MACHINES & MEASURING INSTRUMENTS (9)

Construction & Principle of Operation of DC motor & DC Generator – EMF equation of Generator – Torque Equation of Motor – Construction & Principle of operation of a Transformer – PMMC – Moving Iron types of meter – Single Phase Induction Type Energy Meter.

3. BASICS OF POWER SYSTEM (9)

Generation of Electric Power (Thermal, Hydro, Wind and Solar) – Transmission & Distribution of Electric Power – Types of Transmission & Distribution Schemes – Representation of Substation.

4. ELECTRON DEVICES (9)

Passive Circuit Components-Classification of Semiconductor-PN Junction Diode-Zener diode- Construction and Working Principle –Applications--BJT-Types of configuration-JFET.

5. DIGITAL SYSTEM (9)

Number System – Binary, Decimal, Octal, Hexadecimal – Binary Addition Subtraction, Multiplication & Division– Boolean Algebra – Reduction of Boolean Expressions – Logic Gates - De-Morgan's Theorem , Adder – Subractor.

Total no of Periods : 45

Text Books

1. D P Kothari, I J Nagrath, Basic Electrical Engineering, Second Edition, , Tata McGraw-Hill Publisher
2. A Course In Electrical And Electronic Measurements And Instrumentation,A.K. Sawhney, publisher DHANPAT RAI&CO
3. Text Book of Electrical Technology: Volume 3: Transmission, Distribution and Utilization,B.L.Theraja, A.K.Theraja, publisher S.CHAND
4. Morris Mano, M. (2002) Digital Logic and Computer Design. Prentice Hall of India
5. Millman and Halkias1991, Electronic Devices and Circuits , Tata McGraw Hill,

References

1. R.Muthusubramanian, S.Salivahanan, K A Muraleedharan, Basic Electrical, Electronics And Computer Engineering, Second Edition, ,Tata McGraw-Hill publisher.

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Department of Civil Engineering

Subject Code : **BES17002**	Subject Name : **BASIC MECHANICAL & CIVIL ENGINEERING**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Learn Basics of Internal Combustion Engines, power plants and boilers**
2. **Demonstrate How metals are formed, joined, using machining operations Lathe, Milling and Drilling machines**
3. **To identify & solve problems in Engineering Mechanics**
4. **Learn basics of Building materials and construction**
5. **Know the basic process of concrete, types of masonry Construction of Roads , Railways, Bridges and Dams**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**Demonstrate the working principles of power plants, IC Engines and boilers..**
CO2	**Utilize the concept of metals forming, joining process and apply in suitable machining process**
CO3	**Identify and provide solutions for problems in engineering mechanics**
CO4	**Utilize the concept of Building materials and construction able to perform concrete mix and masonry types**
CO5	**Demonstrate how Roads, Railways, dams, Bridges have been constructed**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**					**M**		**H**	**H**	**H**		**H**
CO2	**H**				**L**	**M**		**M**	**M**	**M**		**M**
CO3	**H**	**H**			**L**	**L**		**M**	**M**	**M**		**M**
CO4	**H**				**L**	**L**			**M**	**M**		**M**
CO5	**H**				**L**	**L**		**M**	**M**	**M**		**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
		√							

Approval	

BES17002 BASIC MECHANICAL & CIVIL ENGINEERING 3 2 0/1 0/0

UNIT- I : THERMAL ENGINEERING (9)

Classification of internal combustion engine – two stroke, four stroke petrol and diesel engines. Classification of Boilers – Cochran boiler – Locomotive boilers – Power plant classification – Working of Thermal and Nuclear power plant.

UNIT- II : MANUFACTURING PROCESS (13)

Metal forming processes – Rolling, forging, drawing, extrusion and sheet metal operations- fundamentals only. Metal Joining processes – Welding - arc and gas welding, Soldering and Brazing. Casting process – Patterns -Moulding tools - Types of moulding - Preparation of green sand mould -Operation of Cupola furnace.

Basics of metal cutting operations – Working of lathe- parts-Operations performed. Drilling machine – Classification – Radial drilling machine - Twist drill nomenclature.

UNIT- III : MECHANICS (9)

Stresses and Strains – Definition – Relationship – Elastic modulus – Centre of gravity – Moment of Inertia – Problems. (Simple Problems Only).

UNIT- IV : BUILDING MATERIALS AND CONSTRUCTION (7)

Materials:Brick - Types of Bricks - Test on bricks - Cement – Types, Properties and uses of cement – Steel - Properties and its uses – Ply wood and Plastics.

Construction:Mortar – Ingredients – Uses – Plastering - Types of mortar - Preparation – Uses – Concrete – Types – Grades – Uses – Curing – Introduction to Building Components (foundation to roof) – Masonry – Types of masonry (Bricks & Stones)

UNIT- V : ROADS, RAILWAYS, BRIDGES & DAMS (7)

Roads – Classification of roads – Components in roads – Railways -Components of permanent way and their function – Bridges – Components of bridges – Dams – Purpose of dams – Types of dams.

Total No. of Periods : 45

Text books

1. S. Bhaskar, S. Sellappan, H.N.Sreekanth,, (2002), "*Basic Engineering*" –Hi-Tech Publications
2. K. Venugopal, V. Prabhu Raja, (2013-14), "*Basic Mechanical Engineering*", Anuradha Publications.
3. K.V. Natarajan (2000), *Basic Civil Engineering,*Dhanalakshmi Publishers
4. S.C. Sharma(2002),*Basic Civil Engineering,*Dhanpat Raj Publications

References

1. PR.SL. Somasundaram, (2002), "*Basic Mechanical Engineering*" –, Vikas Publications.
2. S.C. Rangawala(2002), *Building Material and Construction,* S. Chand Publisher

Subject Code : **BES17ET1**	Subject Name : **BASIC ENGINEERING GRAPHICS**	C	L	T/SLr	P/R
	Prerequisite : None	**2**	**1**	**0/0**	**2/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Learn to know what kind of pencils to be used to sketch lines, numbers, Letters and Dimensioning in drawing sheet.**
2. **Draw Projection of points, line, planes and solids using Drafters**
3. **To identify the angle of projection and development of surfaces, isometric projection and Orthographic projection**
4. **Know the basics of elevation and plan of building.**
5. **Learn the basics of Drafting using AutoCAD Software**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**Utilize the concept of Engineering Graphics Techniques to draft letters, Numbers, Dimensioning in Indian Standards**
CO2	**Demonstrate the drafting practice visualization and projection skills useful for conveying ideas in engineering applications.**
CO3	**Identify basic sketching techniques of engineering equipments**
CO4	**Demonstrate the projections of Points, Lines, Planes and Solids.**
CO5	**Draw the sectional view of simple buildings and utilize Auto CAD Software.**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**	**H**	**M**	**M**	**M**			**H**	**H**		**H**
CO2	**H**	**H**	**H**	**M**	**M**	**M**			**H**	**H**		**H**
CO3	**H**	**H**	**H**	**L**		**M**			**M**	**M**		**M**
CO4	**H**	**H**	**M**	**M**		**H**		**M**	**H**	**H**		**H**
CO5	**H**	**H**	**H**	**M**	**H**	**L**		**M**	**H**	**H**		**H**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
							√		

Approval	

BES17ET1 **BASIC ENGINEERING GRAPHICS** **2 1 0/0 2/0**

CONCEPTS AND CONVENTIONS (Not for examination) (3)

Introduction to drawing, importance and areas of applications – BIS standards – IS: 10711 – 2001 : Technical products Documentation – Size and layout of drawing sheets – IS 9606 – 2001: Technical products Documentation – Lettering – IS 10714 & SP 46 – 2003: Dimensioning of Technical Drawings – IS : 15021 – 2001 : Technical drawings – Projections Methods – drawing Instruments, Lettering Practice – Line types and dimensioning – Border lines, lines title blocks Construction of polygons – conic sections – Ellipse, Parabola, Hyperbola and cyloids.

UNIT- I : PROJECTION OF POINTS, LINES AND PLANE SURFACES (6)

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – projection of polygonal surface and circular lamina in simple position only.

UNIT- II : PROJECTION OF SOLIDS (6)

Projection of simple solids like prism, pyramid, cylinder and cone in simple position

Sectioning of above solids in simple vertical position by cutting plane inclined to one reference plane and perpendicular to the other.

UNIT- III : DEVELOPMMENT OF SURFACES AND ISOMETRIC PROJECTION (6)

Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders, and cones.

Principles of isometric projection – isometric scale – isometric projections of simple solids, like prisms pyramids, cylinders and cones.

UNIT- IV : ORTHOGRAPHICS PROJECTIONS (6)

Orthographic projection of simple machine parts – missing views

BUILDING DRAWING

Building components – front, Top and sectional view of a security shed.

UNIT- V : COMPUTER AIDED DRAFTING (3)

Introduction to CAD – Advantages of CAD – Practice of basic commands – Creation of simple components drawing using CAD software.

Total No. of periods:30

Note:First angle projection to be followed.

Text Books

1. Bhatt, N.D. and Panchal, V.M. (2014) Engineering Drawing Charotar Publishing House
2. Gopalakrishnan, K.R. (2014) Engineering Drawing (Vol.I& II Combined) Subhas Stores, Bangalore.

References

1. Natarajan, K.V (2014) A Text Book of Engineering Graphics, DhanalakshmiPublisheres, Chennai
2. Venugopal, K and Prabhu Raja, V. (2010) Engineering Graphics, New Age International (P) Limited

Special Points applicable to University examinations on Engineering Graphics

1. There will be five questions, each of either or type covering all UNIT-s of the syllabus
2. All questions will carry equal marks of 20 each making a total of 100
3. The answer paper shall consists of drawing sheets of A2 size only. The students will be permitted to use appropriate scale to fit solution within A2 size.

Subject Code : **BPH17L01**	Subject Name : **ENGINEERING PHYSICS LAB**	C	L	T/SLr	P/R
	Prerequisite : None	**1**	**0**	**0/0**	**2/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Demonstrate an ability to make physical measurements & understand the limits of precision in measurements.**
2. **Display the ability to measure properties of variety of electrical, mechanical, optical systems.**

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	**Recognize the correctness and precision in the results of measurements.**
CO2	**Construct and compare the properties of variety of electrical, mechanical, electronic and optical systems.**
CO3	**Practice the handling of Electrical, Electronic, Optical & Mechanical Equipments**
CO4	**Identify and compare the theoretical and practical usage of various instruments**
CO5	

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**	**M**	**H**	**M**							
CO2	**H**	**M**	**M**	**H**						**M**		
CO3	**H**	**M**	**M**	**H**	**M**				**M**	**M**		**M**
CO4	**H**	**H**	**M**	**M**	**H**				**M**			**L**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
							√		

Approval	

BPH17L01 **ENGINEERING PHYSICS LAB** **1 0 0/0 2/0**

LIST OF EXPERIMENTS (Any Seven)

1. Torsional Pendulum Without Masses–Determination of Rigidity Modulus and Moment of Inertia
2. Torsional Pendulum With Masses–Determination of Rigidity Modulus and Moment of Inertia
3. Non Uniform Bending – Determination of Young`s Modulus
4. Uniform Bending – Determination of Young`s Modulus
5. Poiseuille`s Method - Determination of Coefficient of Viscosity of a given liquid
6. Lee's Disc – Determination of Thermal Conductivity of Bad Conductor
7. Spectrometer – Determination of Refractive Index of a Prism
8. Laser Grating – Determination of Wavelength of a given Source
9. Spectrometer –Determination of Wavelength of Mercury Spectrum using Grating
10. Transistor Characteristics.

Subject Code : **BCH17L01**	Subject Name :**ENGINEERING CHEMISTRY LAB**	C	L	T/SLr	P/R
	Prerequisite : None	**1**	**0**	**0/0**	**2/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **To familiarize the students in the determination of water quality parameters**
2. **To help learners measure conductivity and EMF using electrical equipment.**
3. **To create awareness about corrosion.**
4. **To determine the essential parameters of polymers**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**Awareness of water quality parameters and its determination.**
CO2	**Familiarizing the conductometric titration method.**
CO3	**Ability to measure EMF and perform potentiometric titrations.**
CO4	**Measuring the Molecular weight of macromolecules**
CO5	**Gaining awareness about corrosion.**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**	**H**	**H**	**M**	**M**							**L**
CO2	**M**	**H**		**L**	**M**				**L**			
CO3	**L**	**M**		**L**					**L**			
CO4	**M**	**M**		**L**					**L**			
CO5	**L**	**M**	**L**	**L**								**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
							√		

Approval	

BCH17L01 **ENGINEERING CHEMISTRY LAB** **1 0 0/0 2/0**

LIST OF EXPERIMENTS (Any Seven)

(1) Estimation of temporary, permanent and total hardness of water.

(2) Determination of type and extent of alkalinity in water.

(3) Estimation of dissolved oxygen in a water sample.

(4) Conductometric titration of strong acid vs. strong base

(5) Conductometric precipitation titration using barium chloride and sodium sulphate.

(6) Determination of Equivalent conductance of strong electrolyte at infinite dilution.

(7) Determination of single electrode potential.

(8) Estimation of Fe^{2+}ion by potentiometry.

(9) Determination of Molecular Weight and Degree of Polymerisation of Polymer by viscometry.

(10) Determination of rate of corrosion by weight loss method.

Subject Code : **BES17L01**	Subject Name :**BASIC ENGINEERING WORKSHOP**	C	L	T/SLr	P/R
	Prerequisite : None	**1**	**0**	**0/0**	**2/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Familiarize the plumbing tools, fittings, carpentry tools, etc.**
2. **Identify basic electrical wiring and measurement of electrical quantities.**
3. **Identify Electronic components ,logic gates and soldering process**
4. **Display simple fabrication techniques**
5. **Execute a project independently and make a working model**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**Demonstrate fitting tools and carpentry tools, & Perform the process of Filing, Chipping, Cutting.**
CO2	**Perform the process of fabrication of tray, cones and funnels, Tee Halving Cross, Lap Joint Martise& Joints**
CO3	**Demonstrate various types of wirings and other equipments.**
CO4	**Measure fundamental parameters using the electronic instruments**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**	**H**	**M**	**M**			**L**	**M**			**L**
CO2	**H**		**H**	**L**	**M**			**L**	**L**			
CO3	**H**		**M**	**L**				**L**	**L**			
CO4	**H**	**H**	**M**	**L**				**L**	**L**			**M**
CO5												

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
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Approval	

BES17L01 **BASIC ENGINEERING WORKSHOP** **1 0 0/0 2/0.**

MEP PRACTICE

1. **FITTING :**
   Study of fitting tools and Equipments – Practicing, filing, chipping and cutting – making V-joints, half round joint, square cutting and dovetail joints.

2. **CARPENTRY:**
   Introduction – Types of wood – Tools – Carpentry processes – Joints – Planning practice – Tee Halving Joint – Cross Lap Joint – Maritse and Tenon Joint – Dovetail Joint

3. **SHEET METAL:**
   Study of tools and equipments – Fabrication of tray, cones and funnels.

CIVIL ENGINEERING PRACTICE

1. Study of Surveying and its equipments
2. Preparation of plumbing line sketches for water supply and sewage lines
3. Basic pipe connection using valves, laps, couplings, unions, reduces and elbows in house hold fittings

ELECTRICAL ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR
2. Soldering practice – Components Devices and Circuits – Using general purpose PCB
3. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
4. Fluorescent lamp wiring.
5. Stair case wiring

ELECTRONIC ENGINEERING PRACTICE

1. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
2. Measurement of energy using single phase energy meter.
3. Measurement of resistance to earth of an electrical equipment.

Subject Code : **BES17ET2**	Subject Name : **C PROGRAMMING AND LAB**	C	L	T/SLr	P/R
	Prerequisite : None	**2**	**1**	**0/0**	**2/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Outline the basics of C Language.**
2. **Apply fundamentals in C programming.**
3. **Produce and present activities associated with the course.**

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	**Acquire knowledge how to write and execute c programs**
CO2	**Understand the fundamental expression and statements of C Language.**
CO3	**Work with arrays, functions, pointers, structures, Strings and Files in C.**
CO4	**Identify and provide solutions for engineering problems in C programming**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**			**M**	**M**		**H**	**M**			**H**
CO2	**H**	**M**			**H**	**M**		**M**	**H**			**M**
CO3	**H**			**H**		**M**		**M**	**H**			**M**
CO4	**H**			**M**		**M**		**H**	**M**			**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
							√		

Approval	

BES17ET2 **C PROGRAMMING AND LAB** **2 1 0/0 2/0**

1. INTRODUCTION (6)

Fundamentals, C Character set, Identifiers and Keywords, Data Types, Variables and Constants, Structure of a C Program, Executing a C Program.

2.EXPRESSION AND STATEMENT (6)

Operators, Types-Complex and Imaginary, Looping Statement-For, While, Do, Break, continue, Decision Statement-If, If else, Nested if, Switching Statement, Conditional Operator.

3.ARRAYS AND FUNCTIONS (6)

Defining an Array, Using Array elements as counters, Generate Fibonacci number, Generate Prime Numbers, Initializing Arrays, Multidimensional Arrays, Defining a Function, Function call -types of Function calls -Function pass by value -Function pass by reference, Write a Program in Recursive Function.

4. STRUCTURES AND POINTERS (6)

Working with Structures -Introduction -Syntax of structures -Declaration and initialization -Declaration of structure variable -Accessing structure variables, Understanding Pointers -Introduction -Syntax of Pointer.

5. STRINGS AND FILE HANDLING (6)

Strings -Syntax for declaring a string -Syntax for initializing a string -To read a string from keyboard, Files in C -File handling functions -Opening a File closing a file --example: fopen, fclose -Reading data from a File- Problem solving in C

Total No of Periods: 30

1. **www.spoken-tutorials.org**
2. **http://www.learn-c.org/**

Reference :

1. Stephen G. Kochen“ Programming in C- A complete introduction to the C Programming Language. Third Edition, Sams Publishing -2004
2. Ajay Mital, “ Programming in C: A Practical Approach”, Pearson Publication-2010

List of Programs

1. Write a program to check 'a' is greater than 'b' or less than 'b' Hint: use if statement.
2. Write another program to check which value is greater 'a', 'b' or 'c'. Hint: use else-if statement. (Take values of a, b, c as user inputs)
3. Write a Program to find the sum of the series : $x + X^3/3! + X^5/5!+\ldots\ldots\ldots\ldots\ldots X^n/n!$
4. Write a C Program to solve a Quadratic Equation by taking input from Keyboard
5. Write a C Program to arrange 20 numbers in ascending and descending Order. Input the Numbers from Keyboard
6. Write a C Program to Multiply a 3 x 3 Matrix with input of members from Keyboard
7. Write a program that takes marks of three students as input. Compare the marks to see which student has scored the highest. Check also if two or more students have scored equal marks.
8. Write a program to display records of an employee. Like name, address, designation, salary.
9. Write a C program, declare a variable and a pointer. Store the address of the variable in the pointer. Print the value of the pointer.
10. Write a C program to concatenate String 'best' and String 'bus'. Hint: strcat(char str1, char str2);
11. Explore the other functions in string library.
12. Write a program to create a file TEST. Write your name and address in the file TEST. Then display it on the console using C program.

Subject Code : **BES17ET3**	Subject Name : **ENTREPRENEURIAL SKILL DEVELOPMENT & PROJECT LAB**	C	L	T/SLr	P/R
	Prerequisite : None	**1**	**0**	**0/0**	**2/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Understand how entrepreneurship Education transforms individuals into successful leaders.**
2. **Identify individual potential &Shape career dreams**
3. **Understand difference between ideas & opportunities**
4. **Understand the "flow" & create Entrepreneurial CV.**
5. **Identify components & create action plan.**
6. **Use brainstorming in a group to generate ideas.**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**Develop a Business plan & improve ability to recognize business opportunity**
CO2	**Do a self analysis to build a entrepreneurial career.**
CO3	**Articulate an effective elevator pitch.**
CO4	**Analyze the local market environment & demonstrate the ability to find an attractive market**
C05	**Apply an ethical understanding & perspective to change opportunities to business situations**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		**M**	**M**	**H**	**M**	**M**	**M**		**M**	**M**	**M**	**L**
CO2	**H**	**M**		**H**	**M**	**H**	**M**	**H**	**H**	**H**	**M**	**M**
CO3		**M**	**M**	**M**		**H**		**H**	**H**	**H**		
CO4		**H**	**M**	**M**	**M**	**M**		**H**	**M**	**M**	**H**	
CO5		**M**	**M**	**H**	**M**	**M**	**H**	**H**	**M**	**M**	**H**	**L**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
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Approval	

BES17ET3 ENTREPRENEURIAL SKILL DEVELOPMENT & PROJECT LAB 1 0 0/0 2/0

1. CHARACTERISTICS OF A SUCCESSFUL ENTREPRENEUR

Introduction to entrepreneurship education – Myths about entrepreneurship – How has entrepreneurship changed the country – Dream it. Do it - Idea planes - Some success stories – Global Legends – Identify your own heroes – entrepreneurial styles – Introduction, concept & Different types - Barrier to Communication – Body language speaks louder than words

2. DESIGN THINKING & RISK MANAGEMENT

Introduction to Design thinking – Myth busters – Design thinking Process - Customer profiling – Wowing your customer – Personal selling – concept & process – show & tell concept – Introduction to the concept of Elevator Pitch - Introduction to risk taking & Resilience – Managing risks (Learning from failures, Myth Buster) – Understanding risks through risk takers – Why do I do? – what do I do ?

3.IDEA GENERATION & EVALUATION

Introduction – Finding your flow – Entrepreneurial CV – your draft action plan - D.I.S.R.U.P.T - A model for ideation – Let's ID8 – Mind mapping for ideas – build your own idea bank – Concept of Decision matrix & paired comparison analysis – 5Q framework.

4. ENTREPRENEURIAL OUTLOOK & CUSTOMER DISCOVERY

Effectuation – Start with your means – Segmentation & targeting – Niche marketing – Find your Niche – Drawing & mapping the consumption chain - outcome driven innovation – This is my customer

5. VALUE PROPOSITION& CAP STONE PROJECT PRESENTATION

Introduction – Value proposition design – customer segment – validation exercise – value propositions & assessing fit – Refine your value proposition – Blue ocean strategy - What is prototyping – Design your experiment – Design your MVP – Learning cards & Capstone Presentation.

Subject Code : **BEN17002**	Subject Name : **TECHNICAL ENGLISH - II**	C	L	T/SLr	P/R
	Prerequisite : None	2	1	0/0	2/0

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **strengthen the academic and interpersonal advanced vocabulary**
2. **strengthen their writing skill such as summarizing, describing and report writing**
3. **learn to keep the simple conversations in day to day life**
4. **get to know certain life skills such as marketing, advertising and do presentation**
5 **improve the reading skill with comprehension**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**strengthen their active vocabulary and appropriate language usage through reading poems, stories, texts, newspapers, magazines and research articles**
CO2	**use appropriate technical vocabulary in interpreting data**
CO3	**engage effectively in role-play, dialogue, conversation and interviews**
CO4	**equip them for effective interaction with people in all situations both academic and professional**
CO5	**learn English language as a 'life skill' and prepare for placement interviews**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				**H**						**H**		**H**
CO2				**H**						**H**		**H**
CO3				**H**		**M**			**H**	**H**		**H**
CO4				**H**					**H**	**H**		**H**
CO5				**H**					**H**	**H**		**H**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
			√						

Approval	

BEN17002 **TECHNICAL ENGLISH II** **2 1 0/0 2/0**

Unit I Vocabulary, Grammar and Usage – I (6)

Verbal analogy – picking out the odd one from a series –finding one word substitute – paragraph writing: using discourse markers, defining / describing an object / device / instrument / machine using topic sentence and its role, unity, coherence and use of cohesive expressionsEssay writing with due emphasis on features such as topical sentence, unity, coherence and cohesive devices

UnitII Vocabulary, Grammar and Usage – II (6)

Cloze – completion of sentences suitably, phrases and idioms, homophones – collocation -
Techniques of formatting and drafting reports: writing newspaper reports on accidents, thefts and festivals

Unit III Reading (6)

Correcting errors in sentencesEditing a passage (correcting the mistakes in grammar, spelling and punctuation) - interpreting pie and bar charts

Unit IV Writing (6)

Register: formal and informal – using ellipses in dialogues- framing dialogues-Email: Job Application, Resume

Unit V Functional English and Practical Components (6)

Listening: Media Advertisement

Speaking: oral practice- activities related to professional skills (e.g. Marketing, advertising etc.), role play activities using different speech functions (persuasion, negotiation, giving directions and guidance), conversational etiquette (politeness, strategies, turn-taking, body language).

Reading: reading newspaper/ magazine articles for gathering information

Writing: Note-making from newspaper and magazine articles- follow BEC method

Writing and speaking dialogue writing followed by role play in different situations such as asking permission, requesting and instructing, introducing oneself – activities based on BEC

Total No of Periods :30

Text Book

1. Pushkala. R, PadmasaniKannan.S ,Anuradha. V,ChandrasenaRajeswaran.M Quest : A Textbook of ommunication
   Skills, Vijay Nicole,

References

1. Pushkala R, P.A.Sarada, El Dorado: A Textbook of Communication Skills, Orient Blackswan, 2014
2. PadmasaniKannan.S., Pushkala.R. : Functional English
3. Hancock, Mark, English Pronunciation in Use; Cambridge Univ. Press, 2013
4. McCarthy, Michael et.al,, English Vocabulary in Use, Advanced, Cambridge Univ. Press, 2011
5. Wren and Martin: Grammar and Composition, Chand & Co, 2006

Web Sources

1. https://learnenglish.britishcouncil.org
2. www.englishpage.com
3. www.writingcentre.uottawa.ca/hypergrammar/preposit.html
4. www.better-english.com/grammar/preposition.html
5. http://www.e-grammar.org/infinitive-gerund/
6. www.idiomsite.com/

Subject Code : **BMA17003**	Subject Name : **MATHEMATICS – II**	C	L	T/SLr	P/R
	Prerequisite : None	4	3	1/0	0/0

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Understand the Basic concepts in Integration**
2. **Identify the Basic concepts in Multiple integrals**
3. **Use the Basic concepts in Ordinary Differential equations**
4. **Apply the Basic concepts of Analytical Geometry**
5. **Analyze the Basic concepts of Vector Calculus**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**Integrate given function by using methods of integration and to find the area under curve and the volume of a solid by revaluation.**
CO2	**Evaluate the multiple integrals / area /volume and to change the order of integration.**
CO3	**Solve the ordinary differential equation and to solve Eulers differential equation.**
CO4	**Find the equation of planes, lines and sphere and to find the shortest distance between to skew lines.**
CO5	**Find the gradient, maximum directional derivative and work done by a force and to verify Green/ Stokes/ Gauss divergence theorem**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**			**M**	**M**			**M**	**M**		**H**
CO2	**H**	**H**			**M**	**H**			**H**	**H**		**M**
CO3	**H**	**H**			**M**	**H**			**H**	**H**		**M**
CO4	**H**	**H**			**L**	**M**			**M**	**H**		**M**
CO5	**H**	**H**			**M**	**M**			**M**	**H**		**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
	√								

Approval	

BMA17003 **MATHEMATICS – II** **4 3 1/0 0/0**

1. INTEGRATION (12)

Basic concepts of Integration – Methods of Integration– Integration by substitution – Integration by parts – Definite integrals– Properties of definite integrals – Problems on finding Area and Volume using single integrals (simple problems).

2. MULTIPLE INTEGRALS **(**12)

Double integral in Cartesian and Polar Co-ordinates – Change of order of integration – Triple integral in Cartesian Co-ordinates – Spherical Polar Co-ordinates – Change of variables (simple problems).

3.ORDINARY DIFFERENTIAL EQUATIONS (12)

First order differential equations – Second and higher order linear differential equations with constant coefficients and with RHS of the form: e^{ax}, x^n, Sin ax, Cos ax, $e^{ax}f(x)$, x f(x) where f(x) is Sin bx or Cos bx – Differential equations with variable coefficients (Euler's form) (simple problems).

4.THREE DIMENSIONAL ANALYTICAL GEOMETRY (12)

Direction Cosines and Ratios – Equation of a straight line – Angle between two lines – Equation of a plane – Co-planar lines – Shortest distance between skew lines – Sphere – Tangent plane.

5. VECTOR CALCULUS (12)

Scalar and Vector functions – Differentiation – Gradient, Divergence and Curl – Directional derivatives – Irrotational and Solenoidal fields– Line, Surface and Volume integrals – Green's, Stoke's and Gauss divergence theorems (statement only) – Verification.

Total no. of periods : 60

Textbooks

1. Kreyszig E., *Advanced Engineering Mathematics (10th ed.)*, John Wiley & Sons, (2011).
2. Veerarajan T., *Engineering Mathematics (for first year)*, Tata McGraw Hill Publishing Co., (2008).

References

1. Grewal B.S., *Higher Engineering Mathematics*, Khanna Publishers, (2012).
2. John Bird, *Basic Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2010).
3. P.Kandasamy, K.Thilagavathy and K. Gunavathy, *Engineering Mathematics Vol. I (4th Revised ed.)*, S.Chand& Co.,

   Publishers, New Delhi (2000).
4. John Bird, *Higher Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2006).

Subject Code : **BMA17004**	Subject Name : **BIO STATISTICS**	C	L	T/SLr	P/R
	Prerequisite : None	**4**	**3**	**1/0**	**0/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Understand the Basic concepts in Statistics**
2. **Use the Basic concepts in Correlation**
3. **Understand the Basic concepts in Probability theory**
4. **Apply the Basic concepts in Testing of Hypothesis**
5. **Analyze the Basic concepts in Design of Experiments**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**Find the measures of central tendency and to find the measures of dispersion.**
CO2	**Evaluate the moments measures of skewness and kurtorsls and to evaluate correlation and regression.**
CO3	**Apply knowledge and concepts in finding the probability of a random variable and use addition and multiplication laws of Probability**
CO4	**Have ability to test and to give conclusion in testing of hypothesis.**
CO5	**Analyze and interpret results through one way and two way ANOVA**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**				**H**			**M**		**M**	**M**
CO2	**H**	**H**				**H**			**L**			**H**
CO3	**H**	**H**	**L**		**L**	**M**			**L**		**L**	**H**
CO4	**H**	**H**	**L**		**L**	**M**			**M**			**H**
CO5	**H**	**H**	**H**	**M**					**M**			**H**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
	√								

Approval	

BMA17004 **BIO STATISTICS** **4 3 1/0 0/0**

1. BASICS OF STATISTICS (12)

Variables – Uni-variate Data – Frequency Distribution – Measures of Central Tendency – Mean –Median –Mode – Quartiles – Measures of Dispersion – The Range – Quartile Deviation –Standard Deviation.

2. CORRELATION (12)

Measures of Skewness& Kurtosis – Bi-variate data – Correlation & Regression.

3. PROBABILITY AND RANDOM VARIABLE **(**12)

Definition of Random Experiment - Sample Space – Events: Mutually exclusive events - Exhaustive events - Dependent events and Independent events - Mathematical and Statistical definition of probability - Theorems of addition and multiplication laws of Probability (Without proof) - Conditional probability (Simple problems).

4. SAMPLING (12)

Tests of Significance – Large Sample Tests – Mean – Proportions – Small Sample Tests – t, F & Chi-square Tests – Independence of Attributes – Goodness of Fit.

5. DESIGN OF EXPERIMENTS (12)

Analysis of Variance: One Way & Two-Way Classification – Design of Experiments – Randomized Block Design – Completely Randomized Block Design – Latin Square Design.

Total no. of Periods : 60

Text books

1. Gupta S.C, Kapoor V.K, *Fundamentals of Mathematical Statistics*, S.Chand& Co, New Delhi (2003).
2. Veerarajan T., *Probability, Statistics and, Random Processes*, Tata McGraw Hill Publishing Co., (2008).

References

1. Gupta S.P, *Statistical Methods*, S.Chand& Co., New Delhi (2003).
2. Singaravelu, *Probability and Random Processes*, Meenakshi Agency, (2017).
3. Richard Johnson A., *Miller & Freund's Probability and statistics for Engineers (9thed)*, Prentice Hall of India, (2016).

Subject Code : **BPH17002**	Subject Name : **MATERIAL SCIENCE**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Design, conduct experiment and analyze data.**
2. **Develop a Scientific attitude at micro and nano scale of materials**
3. **Understand the concepts of Modern Physics**
4. **Apply the science of materials to Engineering & Technology**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**Demonstrate skills necessary for conducting research related to content knowledge and laboratory skills.**
CO2	**Apply knowledge and concepts in advanced materials and devices.**
CO3	**Acquired Analytical, Mathematical skills for solving engineering problems.**
CO4	**Ability to design and conduct experiments as well as function in a multi disciplinary teams.**
CO5	**Generate analytical thought to interpret results & place them within a broader context**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**	**M**	**M**	**M**	**L**				**M**		**L**
CO2	**H**	**H**		**M**	**M**							**L**
CO3	**H**	**H**	**H**	**H**	**M**					**M**		
CO4	**H**	**H**	**H**	**H**	**M**				**H**	**M**		**L**
CO5	**H**	**M**	**M**	**M**	**M**	**L**			**M**	**M**		**L**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
	√								

Approval	

BPH17002 **MATERIAL SCIENCE** **3 2 0/1 0/0**

1. CRYSTAL PHYSICS (9)

Space Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Ceramic Materials & Graphite Structures – Crystal GrowthTechniques (Slow Evaporation Method & Melt Growth)

2. CONDUCTING & SUPERCONDUCTING MATERIALS (9)

Introduction - Classical Free electron theory of Metals – Derivation of Electrical conductivity – Thermal Conductivity – Deduction of Wiedemann Franz law – Fermi Energy &Fermi Function – Density of Energy States – Qualitative Analysis of Conductors, Semiconductors and Insulators – Some Examples of Important Electrical Materials
Superconducting Materials:Transition temperature – BCS Theory – Properties of Superconductors – Type I &Type II Superconductors – Superconducting materials - Low & High Temperatures Superconductors – AC& DC Josephson Effects – Applications of Superconductors – Basic Concepts of SQUID, Magnetic Levitation.

3. SEMICONDUCTING MATERIALS (9)

Bonds in Semiconductors – Types – Importance of Germanium & Silicon – Other Commonly Used Semiconducting materials - Carrier concentration in Intrinsic Semiconductors (Electron and Hole Density) – Band Gap Determination – Carrier Transport in Semiconductors – Drift, Mobility and Diffusion – Hall effect – Determination of Hall Coefficient and its Applications – Dilute Magnetic Semiconductors (DMS) & their Applications – Schottky diodes.

4.MAGNETIC& DIELECTRIC MATERIALS (9)

Magnetic Materials: Types – Comparison of Dia, Para and Ferro Magnetism – Heisenberg's interpretation –Domain theory – Hysteresis – Soft and Hard Magnetic Materials – Application of Magnetic Resonance Imaging – Important Magnetic, Insulating & Ferro electric materials.
Dielectric Materials: Electrical Susceptibility – Dielectric Constant – Concept of Polarization – Frequency and Temperature Dependence of Polarization – Dielectric loss – Dielectric breakdown – Commomly used Dielectric materials and their practical applications.

5.OPTICAL, OPTOELECTRONIC AND NEW MATERIALS (9)

Properties & Classification of Optical Materials – Absorption in Metals, Insulators & Semiconductors – Composite Materials – Nano Materials – Bio Materials – MEMS – NEMS – LED's – Organic LED's – LCD's – Laser diodes – Photodetectors – Tunneling – Resonant Tunneling Diodes (RTD's) – Carbon Nanotubes – Various Ttypes of Optical Materials with Properties.

Total No. of Periods : 45

Text Books

1. V. Rajendran&Mariakani "Materials Science", Tata McGraw Hill (2004).
2. P.K.Palanisamy," Materials science", Scitech Publication(2002).

Reference Books

1. Dr. SenthilKumar,"Engineering Physics II" VRB Publishers (2016).
2. V. Arumugam, Materials Science", Anuradha Agencies, (2003 Edition).
3. Pillai S.O., "Solid State Physics", New Age International, (2005).

Subject Code : **BCH17002**	Subject Name :**ENGINEERING CHEMISTRY – II**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **Imparting the basic concepts of phase rule and apply the same to one and two component systems.**
2. **Introducing the chemistry of engineering materials such as cement, lubricants, abrasives, refractories, alloys and nano materials.**
3. **To impart a sound knowledge on the principles of chemistry involving different application oriented topics**
4. **Introducing salient features of fuels and combustion.**
5. **To give an overview on modern analytical techniques**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**1. Understand the science of phase equilibria and apply the phase rule to different systems.**
CO2	**2. Gain an overview of Engineering Materials such as Lime, Cement, Lubricants, Abrasives, Refractories, Alloys and Nanomaterials.**
CO3	**3. Recognize the essential information about consumer products such as Soaps and Detergents, also gaining the basic knowledge about Explosives and Propellants.**
CO4	**4. Discover the fuel Chemistry and Combustion process.**
CO5	**5. Inferring few important Analytical Techniques and their applications.**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**L**											**L**
CO2	**M**		**L**			**L**	**M**					**L**
CO3	**M**					**L**						**L**
CO4	**M**	**M**	**L**	**L**			**M**					**M**
CO5	**M**				**M**							**H**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
	√								

Approval	

BCH17002 **ENGINEERING CHEMISTRY – II** **3 2 0/1 0/0**

1. PHASE EQUILIBRIA (8)

Introduction – Definition of terms involved in phase rule. Derivation of Gibbs phase rule – Applications to one component system – water system. Binary system – Eutectic system – Pb – Ag system, Bi – Cd system .Thermal analysis – Cooling curves.

2. MATERIAL CHEMISTRY (10)

Cement – Manufacture, Chemistry of setting and hardening .Lubricants – Requirements of good lubricants, Mechanism, Properties of lubricants, Classification – Examples. Abrasives–Classification –Moh's scale-Hard and soft abrasives, Preparation of artificial abrasives (silicon carbide, boron carbide), Applications of abrasives. Refractories – Classification, Properties-Refractoriness, RUL, Porosity, Thermal spalling Alloys Classification of alloys – Purpose of making alloys - Ferrous and non-Ferrous alloys - Heat treatment Nano materials – properties, carbon nano tubes – properties, fabrication – carbon arc method, laser vapourization method.

3. APPLIED CHEMISTRY (9)

Soaps and detergents : Soaps – Saponification of oils and fats, manufacture of soaps, classification of soap – soft soap, medicated soap, herbal soap, shaving soap and creams.

Detergents – Anionic detergents – manufacture and applications, Comparison of soaps and detergents.

Rocket propellants and explosives: Rocket propellants – characteristics, solid and liquid propellants – examples. Explosives- Introduction, characteristics, classification, Oxygen balance , preparation, properties and uses of detonators, low explosives and high explosives, Dynamites, Gun cotton, Cordite.

Food adulterants- Common adulterants in different foods – milk and milk products, vegetable oils, and fats, spices and condiments, cereals, pulses, sweetening agents and beverages, Contamination with toxic chemicals – pesticides and insecticides.

4. FUELS & COMBUSTION (9)

Introduction to Fuels – classification – Calorific value – GCV, LCV. Solid Fuels–Coal-Proximate Analysis, Metallurgical Coke–Manufacture of Metallurgical Coke – Liquid Fuel–Refining of Petrol, Synthetic Petrol–Manufacturing Process–Hydrogenation of Coal, Polymerization, Cracking–Knocking–Octane Number–Leaded Petrol (or) Anti–knocking – Cetane Number–Ignition Lag–Gaseous fuels–CNG–LPG–Water Gas, Producer gas–Biogas- Combustion– Flue Gas analysis– Orsat's method.

5. ANALYTICAL AND CHARACTERIZATION TECHNIQUES (9)

Electron microscopes: Scanning electron microscope & Transmission electron microscope, instrumentation and applications Absorption and Emission Spectrum - Beer - Lambert's law. Visible and UV Spectroscopy – instrumentation – Block diagram - working. IR Spectroscopy – instrumentation - Block diagram – molecular vibrations – stretching and bending – H_2O, CO_2. –Characterization of some important organic functional groups. Chromatographic techniques – column, thin layer and paper.

Total number of periods : 45

Textbooks

1. C. S.Unnithan, T. Jayachandran& P. Udhayakala, "Industrial Chemistry", Sreelakshmi Publications (2009).
2. Dr.R.Sivakumar and Dr.N.Sivakumar" Engineering Chemistry" Tata McGraw Hill Publishing Company Ltd, Reprint 2013.

References

1. P.C. Jain & Monika Jain, "Engineering Chemistry", DhanpatRai publishing Co., (Ltd.) (2013).
2. B. R. Puri ,L.R. Sharma &M.S.Pathania, "Principles of Physical Chemistry", Vishal publishing co., (2013).

Subject Code : **BES17003**	Subject Name : **ENVIRONMENTAL SCIENCE**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**3**	**0/0**	**0/0**

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

1. **To acquire knowledge of the Environment and Ecosystem & Biodiversity**
2. **To acquire knowledge of the different types of Environmental pollution**
3. **To know more about Natural Resources**
4. **To gain understanding of social issues and the Environment**
5. **To attain familiarity of human population and Environment**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	**To known about Environment and Ecosystem & Biodiversity**
CO2	**To clearly comprehend air, water, Soil, Marine, Noise, Thermal and Nuclear Pollutions and Solid Waste management and identify the importance of natural resources like forest, water, and food resources**
CO3	**To discover water conservation and watershed management**
CO4	**To identify its problems and concerns climate change, global warming, acid rain, ozone layer depletion etc.,**
CO5	**To explain family welfare programmes and role of information technology in human health and environment**

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						**M**	**H**	**M**				**M**
CO2						**M**	**H**			**M**		**M**
CO3						**M**	**H**	**M**				**M**
CO4						**M**	**H**	**M**		**M**		**M**
CO5						**M**	**H**			**M**		**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
			√						

Approval	

BES17003 ENVIRONMENTAL SCIENCE 3 3 0 0/0

Unit I Environment and Ecosystem (9)

Definition, Scope and Importance of environment – need for public awareness – concept, structure and function of an ecosystem - producers, consumers and decomposers – energy flow in the ecosystem. Biodiversity at national and local levels – India

Unit II Environment Pollution (9)

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Nuclear hazards (g) E-Wastes and causes, effects and control measures

Unit III Natural Resources (9)

Forest resources: Use and over-exploitation, deforestation. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems.

Unit – IV Social Issues and the Environment (9)

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns climate change, global warming, acid rain, ozone layer depletion, nuclear accidents ,central and state pollution control boards- Public awareness.

Unit – V Human Population and the Environment (9)

Population growth, variation among nations – population explosion, environment and human health – human rights – value education – HIV/AIDS
– women and child welfare – role of information technology in environment and human health

Total Number of Periods : 45

Text Books

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGrawHill,NewDelhi, (2006).

References

1. Vairamani, S. and Dr. K. Sankaran. **Elements of Environmental and Health Science.**Karaikudi: KPSV Publications, 5th Edition, July, 2013.
2. Ifthikarudeen, Etal, **Environmental Studies**, Sooraj Publications,2005.
3. R.Murugesan, **Environmental Studies,** Millennium Publishers and Distributors, 2nd Edition, July, 2009.

Subject Code: BMA17005	Subject Name : MATHEMATICS III FOR MECHANICAL & CIVIL ENGINEERS	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: **MATHEMATICS II**	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.

To acquaint the student with Fourier transform techniques used in wide variety of situations.

To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the basic concepts in partial differential equations
CO2	To understand the basic concepts in fourier series
CO3	To understand the basic concepts in one & two dimensional heat and wave equations
CO4	To understand the basic concepts in Laplace Transforms
CO5	To understand the basic concepts in Fourier transforms

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H					M			
CO2	H	H		H					M			
C03	H	H		H					M			
C04	H	H		H					M			
C05	H	H		H					M			

COs / PSOs	PSO1	PSO2
CO1	H	M
CO2	H	M
C03	H	M
C04	H	M
C05	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
Approval												

BMA17005 MATHEMATICS III FOR MECHANICAL & CIVIL ENGINEERS

UNIT I: PARTIAL DIFFERENTIAL EQUATIONS 12Hrs

Formation of PDE by eliminating arbitrary constants and eliminating arbitrary functions – Solutions of standard types of first order equations – Lagrange's equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT II: FOURIER SERIES 12Hrs

Dirichlet's conditions – General Fourier series – Half range Sine & Cosine series – Complex form of Fourier series – Parseval's identity – Harmonic Analysis.

UNIT III: APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12Hrs

Classification of second order linear partial differential equations – Solutions of one dimensional wave equation, one-dimensional heat equation – Steady state solution of two dimensional heat equation (Cartesian coordinates only) – Fourier series solutions.

UNIT IV: LAPLACE TRANSFORMS 12Hrs.

Transforms of simple functions – Properties of Transforms – Inverse Transforms – Transforms of Derivatives and Integrals – Periodic functions – Initial and final value theorems – Convolution theorem – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients and Linear simultaneous differential equations of first order with constant coefficients.

UNIT V: FOURIER TRANSFORMS 12Hrs

Statement of Fourier integral theorem – Fourier transform pairs – Fourier Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's theorem.

Total No. of Hours: 60

TEXT BOOKS

1. Veerarajan T.,"Engineering Mathematics"(for first year), Tata McGraw Hill Publishing Co(2008).
2. Veerarajan T,,"Engineering Mathematics"(for semester III), Tata McGraw Hill Publishing Co. (2005).
3. Singaravelu,"Transforms and Partial Differential Equations"Meenakshi Agency,(2017

REFERENCES

1. Kreyszig E,"Advanced Engineering Mathematics"(9th ed.), John Wiley & Sons,(2011).
2. Grewal B.S,"Higher Engineering Mathmatics", Khanna Publishers, (2012).

Subject Code: BCE17001	Subject Name : MECHANICS OF SOLIDS	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn fundamental concepts of Stress, Strain and deformation of soild applications of bars and thin cylinders
  To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
  To understand the effect of torsion on shafts and springs.
  To analyze a complex two dimensional state of stress and plane trusses

COURSE OUTCOMES (COs) : (3- 5)

CO1	To apply the fundamental concepts of stress and strain in the design of various structural components and machines
CO2	To analyze and design shafts to transmit required power
C03	To analyze about the force in member Truss with different methods
C04	To determine the bending, shear stresses and deflection produced in a beam subjected to system of loads
C05	To determine stresses due to impact and suddenly applied loads

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			M								
CO2	H		H									M
C03	H			M	L							
C04	H	H		H								
C05	H	H				H					H	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H
C04	H	H
C05	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
				√								
Approval												

BCE17001 **MECHANICS OF SOLIDS**

UNIT I: INTRODUCTION TO FORCE CONCEPT **12 Hrs**

Equivalent system of forces, rigid bodies, external & internal forces-Application of Statics of Particles-Free body Diagram Concurrent & Non Concurrent Forces - Principles of transmissibility- Equivalent forces & Varignon's theorem. Tension, Compression and Shear stress – Lateral Strain- Poisson's Ratio- Volumetric Strain – Deformation of Simple and Compound Bars - Elastic constants – Composite Sections .

UNIT II: CENTRE OF GRAVITY AND MOMENT OF INERTIA **12 Hrs**

Areas and volumes - Centroid of simple areas and volumes by integration - Centroid of composite areas - Second moment of areas - Radius of Gyration - Parallel axis and Perpendicular axis theorems - Moment of Inertia of simple areas by Integration -Moment of Inertia of Composite Areas - Mass Moment of Inertia of thin plates and simple solids.

UNIT III: BENDING MOMENT & SHEAR FORCE **12 Hrs**

Introduction to Bending and S.F- Beams and support conditions – types of supports – types of loads - shear forces and bending moment diagrams for simply supported beams, cantilevers and overhanging beams with all loads.

UNIT IV: ANALYSIS OF STATICALLY DETERMINATE PLANE TRUSSES **12 Hrs**

Stability and equilibrium of plane frames – Perfect frames - Types of Trusses – Analysis of forces in trusses member – Method of joints – Method of Sections – Tension co-efficient method – Graphical method

UNIT V: BENDING STRESS IN BEAMS & TORSION OF SHAFTS **12 Hrs**

Theory of simple bending-expression for bending stress-Section modulus-bending stress in symmetrical sections-Theory of torsion-Torsion of circular, hollow circular shafts and power -close coiled helical springs and leaf springs

Total No of Hours: 60

TEXT BOOKS

* Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007. 2.
* Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010
* Dr.R.K.Bansal A text book of Strength of Materials, Laxmi Publications,New Delhi 1996.
* S. Ramamirutham and R.Narayanan, Strength of Materials, Dhanpat Rai Publications, New Delhi,1989.

REFERENCES

* Kazimi S.M.A. " Solid Mechanics ", Tata McGraw Hill Publishing Company, New Delhi, 1991.
* Laudner T.J. and Archer R.R., " Mechanical of Solids in Introduction ",McGraw Hill International Editions
* William A.Nash, " Theory and Problems of Strength of Material" Schaum's outline series, Mc Graw Hill International Editions 1994

Subject Code: BCE17002	Subject Name : MECHANICS OF FLUIDS	Ty/Lb/ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To know the importance, application and inter-relationship of various properties of fluid.

To study theories those explain the behavior and performance of fluid when the fluid is flowing through the pipe. To understand the utilization of dimensional analysis as a tool in solving problems in the field of fluid mechanics.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To learn about the basics of fluid mechanics and various properties of fluids
CO2	To learn about the various forces on plane and curved surfaces and the concepts of buoyancy
C03	To have a clear understanding about fluid kinematics and dynamics
C04	To study the basics of boundary layer flow and flow through pipes
C05	To study about various models like distorted models and various dimensionless numbers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H				M	M						
CO2	H	M										
C03	H											H
C04	H				M							
C05	H	H		M								

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H
C04	H	H
C05	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

BCE17002 **MECHANICS OF FLUIDS**

UNIT I: DEFINITIONS AND FLUID PROPERTIES **8 Hrs**

Definitions - Fluid and Fluid Mechanics - Dimensions and Units - Fluid properties –Viscosity, Compressibility, Surface tension and Capillarity, Continuum - concept of system and control volume.

UNIT II: FLUID STATISTICS **11 Hrs**

Pascal's law and Hydrostatic equation - buoyancy -meta centric height – pressure measurement – gauges and manometers.

UNIT III: FLUID KINEMATICS **10 Hrs**

Stream, streak and path lines - classification of flows - continuity equation - stream and potential functions –flow nets – velocity and acceleration measurement-Problems

UNIT IV: FLUID DYNAMICS **12 Hrs**

Euler and Bernoulli's equations - application of Bernoulli's equation - discharge measurement -Hagen Poiseuille equation .

UNIT V: FLOW THROUGH PIPES AND DIMENSIONAL ANALYSIS **19 Hrs**

Darcy Weisbach formula -Major and minor losses of flow in pipes – pipes in series and in parallel – Dimensional analysis - Buckingham π -theorem.

Total No of Hours: 60

TEXT BOOKS

*Dr.R. K. Bansal., "Fluid Mechanics and Hydraulic Machines ", Laxmi Publications 2015.

*Fox, Robert W. And McDonald, Alan T., “Introduction to Fluid Mechanics ",John Willey & sons

REFERENCES

*Streeter, Victor l. And Wylie, Benjamin E., “Fluid Mechanics ", McGraw-Hill Ltd., 1998.

*Natarajan M.K., “Principles of Fluids Mechanics ", Anuradha Agencies, Kumbakonam, 1995

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Department of Civil Engineering

Subject Code: BCE17ES1	Subject Name : BUILDING SCIENCE AND MATERIALS	Ty/Lb/ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge on different materials and properties

To understand the engineering aspects related to buildings

COURSE OUTCOMES (COs) : (3- 5)

At the end of the course, the student will be able to:

CO1	Identify and characterize building materials
CO2	Understand the manufacturing process of bricks and cement
CO3	To have a clear understanding about foundation and its type

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H										M	
CO2	H				M	M						
CO3	H								M			M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		√										

Approval	

BCE17ES1 **BUILDING SCIENCE AND MATERIALS**

UNIT I: BRICKS, AGGREGATES AND CEMENT **9Hrs**

Bricks – Classification – Manufacturing process – Test on bricks – Aggregate: Natural Stone Aggregate – Industrial By- product – Crushing strength, impact strength, and flakiness – Abrasion resistance – Grading – sand – Bulking. Cement: Cement Ingredients – Manufacturing Process – Types – Testing of Cement

UNIT II: MASONRY& MORTAR **9Hrs**

Masonry - stone masonry - rubble and Ashlar masonry - Brick masonry - Bond - Definition need and scope - Types of bonds - English and Flemish bond - merits and demerits - composite masonry - solid and hollow block masonry-soil-cement bricks-Load bearing and non-load bearing walls- Codal provisions. Mortar – Preparation of Lime and Cement Mortar- Concrete – Ingredients – Manufacturing Process – Batching Plant – Ready Mix Concrete - Paints - Plastics – Glass

UNIT III: SUB STRUCTURE AND SUPER STRUCTURE **9Hrs**

Substructure – Setting Out of Foundation and Trenches – Excavation and Timbering – Foundation – Shallow Foundation – Deep Foundation. Super Structure.

UNIT IV: FLOOR, ROOF & STAIR CASE **9Hrs**

Floors - Types of floor - Details of concrete and terrazzo floors - Roofs - Types of Roofs - Types of Flat roofs - sloping roofs -different types and usage - shell roofs - roof coverings-AC sheets-GI sheets-FRP roofs Water proofing treatment of roofs -tar felt treatment- chemical treatment- Types of weathering courses .Stair Case – Definition – Types of Stair – General Dimension and Requirements – Layout of Stair Case.

UNIT V: BUILDING SERVICES **9Hrs**

Damp Proofing- Acoustics Treatment – Thermal Insulation – Fire Protection – Ventilation – Earth Quake Protection- Integration of services in buildings - water supply & plumbing layout for a residential building - elevators & escalators - planning & installation - basic components of the electrical system for a residence .

Total No of Hours: 45 hrs

TEXT BOOKS

* B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Building Construction" - Laxmi Publications (P) ltd., New Delhi.

*Rangwala, S.C. Engineering Materials, Charotar Publishing House, 8th ed.1983.

*Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and method of Construction, Dhanpat roy and Sons, 1997.

REFERENCES

*Taylor, G.D .Materials of Construction, USA Longman Inc, 1989.

*Arora and Bindra, Building Materials and Building Construction, Dhanpat Raj

Subject Code: BAR17I01	INTER DISCIPLINARY THEORY - I Subject Name : ENGINEERING GEOLOGY	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	3	0/0/	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To understand the importance of geological knowledge such as earth, earthquake and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor as well as to choose types of foundation

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	identify and classify rock using basic geologic classification systems
CO2	Understand geologic concepts and approaches.
CO3	Identify the various lithological units and its applications in civil engineering

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H						M				M	
CO2	H						M				M	
C03	H						M				M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		√										
Approval												

BAR17I01 **ENGINEERING GEOLOGY**

UNIT I : GENERAL GEOLOGY **9Hrs**

Geology in civil engineering - branches of geology - earth structure and composition - elementary knowledge on continental drift and plate tectonics. Seismo tectonics of the Indian plate, seismic zones of India, Weathering - work of rivers, wind, glaciers.

UNIT II: MINERALOGY **9Hrs**

Physical properties of minerals - study of rock forming minerals - quartz family. Feldspar family, augite, hornblende, biotite, muscovite, calcite, garnet - properties, behavior and engineering significance of clay minerals –fundamentals of process of formation of ore minerals - coal and petroleum - their origin and occurrence in India.

UNIT III: PETROLOGY **9Hrs**

Classification of Soil and Rock, Types of rock and origin: Igneous (extrusive and intrusive), sedimentary and metamorphic rocks, description occurrence, engineering properties of following rocks. Igneous rocks - granite, diorite, gabbro, pegmatite, dolerite and basalt sedimentary rocks sandstone, limestone, shale, conglomerate and breccia. Metamorphic rocks, quartzite, marble, slate, phyllite, gneiss and schist.

UNIT IV : STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD **9Hrs**

Strength Behavior of Soil and Rock , Stress and strain in rock, failure and shear failure of soil and rock, folds, faults and joints in rock, consequences of failure (earthquakes), Bearing on engineering construction. Seismic and electrical methods for civil engineering investigations.

UNIT V : GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING **9Hrs**

Geologic Mapping and Remote Sensing, Topographic maps, geologic maps, aerial photographs, LIDAR, SAR, interpretation for civil engineering projects - geological conditions necessary for construction of dams, tunnels, buildings, road cuttings, landslides - causes and preventions. Sea erosion and coastal protection.

Total No of Hrs = 45 hrs

TEXT BOOKS

* Parbin singh, “Engineering and General geology ", S. K. Kataria & Sons, 2009
* D. Venkat Reddy “Engineering Geology”, Vikas publishing House New Delhi, 2010
* Krynine and Judd, “Engineering Geology and Geotechniques ", McGraw Hill Book Company, New Delhi 1990.

REFERENCE

* Legeet, “Geology and Engineering ", McGraw Hill Book Company, New Delhi
* Blyth, “Geology for Engineers ", elbs, Pune 1995

Subject Code: BCE17ET1	Subject Name : ENGINEERING SURVEYING I	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	ETL	2	0/0	2/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :) To introduce the principles of various surveying methods and applications to Civil Engineering projects

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Understand the principles of basic survey instruments in civil engineering fields
CO2	Understand the concept of contouring and the ways of plotting
CO3	Students are expected to carryout surveying works related to land and civil engineering projects.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M		M		L			H			
CO2	H	M		M		L			H			
CO3	H	M		M		L			H			

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								

Approval	

BCE17ET1 ENGINEERING SURVEYING I

UNIT I : INTRODUCTIONS AND CHAIN SURVEYING 8 Hrs

Definition - principles - classification - survey instruments - ranging and chaining - reciprocal ranging - setting perpendiculars –errors - traversing.

UNIT II : COMPASS SURVEYING AND PLANE TABLE SURVEYING 7 Hrs

Prismatic compass - surveyor's compass - bearing - systems and conversions - local attraction – magnetic declination - dip - adjustment of error - plane table instruments and accessories – merits and demerits - methods - radiation - intersection - resection.

UNIT III : LEVELLING AND APPLICATIONS 12 Hrs

Level line - horizontal line - levels and staves - sprit level - bench marks - temporary and permanent adjustments - fly and check leveling - reciprocal leveling - longitudinal and cross sections.

UNIT IV : CONTOURING 8 Hrs

Contouring - methods –characteristics and uses of contours - plotting - calculation of areas and volumes- earth work volume.

UNIT V : THEODOLITE SURVEYING 10 Hrs

Theodolite - vernier - description and uses - temporary and permanent adjustments of vernier transit – swing- horizontal angles - vertical angles – measurements of angles and distances - omitted measurements.

Total No. of Hours: 45

TEXT BOOKS

*Kanetkar T.P., “Surveying and Levelling ", vols. I and II, United Book Corporation, Pune, 1994.

*Punmia B.C., “Surveying ", Vols. I and II, Laxmi Publications, Mumbai, 1999.

*N.N basak., “ Surveying and Levelling ", Tata McGraw Hill, New Delhi, 2004.

REFERENCES

*Clark D., Plane and Geodetic Surveying ", vols. I and II and C.B.S. Publishers,New Delhi, Sixth edition, 1991.

*James M. Anderson and Edward M. Mikhail, “Introduction to Surveying ", Tata McGraw Hill, New Delhi, 1995

Subject Code: BCE17L01	Subject Name : BUILDING DRAWING PRACTICE	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Basic Engineering Graphics	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	know about the basic principles of Building Drawing
CO2	know Basic commands of a popular drafting package
CO3	Acquire knowledge on plan, elevation and section of buildings

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H					M		M			M	
CO2	H							M			M	
CO3	H					M		M			M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					

Approval	

BCE17L01 **BUILDING DRAWING PRACTICE**

Experiments

- Basic concept, purpose, function and types of building (Residential, Industrial and Institutional)
- Principles of site selection, orientation of buildings and distribution of space.
- Line plan. Development of plan from a line plan.
- Details of Doors, windows, foundation and stair case etc.
- Single storied residential building with flat and tiled roof.
- Public buildings like office, dispensary, post office, bank etc.
- Factory building with trusses supported on Brick walls and pillars.

Total No of Hours: 30 hrs

TEXT BOOKS

* Civil Engg. Drawing & House planning – B.P.Verma, Khanna publishers, Delhi,1990
* Building drawing & detailing – Dr. Balagopal & T.S.Prabhu, Spades publishers, Calicut,1989.

REFERENCES

* Building drawing – Shah, Tata McGraw-Hill, New Delhi,2000.
* Building planning & drawing – Dr. N.Kumaraswamy, A.Kameswara Rao, Charotar publishing house. Mumbai, 1997.
* Shah, Kale and Patki, Building drawing, Tata McGraw-Hill New Delhi,,1998.
* Balagopal T.S. Prabhu, Building drawing and detailing, Spades Publishers
* Shah & Kale, Building Drawing, Tata McGraw Hill
* B.P. Verma, Civil Engineering Drawing and housing Planning, Khanna Publishers

Subject Code: BCE17L02	Subject Name : **SURVEYING FIELD WORK**	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Surveying I	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To train the students with the practical knowledge on basic surveying methods for construction and road purpose

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Experiments related to finding height and distances by tacheometric, single plane and double plane method.
CO2	Setting out simple curve for construction of road purposes.
CO3	Setting out of works for foundation marking, use of stereoscope for 3-D viewing, Co-ordinate measurements by GPS and Traversing by Total station.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H		M			M					M	L
CO2	H		M			M					M	L
CO3	H		M			M					M	L

COs / PSOs	PSO1	PSO2
CO1	M	H
CO2	M	H
CO3	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					
Approval												

BCE17L02 **SURVEYING FIELD WORK**

UNIT I : CHAIN SURVEYING **4Hrs**

Ranging – Chaining – Traverse

UNIT II : COMPASS SURVEYING **4 Hrs**

Traverse

UNIT III : PLANE TABLE SURVEYING **6 Hrs**

Triangulation to find distance between inaccessible points with and without known scale – Three-Point Problem – Two-Point Problem.

UNIT IV: LEVELLING **8 Hrs**

Study of levels and leveling staff – Fly leveling using dumpy level – Fly leveling using tilting level – Check leveling.

UNIT V : THEODOLITE **8 Hrs**

Study of Theodolite Measurement of angles by reiteration and repetition – Measurement of vertical angles

Total No of Hours: 30

TEXT BOOKS

* Punmia B.C., “Surveying ", Vols. III, Laxmi Publications, Mumbai,1999 and I, II.
* N.N Basak, “ Surveying and Levelling ", Tata McGraw – Hill Publishing Company Limited New Delhi, 2004.

REFERENCES

* Clark D., "Plane and Geodetic Surveying ", Vols. II and C.B.S. Publishers, I and Distributors, New Delhi, Sixth Edition, 1991.
* James M. Anderson and Edward M. Mikhail, "Introduction to Surveying ", McGraw Hill Book Company, New Delhi, 1995

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(An ISO 9001 : 2008 Certified Institution)

Department of Civil Engineering

Subject Code: BAR17IL1	Subject Name : GEOLOGY AND BUILDING MATERIALS LAB	T y/ Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Geology Building Science and Materials	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : Learn to appreciate field condition in relation to engineering projects/problems and understand the problems.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Determine engineering properties of soils
CO2	Measure strike and dip of the bedding planes
CO3	Interpret geological Maps
CO4	Test on Physical Properties of Soil

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H					M	M					
CO2	H					M	M					
C03	H					M	M					
C04	H					M	M					

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H
C04	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					

Approval	

BAR17IL1 GEOLOGY AND BUILDING MATERIALS LAB

COURSE CONTENT:

ENGINEERING GEOLOGY

1. Study of Geological map and section of local area
2. Study the various properties of igneous rocks, sedimentary and metamorphic through rocks samples.
3. Study the various properties of different minerals and mineral ores through samples.
4. Study the various types of folds and faults.
5. Physical properties of minerals such as, hardness, colour, streak, etc.
6. Numerical Problems related to Dip and Strike
7. Study of different geological features through models
8. Field visit

BUILDING MATERIALS

1. Assessment of physical properties of bricks such as absorption, shape and size, structure, soundness, Hardness, presence of soluble salts.
2. Hardness, impact and water absorption test etc for stones
3. Study on different types of bonds for bricks and stones
4. Study on defects in timber

Total No. of Hours: 30

Subject Code: BMA17010	Subject Name : NUMERICAL METHODS FOR MECHANICAL & CIVIL ENGINEERS	Ty / Lb/ ETL	L	T/ S.Lr	P/ R	C
	Prerequisite: Mathematics III For Mechanical & Civil Engineers	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To understand the basic concepts in solution of algebraic and transcendental equations.
To understand the basic concepts in interpolation.
To understand the basic concepts in numerical differentiation and integration.
To understand the basic concepts in numerical solutions of ODE.
To understand the basic concepts in numerical solutions of PDE.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	They will able to solve the non linear non linear equation
CO2	The students will have a clear perception of the power of numerical techniques,
CO3	They would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M		M					M			
CO2	H	M		M					M			
C03	H	M		M					M			
COs / PSOs	PSO1		PSO2									
CO1	M		H									
CO2	M		H									
C03	M		H									

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
	√											
Approval												

BMA17010 NUMERICAL METHODS FOR MECHANICAL & CIVIL ENGINEERS

UNIT I : SOLUTION OF EQUATIONS 12 Hrs

Solution of Algebraic and Transcendental equations – Method of false position – Iteration method – Newton-Raphson method –Linear system– Applications of: Gauss Elimination method – Gauss-Jordan method – Iterative methods – Gauss-Jacobi method – Gauss-Seidel method – Matrix Inversion by Gauss-Jordan method.

UNIT II : INTERPOLATION 12Hrs

Newton forward and backward differences – Central differences – Sterling's and Bessel's formulae – Interpolation with Newton's divided differences – Lagrange's method.

UNIT III : NUMERICAL DIFFERENTIATION AND INTEGRATION 12Hrs

Numerical Differentiation with interpolation polynomials – Numerical Integration by Trapezoidal and Simpson's (both 1/3 rd & 3/8 th) rules – Two and three point Gaussian Quadrature formulae – Double integrals using Trapezoidal and Simpson's rules.

UNIT IV: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS 12 Hrs

Taylor's series – Euler's & Modified Euler's method – Runge Kutta method of fourth order for first & second order differential equations – Milne's predictor-corrector method – Adam-Bashforth's predictor-corrector method.

UNIT V: NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12 Hrs

Finite difference solutions for one dimensional heat equation (both implicit & explicit) – Bender-Schmidt method – Crank-Nicolson method – One dimensional wave equation – Two dimensional Laplace and Poisson equations – Liebmann's method.

Total No. of Hours: 60

TEXT BOOKS

1. Veerarajan T., Numerical Methods, Tata McGraw Hill Publishing Co., (2007).
2. Sastry S.S., Introductory Methods of Numerical Analysis, Prentice Hall of India, (2012).

REFERENCES

1. Kandasamy P., Thilagavathy, Gunavathy K., Numerical Methods (Vol.IV), S.Chand & Co., (2008).
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012).

Subject Code: BCE17003	Subject Name : STRENGTH OF MATERIALS	T y/ Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Mechanics of solids	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge about deflection in beams by various methods

To impart knowledge about analyzing the structural elements by energy concepts and finding stresses and deflection

To impart knowledge about behavior of columns, critical loads and design of columns

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, Students will have

CO1	through knowledge in analysis of indeterminate beams and use of energy method for estimating the slope and deflections of beams and trusses.
CO2	they will be in a position to assess the behaviour of columns,
C03	To knew beams and failure of materials.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		M					M	
CO2	H	H	H	H		M					M	
CO3	H	H	H	H		M					M	
COs / PSOs	**PSO1**		**PSO2**									
CO1	H		H									
CO2	H		H									
C03	H		H									

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

BCE17003 **STRENGTH OF MATERIALS**

UNIT I : ENERGY PRINCIPLES **11 Hrs**

Strain energy and strain energy density - Strain energy in tension, shear, flexure and torsion - Castigliano's & Engessor's energy theorems- Principle of Virtual Work- Application of energy theorems for computing deflection in Determinate structures – Maxwell's reciprocal theorem.

UNIT II : DEFLECTIONS **13 Hrs**

Methods of Deflection Determination of Deflection curve – computation of slopes and deflections in Determinate Beams - Double Integration method – Macaulay's method – Area Moment method –Conjugate Beam method.

UNIT III : INDETERMINATE BEAMS **13 Hrs**

Propped Cantilever and Fixed Beams - Fixed End Moments and Reactions for Standard cases of Loading - Continuous Beams - Theorem of Three Moments - Analysis of Continuous Beams - S.F. and B.M. Diagrams for Continuous Beams.

UNIT IV: COLUMNS **13Hrs**

Eccentrically Loaded Short Columns Middle Third Rule - Core of Section - Columns of Unsymmetrical Sections - Rankine – Gordon Formula Eccentrically Loaded Long Columns. Theories of Failure - Principal Stress, Principal Strain, Shear Stress, Strain Energy and Distortion Energy Theories.

UNIT V: BENDING OF BEAMS **10Hrs**

Bending of Beams of Symmetrical and Unsymmetrical Sections – Box sections and its importance — Winkler Bach Formula - Shear Center Simple problems

Total No of Hours : 60

TEXT BOOKS

Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007.

Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010.

* R.S. Khurmi, "Engineering Mechanics of Solids ", Prentice Hall of India, New Delhi, 1997.
* S.S Ratan, "Strength of Materials ", Tata McGraw Hill Publishing Company, New Delhi, 2008

REFERENCES

* Laudner T.J. and Archer R.R., " Mechanical of Solids in Introduction ",McGraw Hill International Editions, New Delhi,1994..
* William A.Nash, " Theory and Problems of Strength of Material" Schaum's outline series, Mc Graw Hill International Editions, New Delhi, 1994

Subject Code: BCE17004	Subject Name : APPLIED HYDRAULIC ENGINEERING	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Mechanics of fluids	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To study theories those explain the behavior and characteristics of fluid in an open channel .
To study the velocity and discharge measurement in open channel.
To understand the working principle of hydraulic machines and its uses

COURSE OUTCOMES (COs) : (3- 5)

CO1	The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels
CO2	They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions
C03	They will have knowledge in hydraulic machineries

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M		M							M	M
CO2	H	M		M							M	M
CO3	H	M		M							M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								

Approval	

BCE17004 **APPLIED HYDRAULIC ENGINEERING**

FLOW IN OPEN CHANNEL

UNIT I : INTRODUCTION **8 Hrs**

Open channel flow - types and regime of flow - velocity distribution in open channel - specific energy - critical flow and its computation.

UNIT II : UNIFORM AND RAPIDLY VARIED FLOW **14 Hrs**

Uniform flow - velocity measurement - manning's and Chezy's formula - determination of roughness coefficients - most economical sections- Rectangular, Circular and Trapezoidal channel sections .Hydraulic jump - types - energy dissipation – surges

HYDRAULIC MACHINES

UNIT III : ROTODYNAMIC PUMPS **12 Hrs**

Introduction – classification – Rotodynamic pumps: centrifugal pumps – work done – losses - specific speed - minimum speed to start the pump- multistage pumps- parallel and series.

UNIT IV : POSITIVE DISPLACEMENT PUMPS **12 Hrs**

Positive displacement pumps - reciprocating pump –work done- slip - air vessels(theory only)

UNIT V : TURBINES **14 Hrs**

Classification – Pelton wheel turbine –work done-Francis turbine –work done- draft tube –Kaplan turbine –work done.

Total No of Hours: 60

TEXT BOOKS

1. Subramanian k., “Flow in open channels ", Tata McGraw Hill Publishing Company, New Delhi, 1994

2. Dr. R.K.Bansal., "Fluid Mechanics and Hydraulic Machines ", Lakshmi Publications (p) ltd., Pune, 2015.

3. Kumar K.L., “Engineering Fluid Mechanics ", Eurasia publishing house (p) ltd. New Delhi,

(7th edition), 1995.

REFERENCES

1. Ven Te Chow, “Open-channel hydraulics ", McGraw Hill Co., 1996 - , New York.

2. Ramamirtham S., “Fluid mechanics, Hydraulics and Fluid Machines ", Dhanpat Rai

Subject Code: BCE17005	Subject Name : CONCRETE AND CONSTRUCTION TECHNOLOGY	T y/ Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Building Science and materials	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To understand various construction procedures from sub structure to super structure and also the equipment needed for construction of various types of structures from foundation to super structure

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	understand about concrete making materials and supplementary cementations materials.
CO2	Design the concrete mix for the required strength
CO3	Will acquire knowledge on handling of different types of construction equipments

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H		M			M					M	
CO2	H		H			M					M	
CO3	H		M			M					M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								

Approval	

BCE17005 CONCRETE AND CONSTRUCTION TECHNOLOGY

UNIT I : CONCRETE MAKING MATERIALS 8 Hrs

Manufacture and Components of Portland Cement- Hydration Process- Types of Cement, Aggregates - Classification and Properties Admixtures.

UNIT II: MIX DESIGN 10 Hrs

Properties of Fresh Concrete- Workability, Segregation and Bleeding of Concrete - Factors influencing Mix Proportions - I.S and ACI Methods of Mix Design.

UNIT III : PROPERTIES OF HARDENED CONCRETE 8 Hrs

Strength - Creep and Shrinkage - Durability of Concrete - Chemical Attack - Different Types of FRC - Properties and Applications.

UNIT IV: SUB STRUCTURE CONSTRUCTION 9 Hrs

Piling techniques – Sheet piles – Under water construction of Diaphragm wall and basement – Driving diaphragm walls – Driving well and caisson – Sinking coffer dam – Shoring for deep cutting – Well points – Dewatering and stand by plant equipment for underground open excavation.

UNIT V : SUPER STRUCTURE AND CONSTRUCTION EQUIPMENTS 10 Hrs

Construction sequences in cooling Towers, Bunkers, Silos and Chimney – Pre- stressed construction – In situ pre-stressing in high rise structures – Erecting light weight components on tall structures. Types of earth work equipment's - Tractors, Motor graders, Scrappers - Equipment for compaction – Batching and mixing and concreting.

Total No of Hours : 45

TEXT BOOKS

* Shetty. M.S., Concrete Technology, S.Chand and Co, Pune,1984
* Arora S.P. And Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Roy and Sons, New Delhi, 1997.
* Peurifoy, R.L., Ledbetter, W.D And Schexnayder, C., 'Consruction Plaaning, Equipment and Methods' V Edition McGraw Hill, Singapore, 1995

REFERENCES

* Krishnasamy. K.T., Concrete Technology, Dhanapt Rai - New Delhi – 1985
* Neville, properties of concrete elbs, 1977.
* Sharma S.C., Building Construction, Khanna Publishers, New Delhi.1998

Subject Code: BAR17I02	Subject Name : REMOTE SENSING AND GIS	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Geology	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

Introduce the principles of remote sensing to students who are beginners in this field.
Fundamental knowledge on the physics of remote sensing.
Aerial photographic techniques, image interpretation techniques ,to create basic understanding of GIS concepts

COURSE OUTCOMES (COs) : (3- 5)

CO1	Apply the concepts of Electro Magnetic energy, spectrum and spectral signature curves in the practical problems
CO2	Apply the concepts of satellite and sensor parameters and characteristics of different platforms
CO3	Apply the concepts of DBMS in GIS
C04	Analyze raster and vector data and modeling in GIS
C05	Apply GIS in land use, disaster management, ITS and resource information system

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			M	M	M						M
CO2	H			M	M	M						M
CO3	H			M	M	M						M
CO4	H			M	M	M						M
CO5	H			M	M	M						M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H
CO4	H	H
CO5	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								

Approval	

BAR17I02 **REMOTE SENSING AND GIS**

UNIT I: INTRODUCTION TO REMOTE SENSING **9 Hrs**

Definition – components of remote sensing – , Energy sources and radiation principles, electromagnetic radiation (EMR) –EMR spectrum, active and passive remote sensing – platforms — visible, infra red (IR), near IR, middle IR , thermal IR and microwave – black body radiation - Planck's law – Stefan-Boltzman law.

UNIT II : EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS **9 Hrs**

Atmospheric characteristics, scattering of EMR – Raleigh, MIE, non-selective and Raman scattering – EMR interaction with water vapour and ozone – atmospheric windows – significance of atmospheric windows – EMR interaction with earth surface materials – radiance, irradiance, incident, reflected, absorbed and transmitted energy – reflectance – specular and diffuse reflection surface- spectral signature – spectral signature curves – EMR interaction with water, soil and earth surface

UNIT III: OPTICAL AND MICROWAVE REMOTE SENSING SYSTEMS **9 Hrs**

Satellites - classification – based on orbits – sun synchronous and geo synchronous – based on purpose – earth resource satellites, communication satellites, weather satellites, spy satellites, spectral, radiometric and spatial resolutions, Multispectral, thermal and hyper spectral sensing, along and across track scanners – description of sensors in land sat, spot, irs series – current satellites - radar – speckle - back scattering – side looking airborne radar – synthetic aperture radar – radiometer – geometrical characteristics

UNIT IV: GEOGRAPHIC INFORMATION SYSTEM **9 Hrs**

GIS – components of GIS, data – spatial and non-spatial – maps – types of maps – projection – types of projection - raster and vector data structures – comparison of raster and vector data structure – GIS analysis using raster and vector data – DEM for Slope, Aspect, Flow direction, Flow pathways, Flow accumulation, Streams, Catchment area delineation, retrieval, reclassification, overlaying, buffering – data output.

UNIT V: IMAGE PROCESSING AND APPLICATIONS OF RS & GIS **9** Hrs

Visual interpretation of satellite images – elements of interpretation - interpretation keys, Digital Image Processing - application of remote sensing and GIS – urban applications - integration of GIS and remote sensing – Remote sensing applications for watershed management, Rainfall runoff modeling, Irrigation management, Flood mapping, Drought assessment, Environment and ecology, urban analysis –resources information systems.

Total No of Hours : 45

TEXT BOOKS

1. Anji Reddy, Remote Sensing and Geographical Information Systems, B.S. Publications, New Delhi, 2001

2. M.G. Srinivas (edited by), Remote Sensing Applications, Nervosa Publishing House, New Delhi, 2001.

REFERENCE

1. Lillesand T.M. And Kiefer R.W. Remote Sensing And Image Interpretation, John Wiley And Sons, Inc, New York, 1987.

2. Janza.F.J., Blue, H.M., Johnston, J.E.., "Manual of Remote Sensing Vol.I American Society of Photogrammetry, Virginia, U.S.A, 1975.

3. Burrough P.A, Principle Of Gis For Land Resource Assessment, Oxford, 1990

Subject Code: BEN17ET2	Subject Name :SOFT SKILL - I CAREER & CONFIDENCE BUILDING	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	ETL	1	0/0	1/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To create awareness in students, various top companies helping them improve their skill set matrix, leading to develop a positive frame of mind.
- To help students be aware of various techniques of candidate recruitment and help them prepare CV's and resume.
- To help student how to face various types of interview, preparing for HR, technical interviews.
- To help students improve their verbal reading, narration and presentation skills by performs various mock sessions.

COURSE OUTCOMES (COs) : (3- 5) Students will be able to

CO1	Be aware of various top companies leading to improvement in skills amongst them.
CO2	Be aware of various candidate recruitment techniques like group discussion, interviews and be able to prepare CV's and resumes.
CO3	Prepare for different types of interviews and be prepared for HR and technical interviews.
CO4	Improve their verbal, written and other skills by performing mock sessions.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	L	L	M	M	H	M	H	M	H
CO2	L	L	L	L	L	M	M	H	M	H	M	H
CO3	L	L	L	L	L	M	M	H	M	H	M	H
CO4	L	L	L	L	L	M	M	H	M	H	M	H

COs / PSOs	PSO1	PSO2	PSO3				
CO1	L	L	H				
CO2	L	L	H				
CO3	L	L	H				
CO4	L	L	H				

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
			✓						✓			

Approval	

BEN17ET2 SOFT SKILLS – I CAREER & CONFIDENCE BUILDING 1012

UNIT - I **6 Hrs**

Creation of awareness of top companies / improving skill set matrix / Development of positive frame of mind / Creation of self-awareness.

UNIT – II **6 Hrs**

Group discussions / Do's and don'ts – handling group discussions / what evaluators look for interpersonal relationships / Preparation of Curriculum Vitae / Resume.

UNIT - III **6 Hrs**

Interview – awareness of facing questions – Do's and don'ts of personal interview / group interview, enabling students to prepare for different proce3dures such as HR interviews and Technical Interviews / self-introductions.

UNIT – IV **6 Hrs**

Verbal aptitude, Reading comprehension / narration / presentation / Mock Interviews.

UNIT – V **6 Hrs**

Practical session on Group Discussion and written tests on vocabulary and reading comprehension

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 30

Subject Code: BCE17ET3	Subject Name : ENGINEERTING SURVEY- II	T y/ Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Survey- I	ETL	1	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : This subject deals with geodetic measurements and Control Survey methodology and its adjustments. The student is also exposed to the Modern Surveying.

COURSE OUTCOMES (COs) : (3- 5)

CO1	The student will posses knowledge about Tachometric surveying,
CO2	To knew Control surveying, Survey adjustments, Astronomical surveying and Photogrammetric.
CO3	Have knowledge to modern methods of surveying like Photogrammetry, Total station, Hydrographic survey and cartography.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H								M		M	M
CO2	H								M		M	M
CO3	H								M		M	M

COs / PSOs	PSO1	PSO2
CO1	H	M
CO2	H	M
CO3	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

BCE17ET3 **ENGINEERTING SURVEY- II**

UNIT I: ENGINEERING SURVEYS **9 Hrs**

Curve ranging - Horizontal and vertical curves - Simple Curves - setting with chain and tapes, tangential angles by theodolite, double theodolite - Compound and reverse curves - Transition curves - Functions and requirements - Setting out by offsets and angles - Vertical curves

UNIT II : TACHEOMETRIC SURVEYING **9 Hrs**

Tacheometric systems - Tangential, stadia and subtense methods - Stadia systems - Horizontal and inclined sights - Vertical and normal staffing - Fixed and movable hairs - Stadia constants - Anallactic lens – Subtense bar.

UNIT III : CONTROL SURVEYING **9 Hrs**

Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line – Instruments and accessories - Corrections - Satellite station - Reduction to centre - Trignometric levelling – Single and reciprocal observations - Modern trends.

UNIT IV : SURVEY ADJUSTMENTS **9 Hrs**

Errors - Sources, precautions and corrections - Classification of errors - True and most probable values –weighted observations - Principle of least squares - Normal equation – Correlates.

UNIT V: PHOTOGRAMMETRY - **9 Hrs**

Photogrammetry - Introduction - Terrestrial and aerial Photographs - Stereoscopy -Parallax – Electromagnetic distance measurement - Carrier waves - Principles – Instruments Hydrographic Surveying – Tides - MSL - Sounding and methods - Location of soundings and methods - Three point problem - Strength of fix –Sextants and station pointer - River surveys - Measurement of current and discharge -

Total No of Hours: 45

TEXT BOOKS

* Bannister A. and Raymond S., “Surveying”, ELBS, Pune, Sixth Edition, 1992.
* Heribert Kahmen and Wolfgang Faig, “Surveying”, Walter de Gruyter, 1995.
* Kanetkar T.P., “Surveying and Levelling " , Vols. I and II, United Book Corporation, Pune, 1994.
* Punmia B.C., “Surveying ", Vols. I, II and III, Laxmi Publications, New Delhi, 1999.

REFERENCES

* Clark D., “Plane and Geodetic Surveying " , Vols. I and II, C.B.S. Publishers and Distributors, Delhi, sixth Edition, 1971.
* James M. Anderson and Edward M. Mikhail, “Introduction to Surveying ", McGraw Hill Book Company, New Delhi, 1985.

Subject Code: BCE17L03	Subject Name : FLUID MECHANICS & HYDRAULIC MACHINERY LAB	Ty/Lb/ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Mechanics of fluids and hydraulics	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To learn the aim, working principle, components and function of hydraulic equipments.

To get hand-on experience in the operation of hydraulic machines.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Measure theoretical discharge in pipes, Venturimeter, orificemeter and notches
CO2	Demonstrate and conduct experiment to find characteristic curves of various pumps
CO3	Demonstrate and conduct experiment to find characteristic curves of various turbines

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M								M	M
CO2	H	M	M								M	M
CO3	H	M	M								M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					
Approval												

BCE17L03 FLUID MECHANICS & HYDRAULIC MACHINERY LAB

UNIT I : FLOW MEASUREMENT **6 Hrs**

i. Venturimeter.
ii. Orifice meter.

UNIT II : LOSSES IN PIPES **6 Hrs**

Estimation of major energy and minor losses in pipes

UNIT III : PUMPS **10 Hrs**

Performance characteristics of
i. Rated speed centrifugal pump.
ii. Gear pump.
iii. Reciprocating pump.

UNIT IV : TURBINES **8 Hrs**

Performance characteristics of Pelton wheel turbine and Francis turbine.

Total No of Hours: 30 hrs

TEXT BOOKS

* Dr. R. K.Bansal., "Fluid Mechanics And Hydraulic Machines ", Lakshmi Publications (P) Ltd.New Delhi 2005.
* Fox, Robert w. and Mcdonald, Alan T., "Introduction to Fluid Mechanics ",John Willey & Sons, New Jersey

REFERENCES

* Streeter, Victor L. And Wylie, Benjamin e., "Fluid Mechanics ", McGraw-Hill Ltd.New Delhi, 1998.
* Natarajan M.K., "Principles of Fluids Mechanics ", Anuradha agencies, Vidayal karuppur, kumbakonam, 1995

Subject Code: BCE17L04	Subject Name : STRENGTH OF MATERIALS AND CONCRETE LAB	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Strength of Materials ,Concrete and construction technology	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

Learn the properties of different materials like steel, concrete, timber, bricks and other materials

Study the behavior of different structural elements and develop skill in use of measuring instruments

COURSE OUTCOMES (COs) : (3- 5)

CO1	To do tests on cement as per IS codes of practice
CO2	To do tests on fine and coarse aggregates according to IS codes of Practice;
CO3	To do tests on fresh and hardened concrete as per IS codes of practice

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			M					M		M	
CO2	H			M					M		M	
CO3	H			M					M		M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					
Approval												

BCE17L04 **STRENGTH OF MATERIALS AND CONCRETE LAB**

STRENGTH OF MATERIALS LAB

1. Tension test on mild steel and for steel rods.
2. Compression test on wooden specimen
3. Double shear test on mild steel and aluminum rods.
4. Torsion test on mild steel rod.
5. Impact test on metal specimen
6. Hardness tests on metals like mild steel, brass, copper and aluminum.
7. Deflection test on metal beam
8. Compression test on helical spring

Total No of Hours: 15

CONCRETE LAB

1. Tests on Cement

   a.Specific Gravity,

   b. Normal consistency,

   c. Initial and Final setting time of cement

2. Test on Aggregate

   a. Sieve analysis

   b. Specific gravity

   c. Water Absorption

3. Tests on Freshly Mixed Concrete

   Compaction Factor,

   Slump Value.

Total No of Hours: 15

References:

1. Davis H.E. Trophell.G.E & Hanck, G.F.W. , The Testing Of Engineering Materials – Mcgrew Hill, International Book Co.

2. Timoshenko S.P, &Young, D.H. Strength of Materials – East West Press Ltd. 3. Relevant 813 code. Venon john, Engineering Materials, 3rt Edition, McMillan Co.Ltd.

Subject Code: BCS17IL7	Subject Name : BASIC COMPUTER SKILL FOR CIVIL ENGINEERS(INTER DISCIPLINARY LAB II)	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NONE	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To impart a knowledge on the basic computer skill

COURSE OUTCOMES (COs) : (3- 5) At the end of the course the students will be

CO1	Familiar with MS word.
CO2	Able to create the presentation for the department using Power Point
CO3	Familiar with excel

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H		M	H							H	H
CO2	H		M	H							H	H
CO3	H		M	H							H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
								√				
Approval												

BCS17IL7 BASIC COMPUTER SKILL FOR CIVIL ENGINEERS (INTER DISCIPLINARY LAB- II)

APPLICATION PACKAGES

Word

1. To create an advertisement in Word.
2. To illustrate the concept of mail merging in word.

Spread Sheet

3. To create a spread sheet to analyse the marks of the students of a class and also to create appropriate charts.

Power Point

4. To create the presentation for the department using Power Point

Subject Code: BCE17TS1	Subject Name : ADVANCED SURVEYING FIELD WORK AND GIS LAB(TECHNICAL SKILL –I (EVALUATION)	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Survey I, II ,Surveying field work, Remote sensing and GIS	Lb	0	0/0	0/2	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : Experiments related to finding height and distances by tachometric, single plane and double plane method.
Setting out simple curve for construction of road purposes.
Setting out of works for foundation marking, use of stereoscope for 3-D viewing, Co-ordinate measurements by GPS and Traversing by Total station.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Knowledge to carryout Triangulation.
CO2	Knowledge for astronomical surveying including general field marking for various engineering projects and curves setting
CO3	knowledge on handling basic GIS instruments

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H				H	H		M	M
CO2	H	H		H				H	H		M	M
CO3	H	H		H				H	H		M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					

Approval	

BCE17TS1 **ADVANCED SURVEYING FIELD WORK AND GIS LAB**
(Technical skill 1-Evaluation)

a. ADVANCED SURVEYING LAB

UNIT I : TACHEOMETRY

Tangential system (using theodolite, leveling staff)

Stadia system (using theodolite, leveling staff)

Sub tense system (using theodolite, tape, cross staff, leveling staff)

UNIT II: SETTING OUT WORKS

Foundation marking (using theodolite, tape, ranging rods)

Simple curve - right / left handed (using theodolite, tape, ranging rods)

Transition curve (using theodolite, tape, ranging rods)

UNIT III: FIELD ASTRONOMY

Field observation for the calculation of azimuth (using theodolite, tape), Total

Station

b. Applications of Remote Sensing and GIS Lab

1. Introduction to basics of digital images and Data (Vector and Raster)
2. Interpretation of satellite images
3. Understanding the basic principles of Photogrammetry.
4. An introduction to image classification.
5. Interpreting RADAR images.
6. Extracting information from thermal remote sensing data.
7. Using GIS Software for plotting points, lines, polygons on maps.
8. Use of GIS in selection of Landfill site.

Total No of Hours: 30 hrs

REFERENCES

* Clark D, " Plane And Geodetic Surveying " , Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 1971.

* James M. Anderson and Edward M. Mikhail, " Introduction To Surveying ", Mcgraw Hill Book Company, New Delhi, 1985.

* Wolf P.R. " Elements Of Photogrammetry", Mcgraw Hill Book Company, New Delhi,

Subject Code: BCE17006	Subject Name : STRUCTURAL ANALYSIS I	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Strength of Materials	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : This course introduces students to the classical methods of structural analysis, i.e., methods for calculating forces and displacements in structures due to given loads and imposed deformations. Both determinate and indeterminate structures are covered.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Analysis trusses, frames and arches
CO2	Analyse structures for moving loads
CO3	Will be conversant with classical methods of analysis.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H				H			M	
CO2	H	H		H				H			M	
CO3	H	H		H				H			M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								
Approval												

BCE17006 **STRUCTURAL ANALYSIS I**

UNIT I : DEFLECTION OF DETERMINATE STRUCTURES **12Hrs**

Principles of virtual work for deflections - Deflections of pin-jointed plane frames and rigid Plane Frames.

UNIT II: SLOPE DEFLECTION METHOD **12Hrs**

Analysis of continuous Beams – cantilever beams - Continuous beams and rigid frames (with and without sway) - Symmetry and Asymmetry -Portal Frames.

UNIT III: MOMENT DISTRIBUTION METHOD **12Hrs**

Stiffness and carry over factors –Balance – Distribution and carryover of moments - Analysis of continuous Beams - Plane rigid frames with and without sway – Structural frames

UNIT IV: SPACE STRUCTURES **12** Hrs

Introduction to analysis of space trusses using method of tension coefficients – Beams curved in plan.

UNIT V: MOVING LOADS AND INFLUENCE LINES (DETERMINATE) **12 Hrs**

Influence lines for reactions in statically determinate structures – influence lines for member forces in pin jointed frames – Influence lines for shear force and bending moment in beam sections

Total No of Hours: 60

TEXT BOOKS

* R.Vaidyanathan,P.Perumal,, Comprehensive Structural Analysis Vol 1 and vol.2, Laxmi Publications,2004
* Bhavikatti S.S Structural Analysis Vol 1 and vol.2 ,Vikas Publishing House Pvt. Ltd New Delhi
* S.Ramamrutham,R.Narayan,Theory of structures,Dhanpatrai publications,1993

REFERENCES

* Analysis of Structures: Strength and Behaviors T.S. Thandavamoorthy, oxford University press, New Delhi, 2005.

Subject Code: BCE17007	Subject Name : DESIGN OF CONCRETE STRUCTURES - I	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Strength of materials	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart comprehensive knowledge on the design of reinforced concrete structural elements such as beams, columns, slabs and footings.
To bring about an understanding of the behaviour of reinforced concrete and the design philosophies

COURSE OUTCOMES (COs) : (3- 5) The student shall knew

CO1	to design and detailing a slab
CO2	to design and detailing a column
CO3	to design and detailing a footing.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H				M	M		M	M
CO2	H	H	H	H				M	M		M	M
CO3	H	H	H	H				M	M		M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

BCE17007 DESIGN OF CONCRETE STRUCTURES - I

UNIT I: INTRODUCTION AND LIMIT STATE DESIGN OF BEAMS 12 Hrs

Properties of different grades of concrete and steel, Permissible stresses, - advantages of limit state method over other methods - understanding the behavior of R.C.C. members. Introduction to IS 456-2000, SP: 16. Characteristic values, partial safety factor, stress strain relationship - stress block parameters, failure criteria Analysis, design and detailing of singly reinforced & doubly reinforced beam.

UNIT II: LIMIT STATE DESIGN FOR SLABS 12 Hrs.

Design and detailing of one-way and two-way slab panels as per IS code provisions.

UNIT III: LIMIT STATE DESIGN FOR BOND ,ANCHORAGE SHEAR AND TORSION 12 Hrs

Behavior of RC beams in shear and torsion-shear and torsion reinforcement-Limit State Design of R C members for combined bending shear and torsion- use of design aids

UNIT IV : LIMIT STATE DESIGN OF COLUMNS 12 Hrs

Basic assumptions - Types of columns – Slenderness' limits for column- minimum eccentricity - Design and detailing of reinforced concrete short columns of rectangular and circular cross sections under axial load.- column under compression and bi axial bending using IS 456;2000.Examples for practices

UNIT V: LIMIT STATE DESIGN OF FOOTINGS 12 Hrs

Design and detailing of isolated footing for column subjected to axial loads, Design and detailing of Axially and eccentrically loaded Rectangular footings-Design and detailing of Combined Rectangular footings for Two Columns.

Total No of Hours: 60

TEXT BOOKS

* N.Krishna Raju "Design of Reinforced Concrete Structures", CBS publishers & Distributors. Latest Edition, IS456:200.
* S.Ramamrudham ,Design of Reinforced Concrete Structures, Dhanpat Rai publishing company(p) Ltd New Delhi.

REFERENCES

* Ashok K. Jain Reinforced concrete- Limit state design- New chand & Bros, Roorkee 1997.
* IS: 456- 2000 "Indian Standard for Plain and reinforced concrete – code of practice "Bureau of Indian Standard
* A.P Arul Manikam "Structural Engineering"
* Design aids to IS 456-1978 (SP16)
* SP34 Handbook on Concrete Reinforcement and Detailing, BIS 1987.

Subject Code: BCE17008	Subject Name : SOIL MECHANICS	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Geology	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : Provide the description and classification of soil and analysis of stresses in soils under different loading conditions;
To develop an understanding of the principles of effective stress in saturated soils, and its application to one dimensional compression and consolidation

COURSE OUTCOMES (COs) : (3- 5)

CO1	Ability to determine Index properties and classify the soil
CO2	Determine engineering properties through standard tests
CO3	Knowledge of Properties of soil

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H					M	M	M				
CO2	H					M	M	M				
CO3	H					M	M	M				

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

BCE17008 **SOIL MECHANICS**

UNIT I: SOIL CLASSIFICATION AND COMPACTION **10 Hrs**

Nature of soil - phase relationships - soil description and classification for engineering purposes - IS classification system - soil compaction - theory, comparison of laboratory and field compaction methods – Factors influencing compaction behaviour of soils.

UNIT II: SOILWATER AND WATER FLOW **9 Hrs**

Soil water - static pressure in water - Effective stress concepts in soils - capillary stress - permeability measurement in the laboratory and field - factors influencing permeability of soil - seepage - introduction to flow nets - simple problems.

UNIT III: STRESS DISTRIBUTIONS AND SETTLEMENT **9 Hrs**

Effective stress concepts in solids - stress distribution in soil media - use of influence charts - components of settlement - factors influencing settlement of soil - immediate and consolidation settlement - Tergazhi's one dimensional consolidation theory - computation of rate of settlement.

UNIT IV: SHEAR STRENGTH **8 Hrs**

Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory - saturated soil mass - Pore pressure parameters - Liquefaction.

UNIT V: SLOPE STABILITY **9 Hrs**

Slope failure mechanisms - types - infinite slopes - finite slopes - total stress analysis for saturated clay - method of slices - friction circle method - use of stability number.

Total : 45 Hrs

TEXT BOOKS

*V.N.S. Moorthy, “soil mechanics and foundation engineering”, UBS publications and distribution Ltd, New Delhi, 1999.

*Gopal Ranjan and Rao A.S.R., “Basic and Applied Soil Mechanics” Wiley eastern ltd., New Delhi, 1997.

*Arora K.R., “Soil mechanics and Foundation Engineering”, Standard publishers and distributors, New Delhi,1997.

REFERENCES

*Holtz R.D. and Kovacs W.D., “Introduction to geotechnical engineering”, Prentice - hall, New Delhi, 1995.

*Mccarthy D.F., “Essentials of soil mechanics and foundations”, Prentice - Hall, New Delhi, 1997.

*Sutten B.H.C., “Solving problems in soil mechanics", Longman group scientific and technical, U.K. England, 1994

*Dass, B.M, “Principles of geotechnical engineering”, Thompson books

Subject Code: BCE17009	Subject Name : TRANSPORTATION ENGINEERING	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Soil Mechanics. Survey I,II	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To understand the aspects of design, construction and maintenance of tracks for the safe and¬ efficient movement of public and goods. To have an overall knowledge of the design and construction of Highway, airport, docks, harbors and ports as a whole .

COURSE OUTCOMES (COs) : (3- 5)

CO1	The students completing this course would have acquired knowledge on planning, design, construction
CO2	the students will have the ability to Plan and Design various civil Engineering aspects of Railways,
CO3	Knowledge of Airports and Harbour.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H		M			H		M			M	
CO2	H		M			H		M			M	
CO3	H					H		M			M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

BCE17009 TRANSPORTATION ENGINEERING

UNIT I HIGHWAY PLANNING AND ALIGNMENT 9 Hrs

Significance of highway planning –History of road development in India – Classification of highways – Locations and functions – Factors influencing highway alignment – Soil suitability analysis - Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 9 Hrs

Typical cross sections of Urban and Rural roads — Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses.

UNITIII RAILWAYS PLANNING CONSTRUCTION AND MAINTENANCE 10 Hrs

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, - Track Stress, coning of wheels, creep in rails, defects in rails - Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings. Tunneling Methods, drainage and ventilation –Calculation of Materials required for track laying - Construction and maintenance of tracks – Modern methods of construction & maintenance

UNIT IV AIRPORT PLANNING & DESIGN 9 Hrs

Airport planning, components of airports, airport site selection Runway design- orientation, geometric design and correction for gradients Terminal area, airport layout, airport buildings, passenger facilities, parking area and airport zoning

UNIT V HARBOUR ENGINEERING 8 Hrs

Definition of terms - harbors, ports, docks, tides and waves. Harbors – requirements, classification – site investigation for locations, planning and layouts Terminal facilities – port buildings, warehouse, transit sheds, inter-modal transfer facilities, mooring accessories, navigational aids coastal structures piers, breakwaters, wharves, jetties, quays.

Total No of Hrs = 45 hr

TEXT BOOKS

*Saxena Subhash C and Satyapal Arora, A Course In Railway Engineering, Dhanpat Rai And Sons, Delhi, 1998.
*Khanna S K, Arora M G and Jain S S, Airport Planning And Design, Nemchand And Brothers, Roorkee, 1994.
*Khanna K And Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
* Kadiyali l r, Principles and Practice of Highway Engineering, Khanna technical Publications, Delhi
* Dr K.P.Subramaniyam, Transportation Engineering, Scitech Publishers, Chennai 2003

REFERENCES

* IRC standards, 2002
* Bureau of Indian Standards (bis) publications on highway materials, 1998
* Rangwala, Railway Engineering, Charotar Publishing House, Mumbai, 1995

Subject Code: BEE17I04	Subject Name : ENERGY CONSERVATION TECHNIQUES (INTER DISCIPLINARY THEORY – 3)	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
To study the various energy saving and management techniques applied to building and construction with relevance to environment.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course the student shall

CO1	Possess knowledge on basic energy conservation systems
CO2	Design energy efficient buildings
CO3	Able to do energy audit and identify conservative measures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H	H	H	M	M				
CO2	H	H		H	H	H	M	M				
CO3	H	H		H	H	H	M	M				

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								

Approval	

BEE17I04 **ENERGY CONSERVATION TECHNIQUES**

UNIT I : INTRODUCTION **9 Hrs**

Fundamentals of energy- Energy Production Systems-Heating, Ventilating and Airconditioning – Solar Energy and Conservation – Energy Economic Analysis – Energy conservation and audits – Domestic energy consumption – savings - challenges –primary energy use in buildings - Residential – Commercial – Institutional and public buildings – Legal requirements for conservation of fuel and power in buildings.

UNIT II : ENVIRONMENTAL **9 Hrs**

Energy and resource conservation – Design of green buildings – Evaluation tools for building energy – Embodied and operating energy – Peak demand – Comfort and Indoor Air quality – Visual and acoustical quality – Land, water and materials ..

UNIT III: DESIGN **9Hrs**

Natural building design consideration – Energy efficient design strategies – Contextual factors – Longevity and process Assessment – Renewable Energy Sources and design – Advanced building Technologies – Smart buildings – Economies and cost analysis.

UNIT IV: SERVICES **9 Hrs**

Energy in building design – Energy efficient and environment friendly building – Thermal phenomena – thermal comfort – Indoor Air quality – Climate, sun and Solar radiation, - Psychometrics – passive heating and cooling systems - Energy Analysis – Active HVAC systems - Preliminary Investigation – Goals and policies – Energy audit – Types of Energy audit– Energy flow diagram – Energy consumption / Unit Production – Identification of wastage- Priority of conservative measures.

UNIT V: ENERGY MANAGEMENT **9 Hrs**

Energy management of electrical equipment - Improvement of power factor – Management of maximum demand – Energy savings in pumps – Fans – Compressed air systems – Energy savings in Lighting systems – Air conditioning systems – Applications .

Total No. of Hours: 45

REFERENCES

1. Moore F., Environmental Control system Mc Graw Hill, Inc. 1994.
2. Brown, GZ, Sun, Wind and light: Architectural design strategies, John Wiley & Sons,1985.
3. Cook, J, Award – Winning passive Solar Design, Mc Graw Hill, 1984.
4. J.R. Waters, Energy conservation in Buildings: A Guide to part L of the Building Regulations, Blackwell Publishing, 2003.

Subject Code: BCE17ET4	Subject Name : WATER RESOURCES & IRRIGATION ENGINEERING	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Applied hydraulic engineering	ETL	1	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
To impart knowledge and skills on Planning, design, operation and management of reservoir system

COURSE OUTCOMES (COs) : (3- 5)

CO1	Students will come to know about water resources and management in India
CO2	Students will come to know the irrigation management practices of the past, present and future
CO3	The student will gain knowledge on different methods of irrigation including canal irrigation.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H				M	H	H	M			M	L
CO2	H				M	H	H	M			M	L
CO3	H				M	H	H	M			M	L

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								

Approval	

BCE17ET4 WATER RESOURCES & IRRIGATION ENGINEERING

UNIT I :WATER RESOURCES 8 Hrs

Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Estimation of water requirements for irrigation and drinking- Single and multipurpose reservoir – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Design flood-levees and flood walls.

UNIT II WATER RESOURCE MANAGEMENT 8Hrs

Economics of water resources planning; – National Water Policy – Consumptive and non- consumptive water use - Water quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget- Conjunctive use of surface and ground water

UNIT III : IRRIGATION ENGINEERING 9 Hrs

Irrigation – Need and mode of Irrigation – Merits and demerits of irrigation – Need – Merits and Demerits – Duty, Delta and Base period – Irrigation efficiencies – Crops and Seasons - Crop water Requirement – . Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and Demerits – Sprinkler irrigation – Drip irrigation

UNIT IV : DIVERSION AND IMPOUNDING STRUCTURES 10 Hrs

Weirs – elementary profile of a weir – weirs on pervious foundations - Types of Impounding structures - Tanks, Sluices and Weirs – Gravity dams – Earth dams – Arch Dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams

UNIT V: CANAL IRRIGATION 10 Hrs

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works.

Total No of Hours: 45

TEXT BOOKS

* Asawa, G.L., “Irrigation Engineering”, New Age International Publishers, New Delhi, 2000.
* Sharma, R.K., and Sharma, T.K., “Irrigation Engineering”, S.Chand and Company,New Delhi, 2000.

REFERENCES

* Basak, N.N., “Irrigation Engineering”, Tata McGraw-Hill Publishing Co., New Delhi, 2000.
* Garg, S.K., “Irrigation Engineering,” Laxmi Publications, New Delhi, 1999.
* Gupta, B.L., and Amir Gupta, “Irrigation Engineering”, SatyaPraheshan, New Delhi

Subject Code: BCE17L05	Subject Name : TRANSPORTATION ENGINEERING LAB	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Transportation Engineering	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The objectives of these laboratory experiments are to determine specific gravity (bulk and apparent), absorption capacity, and fineness modulus of a fine aggregate sample and to plot a gradation curve for the sample.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course the student shall possesses

CO1	Knowledge on testing of aggregates
CO2	Knowledge on testing of bitumen
CO3	Knowledge on deflection of pavements

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H								H			
CO2	H								H			
CO3	H								H			

COs / PSOs	PSO1	PSO2
CO1	H	M
CO2	H	M
CO3	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					
Approval												

BCE17L05 **TRANSPORTATION ENGINEERING LAB**

LIST OF EXPERIMENTS

1. CBR Test of Given soil sample.
2. Grading Of aggregates.
3. Water Absorption Test on aggregates
4. Abrasion test on aggregates.
5. Impact Test On aggregates
6. Bitumen tests
7. Benklemann Beam apparatus.

Total No of Hours : 30

Subject Code: BCE17L06	Subject Name : GEOTECHNICAL ENGINEERING LABORATORY	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Soil Mechanics	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To illustrate some of the principles taught during the soil mechanics course.

To impart knowledge of laboratory and index testing methods commonly used in Soil & foundation engineering.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Knowledge to determine Index properties of the soils like water content, specific gravity and Atterberg limits
CO2	Knowledge engineering properties like field density, shear strength, permeability, compaction and consolidation
CO3	Test the soil to assess its ability to withstand the load

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			H		H			H			
CO2	H			H		H			H			
CO3	H			H		H			H			

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

BCE17L06 GEOTECHNICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

1. Specific gravity of soil solids
2. Grain size distribution - Sieve analysis - Hydrometer analysis
3. Atterberg limits test – Liquid limit, Plastic limit and shrinkage limit tests
4. Field density Test
5. Determination of moisture - Density relationship using standard proctor.
6. Permeability determination (constant head and falling head methods)
7. Direct shear test on cohesion less soil
8. Unconfined compression test in cohesive soil
9. Tri axial compression test in cohesion less soil
10. Laboratory Vane shear test in cohesive soil
11. One dimensional Consolidation test (Determination of coefficient of consolidation only)

Total No of Hrs = 30 hrs

REFERENCES

* "Soil Engineering Laboratory Instruction Manual ", Published by the Engineering College Co-operative Society, Chennai, 1996.
* Lambe T.W., "Soil Testing for Engineers ", John Wiley and Sons, New York, 1990.
* "I.S.Code of Practice (2720) Relevant Parts ", as amended from time to time..

Subject Code: BAR17IL2	(INTER DISCIPLINARY LAB 3) Subject Name : BUILDING DRAWING USING CIVIL ENGINEERING SOFTWARE	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Building Drawing Practice	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To provide the student with an appreciation of the capabilities and limitations of the AutoCAD program.

COURSE OUTCOMES (COs) : (3- 5)

CO1	prepare the building plans satisfying the principles of planning and byelaws.
CO2	draw plan, section and elevation for various structures
CO3	prepare detailed working drawings of doors, windows, roof trusses and staircases

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H		H			H		M				H
CO2	H		H			H		M				H
CO3	H		H			H		M				H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					
Approval												

BAR17IL2 **BUILDING DRAWING USING CIVIL ENGINEERING SOFTWARE**

EXPERIMENTS

1. Learn and use basic AutoCAD commands - manage drawing using layers, colour and line types - complete basic cad drawings, with borders, text and dimensions - use and edit text and text styles – Method of scales in various drawing - understand and the use of blocks.
2. Development of line plan for residential building. one for single storied building and another for two storied building.
3. Submission drawing for residential building including its planning and with area and parking statements and all other details as per the norms and local bye-laws.
4. Industrial buildings with roof truss.
5. To draw the 3D view of residential building.

Total No of Hours: 30 hrs

TEXT BOOKS

* Civil Engg. Drawing & House planning – B.P.Verma, Khanna publishers, Delhi,1990
* Building drawing & detailing – Dr. Balagopal & T.S.Prabhu, Spades publishers, Calicut,1989.

REFERENCES

* Building drawing – Shah, Tata McGraw-Hill, New Delhi,2000.
* Building planning & drawing – Dr. N.Kumaraswamy, A.Kameswara Rao, Charotar publishing house. Mumbai,1997.
* Shah, Kale and Patki, Building drawing, Tata McGraw-Hill New Delhi,,1998.

Subject Code: BCE17TS2	Subject Name : TECHNICAL SKILL II (EVALUATION) SURVEY CAMP	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Survey field work ,advanced surveying field work	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The student will go to the outside site so that they will realize the practical difficulties in taking surveys in field

COURSE OUTCOMES (COs) : (3- 5) The student will be able to

CO1	perform survey as per the field condition
CO2	conduct LS and CS by using advanced equipment
CO3	prepare contour map for the given area

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H			H	H	H	H	H		M	M
CO2	H	H			H	H	H	H	H		M	M
CO3	H	H			H	H	H	H	H		M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
								√				
Approval												

BCE17TS2 **SURVEY CAMP**

Three weeks survey camp using Theodolite, cross staff, leveling staff, tapes and Plane table

(i) Triangulation
(ii) Trilateration
(iii) Star observation to determine azimuth
(iv) Rectangulation

* Will be accommodated during preceding winter vacation

Total No of Hours: 30

REFERENCES

1. Bannister A. and Raymond S., “Surveying " , ELBS,Pune, Sixth Edition, 1992.

2. Heribert Kahmen and Wolfgang Faig, “Surveying " , Walter de Gruyter, 1995.

3. Kanetkar T.P., “Surveying and Levelling”, Vols. I and II, United Book Corporation, Pune, 1994.

4. Punmia B.C., “Surveying ", Vols. I, II and III, Laxmi Publications, New Delhi, 1999.

5. Clark D., “Plane and Geodetic Surveying” , Vols. I and II, C.B.S. Publishers and Distributors, Delhi, sixth Edition, 1971.

6. James M. Anderson and Edward M. Mikhail, “Introduction to Surveying ", McGraw Hill Book Company, New Delhi, 1985.

7. Wolf P.R. “Elements of Photogrammetry", McGraw Hill Book Company, New Delhi, 1988

Subject Code: BCE17L07	Subject Name : INPLANT TRAINING (EVALUATION) PRACTICAL/FIELD TRAINING	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: ALL	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To develop technical skill and practical learning in field work

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student will possess sound knowledge and experience in civil construction field
CO2	Student can correlate theoretical knowledge with practical experience
CO3	Student will be able to prepare report based on the experience gained

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H					H		H	H	M	H	H
CO2	H					H		H	H	M	H	H
CO3	H					H		H	H	M	H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
								√				
Approval												

BCE17L07 **INPLANT TRAINING**

INDUSTRIAL TRAINING

Soil Investigation

Construction-different types of foundation, Highways and Embankments

Prestressing- Bridges

Industrial Structures- steel-fabrication and erection

Specification for various works- measurement and Billing

OFFICE TRAINING

Architectural plan

Latest civil Engineering softwares based on design and analysis

Students have to visit at least one industry relevant to civil engineering as part of industrial training and spend a minimum of 15 days during semester break between VI and VII semester. A report of the same should be submitted at the beginning of the 7th semester and evaluation shall be conducted based on the report, presentation and viva-voce.

Subject Code: BCE17010	Subject Name : STRUCTURAL ANALYSIS II	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Structural Analysis I	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To impart extended knowledge on the concepts taught in Structural Analysis I (Determinate to indeterminate structures.)

To understand the basic concepts of finite element analysis.

COURSE OUTCOMES (COs) : (3- 5)

CO1	analysis suspension bridges and arches
CO2	will be conversant with classical methods of analysis.
CO3	analyse structures by finite element method

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H			**M**	**M**			**M**	**M**
CO2	H	H		H			**M**	**M**			**M**	**M**
C03	H	H		H			**M**	**M**			**M**	**M**

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								

Approval	

BCE17010 **STRUCTURAL ANALYSIS II**

UNIT I : ARCHES **12 Hrs**

Arches structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects

UNIT II : SUSPENSION BRIDGES **12 Hrs**

Analysis of suspension bridges – Un stiffened cables and cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders.

UNIT III: MATRIX METHOD FOR INDETERMINATE FRAMES **12Hrs**

Equilibrium and compatibility - Determinate Vs indeterminate structures –Indeterminacy - primary structure - Compatibility conditions - Analysis of indeterminate pin-jointed plane frames, continuous beams. Element and global stiffness and flexibility matrices– Co-ordinate transformations – transformations of stiffness matrices - Analysis of Continuous Beams.

UNIT IV : PLASTIC ANALYSIS OF STRUCTURES **12 Hrs**

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.

UNIT V : FINITE ELEMENT METHOD **12 Hrs**

Introduction- Discretisation of a structure- Displacement functions- Truss element- Beam element- Plane stress and plane strain- Triangular elements

Total No of Hours: 60

TEXT BOOKS

* R.Vaidyanathan,P.Perumal,, Comprehensive Structural Analysis Vol 1 and vol.2, Laxmi Publications,2004
* S.Ramamrutham,R.Narayan,Theory of structures,Dhanpatrai publications,1993
* Bhavikatti S.S Structural Analysis Vol 1 and vol.2 ,Vikas Publishing House Pvt. Ltd New Delhi

REFERENCES

*Matrix analysis of framed structures – William Weaver, Jr & James M.Gere, CBS Publishers & Distributors, Delhi, 1995

*Structural Analysis – A Matrix Approach – G.S.Pandit & S.P.Gupta, Tata McGraw-Hill, New Delhi ,1998
* Manicka Selvam V.K.,Elementary Matrix Analysis of Structures, Khanna Publishers Mumbai,1990.
*Coates R.C., Coutie M.G. and Kong F.K., Structural Analysis, ELBS and Nelson, Newjersey,1990

Subject Code: BCE17011	Subject Name : FOUNDATION ENGINEERING	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Soil mechanics	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To import knowledge on common method of sub soil investigation, selection of foundation and design of foundation..

COURSE OUTCOMES (COs) : (3- 5)

CO1	Students will have the ability to select type of foundation required for the soil at a place
CO2	Able to design shallow, foundation, deep foundation and retaining structures.
CO3	At the end of this course student acquires the capacity to investigate the soil condition and to select and design a suitable foundation

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H		H		H				
CO2	H	H	H	H		H		H				
CO3	H	H	H	H		H		H				

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								

Approval	

BCE17011 FOUNDATION ENGINEERING

UNIT I: SOIL EXPLORATION 9 Hrs

Scope and objectives - method of exploration - auguring and boring - wash boring and rotary drilling - depth of boring - spacing and depth of bore hole - sampling - representative and undisturbed - sampling techniques - split spoon sampler, thin tube sampler, stationary piston sampler - bore log and report - penetration tests (SPT and SCPT) - Selection of foundation.

UNIT II: SHALLOW FOUNDATION 12 Hrs

Introduction - location and depth of foundation - codal provision - bearing capacity of shallow foundation on homogeneous deposits - Terzaghi's formula and BIS formula - factors affecting bearing capacity - problems- bearing capacity from in situ tests (SPT, SCPT and plate load) allowable bearing pressure - components of settlement - determination of settlement of foundation on granular and clay deposit - total and differential settlement - allowable settlement - codal provision.

UNIT III: FOOTINGS AND RAFTS 8 Hrs

Types of foundation - contact pressure distribution below footings, design of footings, isolated footing, combined footing, mat foundation - types - Applications - proportioning- floating foundation - codal provision.

UNIT IV: PILE FOUNDATION 8 Hrs

Types of piles and their function - factors influencing the selection of pile - load carrying capacity of single pile in granular and cohesive soils - static formulae - dynamic formulae (engineering news and hiley's) - capacity from insitu tests (SPT and SCPT) - negative skin friction - uplift capacity - group capacity by different methods (feld's rule, converse - Labarra formula and block failure criterion) - settlement of pile groups -interpretation of pile load test (routine test only) - under reamed piles - capacity under compression and uplift .

UNIT V: RETAINING WALLS 8Hrs

Plastic equilibrium in soils - active and passive states - Rankine's theory - cohesionless, effect of water table andcohesive soil - coloumb's wedge theory - condition for critical failure plane - earth pressure on retaining wallsof simple configurations - Rebhann and Culmann's graphical method - stability analysis of retaining walls.

Total No of Hours: 45

TEXT BOOKS

*Arora, K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and distributors,New Delhi,1997.
*Gopal Ranjan and Rao, "A.S.R. Basic and Applied Soil Mechanics", Wiley Eastern Ltd., New Delhi, 1997.
*V.N.S. Moorthy, "Soil Mechanics and Foundation Engineering", UBS Publications and distribution Ltd, New Delhi, 1999.

REFERENCES

*****Bowles J.E. "Foundation Analysis and Design", McGraw hill, 1994.

*Dass, B.M , "Principles of Geotechnical Engineering", Thompson Books, Singapore ,5th edition, 2003
*Kaniraj, S.R, "Design Aids in Soil Mechanics and Foundation Engineering", Tata Mcgraw Hill Publishing Company Ltd, New Delhi, 2002
*Swamisaran, "Analysis and Design of Structures - Limit State Design", Oxford Ibh Publishing co Pvt Ltd. New Delhi, 1998

Dr. M.G.R. EDUCATIONAL AND RESEARCH INSTITUTE UNIVERSITY
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(An ISO 9001 : 2008 Certified Institution)

Department of Civil Engineering

Subject Code:	Subject Name : (INTERDISCIPLINARY THEORY IV) DESIGN OF CONCRETE STRUCTURES – II	TY / L/ ETL	L	T / S.Lr	P/ R	C
BAR17I03	Prerequisite: Design of Concrete Structures – I	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To bring an exposure on advanced topics in structural design comprising of RCC structures
To understand the design methods of specialized components of RCC structures

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Design retaining walls, staircase and water tanks.
CO2	Design Slab using yield line theory
CO3	Design masonry walls for axial and eccentrical loads

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H		H	M	M	M		M	
CO2	H	H	M	H		H	M	M	M		M	
CO3	H	H	M	H		H	M	M	M		M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BAR17I03 DESIGN OF CONCRETE STRUCTURES – II

UNIT I : RETAINING WALLS **11 Hrs**

Design of retaining walls – cantilever and counter fort.

UNIT II : DESIGN OF STAIRCASE AND FLAT SLAB **8 Hrs**

Introduction to ductile detailing & provisions of IS 13920 - Design of Staircases - Design of flat slabs.

UNIT III: DESIGN OF WATER TANK **11 Hrs**

Design of circular and rectangular water tanks resting on ground. Design of staging and foundations.

UNIT IV: YIELD LINE THEORY. **7 Hrs**

Application of virtual work method to square, rectangular, circular and triangular slabs.

UNIT V BRICK MASONRY **8 Hrs**

Design of masonry walls and pillars as per NBC and I.S.codes.

Total No of Hours : 45

TEXT BOOKS

* Varghese P C, Limit State Design of Reinforced Concrete, Prentice Hal of India, Private, Limited New Delhi, 1997
* Krishna Raju N. Design of RC structures, CBS Publishers and distributors, New Delhi, 1995.
* S.Ramamrudham,Design of Reinforced Concrete Structures, Dhanpat Rai publishing company(p) Ltd New Delhi.
* Dayarathnam.P, Brick and Reinforced Brick Structures, Oxford and IBH Publishing House, 1999.

REFERENCES

* Mallick and Gupta, Reinforced Concrete Design, Oxford and IBH, Delhi, 1997
* Design Aides to IS 456-1978 (SP-16)
* Code of Practice for Plain and Reinforced Concrete – IS456-2000.
* IS 1905:1987, Code of practice for structural use of unreinforced mansonry Bureau of Indian Standards

Subject Code: BEN17ET5	Subject Name : Soft Skill – II	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Soft Skills – I	ETL	1		2	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The main objective is to strengthen the logical and arithmetic reasoning skills of the students.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Recognize and apply arithmetic knowledge in a variety of contexts.
CO2	Ability to identify and critically evaluate philosophical arguments and defend them from criticism.
CO3	Define data and interpret information from graphs.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	L	L	H	M	H	H
CO2	M	M	M	H	L	H	L	H	H	H	H	L
CO3	H	H	H	H	H	H	M	M	H	H	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1								
CO2								

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
									✓			

Approval	

BEN17ET5 **SOFT SKILL- II**

(Common to all E&T courses)

UNIT I Logical Reasoning I

Logical Statements – Arguments – Assumptions – Courses of Action.

UNIT II Logical Reasoning II

Logical conclusions – Deriving conclusions from passages – Theme detection.

UNIT III Arithmetical Reasoning I

Number system – H.C.F & L.C.M – Problem on ages – Percentage – Profit & Loss – Ratio & Proportion – Partnership.

UNIT IV Arithmetical Reasoning II

Time & Work – Time & Distance – Clocks – Permutations & Combinations – Heights & Distances – Odd man out and Series.

UNIT V Data Interpretation

Tabulation – Bar graphs – Pie graphs – Line graphs.

Reference Book:

1. R.S.Agarwal, A modern approach to Logical Reasoning, S.Chand & Co., (2017).

2. R.S.Agarwal, A modern approach to Verbal and Non verbal Reasoning, S.Chand & Co., (2017).

3. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S.Chand & Co., (2017).

4. A.K.Gupta, Logical and Analytical Reasoning, Ramesh Publishing House, (2014).

5. B.S.Sijwali, Indu sijwali, A new approach to Reasoning (Verbal and Non verbal), Arihant Publishers, (2014).

Subject Code: BCE17L08	Subject Name : ENVIRONMENTAL AND HYDRAULIC STRUCTURES DRAWING	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Environmental engineering, Water resources and irrigation engineering	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The purpose of this course is to impart the knowledge about the design of irrigation and environmental engineering structures.

COURSE OUTCOMES (COs) : (3- 5)

CO1	hand-on experience in drawing of irrigation engineering structures
CO2	hand-on experience in drawing of environmental engineering structures
CO3	To draw plan elevation and section of structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H							H	H		M	
CO2	H							H	H		M	
CO3	H							H	H		H	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					
Approval												

BCE17L08 ENVIRONMENTAL AND HYDRAULIC STRUCTURES DRAWING

UNIT I : WATER SUPPLY AND TREATMENT 7 Hrs

Design & Drawing of flocculate, clarifier – Rapid sand filter – House service connection for water supply and drainage.

UNIT II : SEWAGE TREATMENT & DISPOSAL 8 Hrs

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank – Secondary clarifiers – Sludge digester – Sludge drying beds – Waste stabilization ponds - Septic tanks and disposal arrangements – Manholes.

UNIT III : IMPOUNDING STRUCTURES 5 Hrs

Gravity dam, Tank Surplus Weir, Tank Sluice with tower road – Drawing showing plan, Elevation, half section including foundation details.

UNIT IV: CANAL TRANSMISSION STRUCTURES 5 Hrs

Aqueducts – Syphon Aqueducts – Super passage – Canal siphon – Canal Drops- Drawing Showing plan, elevation and foundation details.

UNIT V : CANAL REGULATION STRUCTURES 5Hrs

Canal head works- Canal Regulator – Canal escape- Proportional Distributors – Drawing showing detailed plan, elevation and foundation.

Total No of Hours: 30

TEXT BOOKS

* Modi, P.N., "Environmental Engineering I & II", Standard Book House, Delhi – 6
* SathyanarayanaMurthy "Irrigation Design and Drawing" Published by Mrs L.Banumathi, Tuni east Godavari District.A.P. 1998.
* Sharma R.K. Irrigation Engineering and Hydraulic Structures Oxford and IBH Publishing co., New Delhi 2002.

REFERENCES

* Peary, H.S., ROWE, D.R., Tchobanoglous, G., "Environmental Engineering", McGrawHill Book Co., New Delhi, 1995.
* Metcalf & Eddy, "Wastewater Engineering (Treatment and Reuse)", 4thedition, Tata McGraw-Hill, New Delhi, 2003.
* Garg S.K., "Irrigation Environmental Engineering and design StructuresI", Khanna Publishers, New Delhi, 17th Reprint, 2003.
* Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999
* Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi.

Subject Code: BCE17L09	Subject Name : ENVIRONMENTAL ENGINEERING LABORATORY	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Environmental Engineering	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge on preparation of reagents, testing various water and waste water quality parameters .

COURSE OUTCOMES (COs) : (3- 5)

CO1	To get hand-on experience in the operation of equipments like pH meter, TDS meter, turbidity meter, etc.
CO2	To analyze water and wastewater volumetrically and using certain equipments
CO3	The students completing the course will be able to characterize wastewater and conduct treatability studies.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M		H		H	H	M		M	
CO2	H	M	M		H		H	H	M		M	
CO3	H	M	M		H		H	H	M		M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

BCE17L09 **ENVIRONMENTAL ENGINEERING LABORATORY**

LIST OF EXPERIMENTS

1. a) Determination of pH.
   b) Determination of Turbidity.
2. Determination of Hardness.
3. Determination of Alkalinity.
4. Determination of Residual Chlorine.
5. Estimation of Chlorides.
6. Estimation of Ammonia Nitrogen.
7. Estimation of Sulphate.
8. Determination of optimum coagulant dose.
9. Determination of specific conductivity.
10. Estimation of available chlorine in Bleaching Powder.
11. Determination of dissolved Oxygen.
12. Determination of suspended settleable, volatile and fixed solids
13. B.O.D. Test.
14. C.O.D. Test.

Total No of Hours: 30

REFERENCE BOOKS

* Trivedi and Goel – Chemical and biological methods for water pollution studies. New Delhi,2000.
* A course Manual – Water and wastewater analysis. National Environmental Engineering Research Institute. Nagpur – publication.
* Standard Methods for Examination of water and Waste water APHa, AWWA and WPCF, 1985 Edition.

Subject Code: BCE17L10	Subject Name : STRUCTURAL ANALYSIS AND DESIGN BASED ON CIVIL ENGINEERING SOFTWARE	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Structural Analysis I & II,design of concrete structures I& II	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : Concurrent Engineering based user environment for model development, analysis, design, visualization and verification. The course covers the complete analysis and design of RCC structures.

COURSE OUTCOMES (COs) : (3- 5)

CO1	They will have knowledge of designing a beam ,column and slab as per code
CO2	They will get an idea about member selection and optimized members selection consisting of design .
CO3	able to visualize and interpret data in software

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H							H	H
CO2	H	H	H	H							H	H
CO3	H	H	H	H							H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					
Approval												

BCE17L10 STRUCTURAL ANALYSIS AND DESIGN BASED ON CIVIL ENGINEERING SOFTWARE

LIST OF EXPERIMENTS

1. Introduction to staad pro - Joint, Member/Element, Mesh Generation with flexible user-controlled numbering
2. Analyse and design any beam with any loading type and any kind of supports.
3. Analyse and design of any 2D Frame with any loading type for any load sets.
4. Portal frame with 5 load combinations- Analysis
5. Analysis of beam with moving load
6. Analyse steel structures with truss elements.

Total No of Hours: 30

TEXT BOOK

* Structural design and drawing (Reinforced Concrete and Steel)-N. Krishna Raju, University publishers 3rd Edn, 2009.
* Design Of Steel Structures- B.C.Punmia, Ashok Kumar Jain,Arun kumar Jain ,Lakshmi Publications Pvt Ltd, 1999.

REFERENCE

* Krishnamoorthy D- Structural Design and drawing Vol II CBS Publishers and distributors Delhi 1990.
* Krishnamoorthy D- Structural Design and drawing Vol III (steel structures) CBS Publishers and Distributors Delhi 1990.

Subject Code: **BCE17L11**	Subject Name: **MINI PROJECT**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: ALL	Lb	0	0/0	0/2	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The objective of project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving design related to civil engineering.

COURSE OUTCOMES (COs) : (3- 5) Students will be able to

CO1	Work in a team and develop multidisciplinary ,research skills
CO2	Explore innovative ideas in civil engineering design field
CO3	Develop design projects based on industrial and field requirements

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H	H	H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

BCE17L11 **MINI PROJECT OBJECTIVE**

The objective of project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving design related to civil engineering. Every project work shall have a guide who is a member of the faculty of the university.

Three periods per week shall be allotted in the time table for this important activity and this time shall be utilized by the students to receive directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars the progress made in the project. Each student shall finally produce a comprehensive report covering background information, design data, design, detailing, drawing and conclusions. This final report shall be typewritten form as specified in the guidelines. The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

Subject Code: BCE17TS3	Subject Name : **TECHNICAL SKILL III (EVALUATION) DETAILING OF R.C. AND STEEL STRUCTURES**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Building Drawing Practice	Lb	0	0/0	0/2	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE To Impart knowledge on various softwares used in civil engineering

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquire latest civil engineering softwares
CO2	May able to correlate theoretical knowledge with practical training
	May extend the software knowledge for research purpose

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H							H	H
CO2	H	H	H	H							H	H
C03	H	H	H	H							H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
								√				

Approval	

BCE17TS3 **DETAILING OF R.C. AND STEEL STRUCTURES**

TECHNICAL SKILL III (EVALUATION)

Course Outline:

Student should learn about detailing of Reinforced concrete structures and steel structures detailing and quantity of steel calculation.

R.C.C Member

1. One way slab
2. Two way slab
3. Cantilever slab
4. Beam
5. Column
6. Footing

Steel Structures

1.Roof Trusses

2. Beam Column joint

3.Gantry Girder

4.Plate Girder

Subject Code: BCE17012	Subject Name : **DESIGN OF STEEL STRUCTURES**	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Structural analysis I & II	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE: To introduce the student to material behaviour and Load and Resistance Factor Design methodology.
To design and analyze tension members and compression members.

COURSE OUTCOMES (COs) : (3- 5)

CO1	The students would have knowledge on the design of structural steel members subjected to compressive, tensile and bending forces, as per current code .
CO2	To know to design structural systems such as roof trusses and gantry girders.
CO3	To design and analyze beams and connections

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		M	M	M				
CO2	H	H	H	H		M	M	M				
CO3	H	H	H	H		M	M	M				

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								
Approval												

BCE17012 **DESIGN OF STEEL STRUCTURES**

UNIT I INTRODUCTION **12 Hrs**

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Connections using rivets, welding, bolting – Design of bolted and welded joints – Eccentric connections - Efficiency of joints.

UNIT II TENSION MEMBERS **12 Hrs**

Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

UNIT III COMPRESSION MEMBERS **12 Hrs**

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of laced and battened type columns – Design of column bases – Gusseted base

UNIT IV BEAMS **12 Hrs**

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to uniaxial and biaxial bending – Design of plate girders - Intermediate and bearing stiffeners – Flange and web splices.

UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES **12 Hrs**

Roof trusses – Roof and side coverings – Design of purlin and elements of truss; end bearing – Design of gantry girder.

Total No of Hours: 60

TEXTBOOKS:

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013

2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2 nd Edition, 2013.

3. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

REFERENCES:

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002

2. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005

3. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800–2007, IK International Publishing House Pvt. Ltd., 2009

4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007 Structures Publications, 2009.

5. IS 800 :2007, General Construction In Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007

Subject Code: BCE17013	Subject Name: **CONSTRUCTION MANAGEMENT**	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NONE	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To make the students aware of the various construction techniques and practices.

To introduce a concepts of projects formulation

COURSE OUTCOMES (COs) : (3- 5)

CO1	The student should be able to plan construction projects, schedule the activities using network diagrams,
CO2	Determine the cost of the project, control the cost of the project by creating cash flows and budgeting and to use the project information as decision making tool
CO3	Knowledge about different methods of planning

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H					H	M	M		M		H
CO2	H					H	M	M		M		H
CO3	H					H	M	M		M		H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

BCE17013 CONSTRUCTION MANAGEMENT

UNIT I : NETWORK TECHNIQUES 12 Hrs

Introduction to network techniques - Use of CPM and PERT for planning - Scheduling and control of construction work, bar charts Error in networks, Types of nodes and node numbering systems.

UNIT II : CONSTRUCTION PLANNING 12 Hrs

Basic concepts in the development of construction plan - Planning for construction and site facilities using networks - Preparation of construction schedules for jobs, materials, and equipment using CPM. .

UNIT III : COST CONTROL OF CONSTRUCTION 12 Hrs

Construction quality control and inspection - Significance of variability and estimation of risks - Construction cost control - Crashing of networks.

UNIT IV : QUALITY AND SAFETY DURING CONSTRUCTION 12 Hrs

Importance of Quality and safety – Organizing for quality and safety – safety measures – Prevention of fire at construction site – Elements and organization of quality - Quality assurance techniques.

UNIT V MANAGEMENT INFORMATION SYSTEM 12 Hrs

Definition of MIS – Requirement of MIS – Database approach – Types of project information – Accuracy and use of information.

Total No of Hours: 60

TEXT BOOKS

* Chitkara, K.K "Consruction Project Management Planning "Scheduling And Control, Tata Mc Graw – Hill Publishing Co., Newdelhi, 1998.

* S. Seetharaman - Construction Engineering & Management, Dhanpat Rai Publications ,Pune,1995.

REFERENCES

* Construction Management - Sangareddy And Meyyappan,Prathibha Publications,Cbe,1994.

* Moder. J., C. Phillips And Davis, "Project Management With Cpm, Pert And Precedence Diagramming,1999.

* Prasanna Chandra, " Project Management ", Tmh ,New Delhi,1997.

Subject Code: BMG17001	MANAGEMENT PAPER -I Subject Name: **PRINCIPLES OF MANAGEMENT**	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NONE	Ty	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To increasing organizational effectiveness, To achieve optimum utilization of various resources.To have co-ordination between various department in the organization.

COURSE OUTCOMES (COs) : (3- 5)

CO1	students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling
CO2	Have same basic knowledge on international aspect of management
CO3	Able to apply managerial skill in working environment

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M		M		M	M	H
CO2						M		M		M	M	H
CO3						M		M		M	M	H

COs / PSOs	PSO1	PSO2
CO1	L	L
CO2	L	L
CO3	L	L

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Management Science		
										√		
Approval												

BMG17001 **PRINCIPLES OF MANAGEMENT**

OBJECTIVES:

To increasing organizational effectiveness, To achieve optimum utilization of various resources.

To have co-ordination between various department in the organization.

UNIT-I **9Hrs**

Management: Importance – Definition – Nature and Scope of Management Process – Role and Functions of a Manager – Levels of Management – Development of Scientific Management and other Schools of thought and approaches.

UNIT-II **9Hrs**

Planning: Nature – Importance – Forms – Types – Steps in Planning – Objectives – Policies – Procedures and Methods – Natures and Types of Policies – Decision –making – Process of Decision – making – Types of Decision.

UNIT-III **9Hrs**

Organisation: Types of Organisations – Organisation Structure – Span of Control and Committees – Departmentalisation – Informal Organisation.

UNIT-IV **9Hrs**

Authority – Delegation – Decentralisation – Difference between Authority and Power – Responsibility – Recruitment – Sources, Selection, Training – Direction – Nature and Purpose.

UNIT-V **9Hrs**

Co-ordination – Need, Type and Techniques and requisites for excellent Co-ordination – Controlling – Meaning and Importance – Control Process.

Total No of Hours : 45

Reference Books

1. C.B.Gupta, Management Theory & Practice -Sultan Chand & Sons - New Delhi.
2. L.M.Prasad, Principles & Practice of Management - Sultan Chand & Sons - New Delhi.
3. P.C. Tripathi & P.N Reddy, Principles of Managements - Tata Mc.Graw Hill - New Delhi.
4. Weihrich and Koontz, Management – A Global Perspective.
5. N.Premavathy, Principles of Management - Sri Vishnu Publication - Chennai.
6. J.Jayasankar, Business Management - Margham Publication - Chennai.

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Subject Code: BCE17L12	Subject Name: ADVANCED CONCRETE LAB	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete and construction technology, design of concrete structures I	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To determine the appropriate mix proportion of normal concrete at specified properties

To prepare the specimens for further testing.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student able to design the mix using proper IS code
CO2	Student able to test the concrete specimen and interpret the result with the standards
CO3	Student able to improve their research potential with eco friendly innovative prodncts

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	H	H		H	M
CO2	H	H	H	H	H	H	H	H	H		H	M
CO3	H	H	H	H	H	H	H	H	H		H	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					
Approval												

BCE17L12 **ADVANCED CONCRETE LAB**

LIST OF EXPERIMENTS

1. Crushing Value - Test
2. Mix design using test parameters and assessing the strength of concrete
3. Mortar cube preparation and testing
4. Cube compression test
5. Tension test of concrete - cylinder split test
6. Flexural test on concrete specimen
7. Test using Vee Bee consistometer
8. Flow Table Test

Total No of Hours: 30

Subject Code: BCE17L13	Subject Name: ESTIMATION AND EVALUATION PRACTICAL	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Estimation and quantity surveying	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart hands on training on estimation of various civil structures and prepare valuation reports

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student able to estimate the various structures as per the norms
CO2	Student able to valuate the existing structures
CO3	Student able to connect the actual scenario in the construction industry

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H		H	H	M	H	H
CO2	H	H	H	H		H		H	H	M	H	H
CO3	H	H	H	H		H		H	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	H	H						
CO2	H	H						
CO3	H	H						

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

BCE17L13 **ESTIMATION AND EVALUATION PRACTICAL**

LIST OF EXPERIMENTS:

1. Detailed Estimate [Duration and Cost] for a two storey building.
2. Detailed estimate for following projects:

   [i] a culvert.

   [ii] stretch of road about 1 Km long including earthwork.

   [iii] Elevated water tanks.

   [iv] Manholes, Septic tanks.

   [v] Water supply Scheme and

   [vi] Drainage Scheme.

3. Estimate of Electrification Work for a Material Testing Laboratory.
4. Time Estimate by Network Analysis.
5. Estimation of Air Conditioning requirements for a Library.
6. Valuation reports for:

[i] A hotel

[ii] A Theatre

[iii] An Educational Building

Total No of Hours : 30

BOOKS/REFERENCES

1. B.N.Dutta-Estimating and Costing in Civil Engineering, UPSPD

2. Delhi Schedule Rates, C.P.W.D.

Subject Code: **BCE17L14**	Subject Name: **PROJECT PHASE-I**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: ALL	Lb	0	0/1	0/3	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To guide the students such a way that the students carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Work in a team and develop multidisciplinary ,research skills
CO2	Explore innovative ideas in civil engineering field
CO3	Develop projects based on industrial and field requirements

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H	H	H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

BCE17L14 **PROJECT PHASE-I**

OBJECTIVE

To guide the students such a way that the students carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations

The objective of project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to civil engineering. Every project work shall have a guide who is a member of the faculty of the university.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusions. This final report shall be typewritten form as specified in the guidelines.

The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

Subject Code: BFL1700X	Subject Name : Foreign Language(Evaluation)	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	L	1	0/1	0/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To recognize the cultural values, practices, and heritage of the foreign country, communicate effectively in a foreign language and interact in a culturally appropriate manner with native speakers of that language.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Achieve functional proficiency in listening, speaking, reading, and writing.
CO2	Develop an insight into the nature of language itself, the process of language and culture acquisition.
CO3	Decode, analyze, and interpret authentic texts of different genres.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	L	L	H	L	H	M	H	H	L
CO2	M	L	L	L	L	H	L	H	H	H	H	L
CO3	L	L	M	M	L	H	M	H	M	H	H	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1								
CO2								

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
			✓									
Approval												

Subject Code:	Subject Name : MANAGEMENT PAPER -II TOTAL QUALITY MANAGEMENT	T / L/ ETL	L	T/S Lr	P	C
BMG17003	Prerequisite: Basic Knowledge as quality techniques and implementation	L	2	0/1	0	3

L : Lecture T : Tutorial P : Project C: Credits

OBJECTIVE:

- To acquaint the students with the basic concept of Total Quality (TQ) from design assurance to service assurance.
- To give understand International Quality Certification Systems – ISO 9000 and other standards.
- To apply in design manufacturing, quality control and services, and to closely interlink management of quality, reliability and maintainability for total product assurance.
- To understand concepts related to quality of services in contemporary environment.

COURSE OUTCOMES (COs) :

CO1	To maintain quality in all aspects
CO2	To understand the basic tools for quality control
CO3	To bring out zero defect products

Mapping of Course Outcomes (COs) with Program Outcomes (POs) & Program Specific Outcomes (PSOs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	M	M	L	L	H	H	H	M	H
CO2	M	M	M		M	L		H			H	M
CO3	H	H	M	M	H	M	M	H	H	M	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

	Basic Sciences	Engineering Sciences	Humanities and Social	Program Core	Program Electives	Open Electives	Practical / Project	Internships /	Soft Skills	Management Science		
Category										✓		
Approval												

BMG17003 **TOTAL QUALITY MANAGEMENT** **3 0 0 3**

OBJECTIVE

Meeting the customer's requirements is the primary objective and the key to organisational survival and growth.; The second objective of TQM is continuous improvement of quality. The management should stimulate the employees in becoming increasingly competent and creative.

UNIT I : INTRODUCTION **9 Hrs**

Definition of quality, dimensions of quality, quality planning, quality costs – analysis techniques for quality costs, basic concepts of total quality management, historical review, principles of TQM, leadership – concepts, role of senior management. Quality council, quality statements, strategic planning, Deming philosophy, BARRIEs to TQM implementation.

UNIT II : TQM PRINCIPLES **9 Hrs**

Customer satisfaction – customer perception of quality, customer complaints, service quality, customer retention, employee involvement – motivation, empowerment, teams, recognition and reward, performance appraisal, benefits, continuous process improvement – juran trilogy, pdsa cycle, 5s, kaizen, supplier partnership – partnering, sourcing, supplier selection, supplier rating, relationship development, performance measures – basic concepts, strategy, performance measure.

UNIT III : STATISTICAL PROCESS CONTROL (SPC) **9 Hrs**

The seven tools of quality, statistical fundamentals – measures of central tendency and dispersion, population and sample, normal curve, control charts for variables and attributes, process capability, concept of six sigma, new seven management tools.

UNIT IV : TQM TOOLS **9 Hrs**

Benchmarking – reasons to benchmark, benchmarking process, quality function deployment (QFD) – house of quality, QFD process, benefits, taguchi quality loss function, total productive maintenance (TPM) – concept, improvement needs, FMEA – stages of FMEA.

UNIT V : QUALITY SYSTEMS **9 Hrs**

Need for iso 9000 and other quality systems, iso 9000:2000 quality system – elements, implementation of quality system, documentation, quality auditing, qs 9000, iso 14000 – concept, requirements and benefits.

Total No of Hours : 45

TEXT BOOKS

* Dale h. Besterfiled, et at., Total Quality Management, Pearson Education Asia, 1999. (Indian Reprint 2002).

REFERENCE

* James R. Evans & William M.Sidsay, The Management And Control Of Quality, (5th edition), South – Western (Thomson Learning), 2002 (isbn 0 – 324 – 06680 – 5)
* Feigenbaum.A.V. "Total Quality Management, Mcgraw – Hill, 1991.
* Oakland.J.S. "Total Quality Management Butterworth – Hcinemann Ltd., Oxford. 1989.
* Narayana V. And Sreenivasan, N.S. Quality management – Concepts And Tasks, New Age International 1996.
* Zeiri. "Total Quality Management For Engineers Wood Head Publishers, 1991.

Subject Code: BCE17L15	Subject Name: **PROJECT PHASE-II**	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: ALL	Lb	0	0/5	0/10	10

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The objective of project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to civil engineering.

COURSE OUTCOMES (COs) : (3- 5) Students will be able to

CO1	Work in a team and develop multidisciplinary ,research skills
CO2	Explore innovative ideas in civil engineering field
CO3	Develop projects based on industrial and field requirements

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H	H	H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

BCE17L15 **PROJECT PHASE-II**

OBJECTIVE

The objective of project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to civil engineering. Every project work shall have a guide who is a member of the faculty of the university.

Fourteen periods per week shall be allotted in the time table for this important activity and this time shall be utilized by the students to receive directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars the progress made in the project. Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusions. This final report shall be typewritten form as specified in the guidelines. The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

ELECTIVE SYLLABUS

Subject Code: BCE17E01	Subject Name : ENVIRONMENTAL ENGINEERING	Ty/Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge in fundamental theory and design of conventional water treatment facilities.

To impart knowledge in fundamental theory and design of conventional wastewater treatment facilities .

To impart knowledge on the principles used to design advanced wastewater treatments.

COURSE OUTCOMES (COs) : (3- 5)

CO1	an insight into the structure of drinking water supply and waste water systems, including water transport, treatment and distribution
CO2	an understanding of water quality and waste water criteria and standards, and their relation to public health
CO3	the ability to design and evaluate water supply and waste water project alternatives on basis of chosen

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M		H		H	H				M
CO2	H	M	M		H		H	H				M
CO3	H	M	M		H		H	H				M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E01 **ENVIRONMENTAL ENGINEERING**

UNIT I : PLANNING FOR WATER SUPPLY SYSTEMS **9 Hrs**

Scope of environmental engineering – role of environmental engineer – Public water supply systems – objectives – design period – population forecasting – water demand – sources of water – sources selection – water quality – characterization – sources of wastewater –estimation of storm runoff.

UNIT II: WATER TREATMENT **9 Hrs**

Screening - types of screening - plain sedimentation – sedimentation with coagulation – settling & flotation - filtration - disinfection

UNIT III : SEWAGE TREATMENT – PRIMARY TREATMENT **9 Hrs**

Objectives – unit operations & processes – principles, functions and design of screen, grit chambers and primary sedimentation tanks.

UNIT IV : SEWAGE TREATMENT – SECONDARY TREATMENT **9 Hrs**

Secondary treatment – activated sludge process and trickling filter; other treatment methods – stabilization ponds and septic tanks – advances in sewage treatment.

UNIT V: SEWAGE DISPOSAL AND SLUDGE MANAGEMENT **9 Hrs**

Methods – dilution – self purification of surface water bodies – oxygen sag curve – land disposal – sewage farming – deep well injection – soil dispersion system. Thickening – sludge digestion – biogas recovery - drying beds – conditioning and dewatering – sludge disposal.

Total No of Hours: 45

TEXT BOOKS

* Garg, S.K., Environmental Engineering, Vols. I &II, Khanna Publishers, New Delhi, 1994
* C.S.Shah, Water Supply And Sanitation, Galgotia Publishing Company, New Delhi, 1994

REFERENCES

* Manual on Water Supply And Treatment, Ministry Of Urban Development, Government Of India, New Delhi, 1999.
* Manual on sewerage and sewage treatment, CPHEEO, Ministry Of Urban Development, Government Of India, New Delhi, 1993.
* H.S.Peavy, D.R.Rowe and George Tchobanoglous, Environmental Engineering, Mcgraw-Hill Book Company, New Delhi, 1995.

Subject Code: BCE17E02	Subject Name : DESIGN OF COMPOSITE STRUCTURES	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite :Design of steel and concrete structures	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To develop an understanding of the behaviour and design study of Steel concrete composite elements and structures

COURSE OUTCOMES (COs) : (3- 5)

At the end of this course students will be in a position to

CO1	Design composite beams, columns, trusses and box-girder bridges including the related connections.
CO2	They will get exposure on case studies related to steel-concrete constructions of buildings
CO3	Apply the concepts of composite construction in engineering

Mapping of Course Outcomes with Program Outcomes (POs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		M			M		M	
CO2	H	H	H	H		M			M		M	
CO3	H	H	H	H		M			M		M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							
Approval												

BCE17E02 DESIGN OF COMPOSITE STRUCTURES

UNIT I INTRODUCTION 9 Hrs

Introduction to steel - concrete composite construction – Coes – Composite action – Serviceability and - Construction issues.

UNIT II DESIGN OF CONNECTIONS 9 Hrs

Shear connectors – Types – Design of connections in composite structures – Degree of shear connection – Partial shear interaction

UNIT III DESIGN OF COMPOSITE MEMBERS 9 Hrs

Design of composite beams, slabs, columns, beam – columns - design of composite trusses.

UNIT IV COMPOSITE BOX GIRDER BRIDGES 9 Hrs

Introduction - behaviour of box girder bridges - design concepts.

UNIT V CASE STUDIES 9 Hrs

Case studies on steel - concrete composite construction in buildings - seismic behaviour of composite structures.

Total No of Hours : 45

REFERENCES:

1. Johnson R.P., “Composite Structures of Steel and Concrete Beams, Slabs, Columns and Frames for Buildings”, Vol.I, Blackwell Scientific Publications, 2004.
2. Oehlers D.J. and Bradford M.A., “Composite Steel and Concrete Structural Members, Fundamental behaviour”, Pergamon press, Oxford, 1995.
3. Owens.G.W and Knowles.P, ”Steel Designers Manual”, Steel Concrete Institute(UK), Oxford Blackwell Scientific Publications, 1992.

Subject Code: BCE17E03	Subject Name : INDUSTRIAL STRUCTURES	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Design of steel and concrete structures	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : This course deals with some of the special aspects with respect to Civil Engineering structures in industries.

COURSE OUTCOMES (COs) : (3- 5)

At the end of this course the student shall be able to.

CO1	Discuss the planning and functional requirements of Industrial structures**.**
CO2	Discover the need to learn about the design concepts, and constructional aspects of Industrial structure.
CO3	Analyse and evaluate the importance of various construction materials for Industrial Construction.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		M	M		M		M	
CO2	H	H	H	H		M	M		M		M	
CO3	H	H	H	H		M	M		M		M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							
Approval												

BCE17E03 **INDUSTRIAL STRUCTURES**

UNIT I: PLANNING **9Hrs**

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

UNIT II: FUNCTIONAL REQUIREMENTS **9Hrs**

Lighting – Ventilation – Accounts – Fire safety – Guidelines from factories act.

UNIT III: DESIGN OF STEEL STRUCTURES **9Hrs**

Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos

UNIT IV: DESIGN OF R.C. STRUCTURES **9Hrs**

Silos and bunkers – Chimneys – Principles of folded plates and shell roofs

UNIT V: PREFABRICATION **9Hrs**

Principles of prefabrication – Prestressed precast roof trusses- Functional requirements for Precast concrete units

Total No. of Hours: 45

TEXT BOOKS

*Reinforced Concrete Structural elements – P. Purushothaman

*Pasala Dayaratnam – Design of Steel Structure - 1990

REFERENCES

*Henn W. Buildings for Industry, Vols. I and II, London Hill Books, 1995

*Handbook on Functional Requirements of Industrial buildings, SP32 – 1986, Bureau of Indian Standards, New Delhi 1990

*Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Structural Engineering Research Centre, Madras, 1982

Subject Code: BCE17E04	Subject Name: SMART STRUCTURES AND SMART MATERIALS	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete and Construction Technology	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE: This course is designed to give an insight into the latest developments regarding smart materials and their use in structures. Further, this also deals with structures which can self adjust their stiffness with load.

COURSE OUTCOMES (COs) : (3- 5)
At the end of this course the student shall be able to

CO1	Understand the physical principles underlying the behavior of smart materials;
CO2	Understand the engineering principles in smart sensor, actuator and transducer technologies;
CO3	Use principles of measurement, signal processing, drive and control techniques necessary to developing smart structures and products
CO4	Appreciate and suggest improvement on the design, analysis, manufacturing and application issues involved in integrating smart materials and devices with signal processing and control capabilities to engineering smart structures and products

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			H	H	H	H	H			M	M
CO2	H			H	H	H	H	H			M	M
CO3	H			H	H	H	H	H			M	M
CO4	H			H	H	H	H	H			M	M

COs / PSOs	PSO1	PSO2						
CO1	H	H						
CO2	H	H						
CO3	H	H						
CO4	H	H						

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E04 SMART STRUCTURES AND SMART MATERIALS

UNIT I: INTRODUCTION 9Hrs

Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT II: MEASURING TECHNIQUES 9Hrs

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT III: SENSORS 9Hrs

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT IV: ACTUATORS 9Hrs

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro rheological Fluids– Electro magnetic actuation – Role of actuators and Actuator Materials.

UNIT V: SIGNAL PROCESSING AND CONTROL SYSTEMS 9Hrs

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

Total No of Hours : 45

TEXT BOOKS

*Brain Culshaw – Smart Structure and Materials Artech House – Borton. London-1996.

REFERENCES

*L. S. Srinath – Experimental Stress Analysis – Tata McGraw Hill, 1998.

*J. W. Dally & W. F. Riley – Experimental Stress Analysis – Tata McGraw Hill, 1998.

Subject Code: BCE17E05	Subject Name: ESTIMATION AND QUANTITY SURVEYING	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To study the functional planning of buildings as per standards; To study the estimate types and terms involved in estimation; To study the important specifications necessary for the works in buildings; To study the concepts of tenders and contracts;

COURSE OUTCOMES (COs) : (3- 5)

At the end of this course the student shall be able to

CO1	Prepare various types of estimation and find out the quantity of works involved.
CO2	Carry out analysis of rates and bill preparation.
CO3	Prepare specifications for various items of construction works
CO4	Estimate the quantity of works involved in road works, water supply and sanitary works

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H		M		M	H		H	H
CO2	H	H		H		M		M	H		H	H
CO3	H	H		H		M		M	H		H	H
CO4	H	H		H		M		M	H		H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H
CO4	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E05 ESTIMATION AND QUANTITY SURVEYING

UNIT I : ESTIMATION 9 Hrs

Types of estimates- units of measurements-methods of estimates – advantages- estimation of load bearing and framed structures –estimate of quantities in residential building- calculation of quantities of brick work, RCC, PCC, white washing ,color washing and painting / varnishing – calculation of brick work and RCC works in arches – estimate of joineries for paneled and glazed doors ,windows, ventilators, handrails etc.

UNIT II: ESTIMATE OF OTHER STRUCTURES 9 Hrs

Estimating of septic tank, soak pit – Sanitary and water supply installations – Water supply pipe line – Sewer line – Tube well – Open well – Estimate of bituminous and cement concrete roads-estimation of retaining walls and culverts.

UNIT III: SPECIFICATIONS AND TENDERS 9 Hrs

Data –schedule of rates- analysis of rates-specifications-sources-detailed and general specifications – tenders- e-tender contracts- contracts types– preparation of tender notice and documents-arbitration and legal requirements

UNIT IV: VALUATION 9 Hrs

Necessity – basics of value engineering –capitalized value – depreciation and its methods – escalation _ value of building – calculation of standard rent – mortgage- lease.

UNIT V: REPORT PREPARATION AND CASH FLOW 9 Hrs

Principle of report preparation – report on estimate of residential building- commercial building -culvert – roads – water supply and sanitary installations – tube wells – open wells.

Total No of Hrs = 45 hrs

TEXT BOOKS

* B.N.Dutta, Estimating And Costing In Civil Engineering –UBS publishers and distribution Pvt Ltd, 2003.
* Mr. B.Kanagasabapathy, M/S. Ehilalarasi Kanagasabapathy,Practical Valuation – Vol I, Thiruchirappalli, 1995.
* Kohl, D.D and Kohli, R.C., “A Text Book of Estimating and Costing (Civil)”, S.Chand & CompanyLtd., 2004.
* Rangwala, “Estimating, Costing and Valuation”, Charotar Publishing House Pvt Ltd., 2012.

REFERENCES

* G.S.Birdie, A Text Book On Estimating And Costing, Dhanpat Rai And Sons, New Delhi,1995.
* Mr. B.Kanagasabapathy, M/S. Ehilalarasi Kanagasabapathy, Fixation of Fair Rent , Thiruchirappalli, 1995.

Subject Code: BCE17E06	Subject Name: HOUSING PLANNING AND DESIGN	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Building Drawing Practice	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : A house plan is a set of construction or working drawings that define all the construction specifications of a residential house A truly successful project is one where project goals are identifies early on and where the interdependencies of all building systems are coordinated concurrently from the planning and programming phase.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Plan the buildings, as per the law and rules and regulations
CO2	Analyze the slum clearance project and prepare plan for plot map cost flow
CO3	identify the financing agencies and its functions

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H				H		H			H	
CO2	H	H				H		H			H	
CO3	H	H				H		H			H	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E06 HOUSING – PLANNING AND DESIGN

UNIT I: INTRODUCTION TO HOUSING 9Hrs

Definition of Basic Terms – House, Home, Household, Apartments - Objectives of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Local bodies' Bye-laws at Urban and Rural Level and Development Control Regulations, Institutions for Housing at National, State and Local levels.

UNITII: HOUSING PROGRAMMES 9Hrs

Basic Concepts – Contents and Standards for Housing Programmes - Sites and Services, Neighbourhood, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programme, Role of Public, Private and Non-Government Organisations.

UNIT III: PLANNING AND DESIGN OF HOUSING PROJECTS 9Hrs

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems).

UNIT IV: CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9Hrs

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation.

UNIT V: HOUSING FINANCE AND PROJECT APPRAISAL 9Hrs

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems).

Total No of Hours : 45

TEXT BOOKS

* Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 1999.
* Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 1997.

REFERENCES

* Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 200.
* UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 1994.
* National Housing Policy, 1994, Government of India.

Subject Code: BCE17E07	Subject Name: BUILDING TECHNOLOGY AND HABITAT ENGINEERING	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: none	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Recognise the various materials used in building construction
CO2	Understand the importance of climate and its influence in construction
CO3	Understand the importance of thermal control, ventilation and air movement in building.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H				H		H				M	
CO2	H				H		H				M	
CO3	H				H		H				M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E07 BUILDING TECHNOLOGY AND HABITAT ENGINEERING

UNIT I BUILDING STONES 9Hrs

Requirement of good building stone- characteristics - testing.Lime: Properties- Classifications -Manufacture -Testing of lime. Pozzolona: Natural and Artificial pozzolonas. Timber - Defects - Seasoning - Decay - Preservation, Tiles- Flooring and roofing tiles-specification-tests. Paints varnishes and distempers, Common constituents, types and desirable properties.

UNIT II MISCELLANEOUS MATERIALS 9Hrs

Insulating Materials - Thermal and sound insulating material desirable properties and type. Geosynthetics and its applications .Lintels –Arches – Stairs- different types and its components. Doors, Windows and Ventilations - Classification - Technical terms-Classification and Types

UNIT III ROOF 9Hrs

Types of roofs – wooden trusses .Finishing works - Plastering, pointing, painting, white washing, colour washing, distempering; Damp proofing ant termite treatment.

UNIT IV CLIMATE AND COMFORT 9Hrs

Global climatic factors – Elements of climates –Classification of tropical climates- site climate .The desirable conditions- Thermal comfort factors-Thermal comfort indices – Effective temperature

UNIT V THERMAL CONTROL 9Hrs

Means of thermal control – Mechanical control- structural control- ventilation and air movement

Total No of Hours : 45

REFERENCES:

* Gurucharan Singh, Building materials,,1996
* Rangwala S. C, Engineering Materials, Charotar Publishing House, 1992, Anand
* Punmia B. C, Building Construction, Laxmi Publlications, 1999, New Delhi.
* Rangwala S. C, Building Construction, Charotar Publishing House, 1992, Anand
* Huntington W.C, Building Construction, John Wiley, 1959, New York.
* Koenigsberger,Manual of Tropical Housing and Building, Orient Longman Ltd

Subject Code: BCE17E08	Subject Name: COST EFFECTIVE BUILDINGS	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete and Construction Technology	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Identify the cost effective techniques and environmental friendly materials in construction
CO2	Identify the effects of global warming in construction
CO3	Understand the green building and its benefits in construction field.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H			H	H		H			H	H
CO2	H	H			H	H		H			H	H
CO3	H	H			H	H		H			H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E08 COST EFFECTIVE BUILDINGS

UNIT I: INTRODUCTION TO COST EFFECTIVE CONSTRUCTION 12Hours

Introduction to the concept of cost effective construction -Uses of different types of materials and their availability - Stone and Laterite blocks- Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- Lime-Poszolana Cement- Gypsum Board- Light Weight Beams- Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite- Bamboo- Availability of different materials-Recycling of building materials – Brick- Concrete- Steel- Plastics - Environmental issues related to quarrying of building materials.

UNIT II: TECHNOLOGIES & METHODS IN CONSTRUCTION 12 Hours

Environment friendly and cost effective Building Technologies - Different substitute for wall construction Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials - Wall and Roof Panels – Beams – columns - Door and Window frames - Water tanks - Septic Tanks - Alternate roofing systems - Filler Slab - Composite Beam and Panel Roof -Pre-engineered and ready to use building elements - wood products - steel and plastic - Contributions of agencies

UNIT III: GLOBAL WARMING & THE RELEVANCE OF GREEN BUILDINGS 07 Hours

Global Warming – Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions - Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits- Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials- Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings.

UNIT IV: GREEN BUILDING 07 Hours

Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings - Embodied Energy in Materials-Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings.

UNIT V: GREEN DESIGN 07 Hours

Green Design – Definition - Principles of sustainable development in Building Design - Characteristics of Sustainable Buildings – Sustainably managed Materials - Integrated Lifecycle design of Materials and Structures (Concepts only)

Total No of Hours : 45

REFERENCES:

* K S Jagadeesh, B V Venkatta Rama Reddy & K S Nanjunda Rao ,Alternative Building Materials and Technologies , New Age International Publishers.
* Asko Sarja ,Integrated Life Cycle Design of Structures , SPON Press.
* D S Chauhan and S K Sreevasthava , Non conventional Energy Resources , New Age International Publishers.
* Laurie Backer, Buildings How to Reduce Cost, Cost Ford.

Subject Code: BCE17E09	Subject Name: INDUSTRIAL WASTE MANAGEMENT	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Environmental engineering	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge on various environmental legislations.
To understand the treatment of industrial wastes.
To impart knowledge on the pollution potential of major industries and the methods of controlling the same.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Suggest the industrial waste disposal methods on land and water environment.
CO2	Conduct waste audit in an industry and implement waste minimization techniques.
CO3	Identify the impacts on environment due to various industrial effluents.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			M	H	H	H	H		M	H	H
CO2	H			M	H	H	H	H		M	H	H
CO3	H			M	H	H	H	H		M	H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E09 INDUSTRIAL WASTE MANAGEMENT

UNIT I: INTRODUCTION 9Hrs

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Hazardous Wastes – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes – Pollution Control Boards.

UNIT II: CLEANER PRODUCTION 9Hrs

Waste management Approach – Waste Audit – Volume and strength reduction – material and process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT III: TREATMENT OF INDUSTRIAL WASTEWATER 9Hrs

Equalisation – Neutralisation – removal of suspended and dissolved organic solids - Chemical oxidation – Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management.

UNIT IV: 4. TREATMENT AND DISPOSAL OF HAZARDOUS WASTES 9Hrs

Physio chemical treatment – solidification – incineration – Secured landfills – Legal Provisions.

UNIT V: CASE STUDIES 9Hrs

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants.

Total No. of Hours: 45

TEXT BOOKS

*M.N.Rao & A.K.Dutta, Wastewater Treatment, Oxford IBH Publication, 1995.

*W .W. Eckenfelder Jr., Industrial Water Pollution Control, McGraw-Hill Book Company, New Delhi, 1994.

REFERENCES

*T.T.Shen, Industrial Pollution Prevention, Springer, 1999.

*R.L.Stephenson and J.B.Blackburn, Jr., Industrial Wastewater Systems Hand book, Lewis Publisher, New York,

*H.M.Freeman, Industrial Pollution Prevention Hand Book, McGraw Hill Inc., New Delhi, 1995.

Subject Code: BCE17E10	Subject Name: CLEANER PRODUCTION	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To develop a basic knowledge about the cleaner production and apply the same in the field application.

To educate the students on complete management principles related to Cleaner Production and Control of Industrial Pollution.

COURSE OUTCOMES (COs) : (3- 5)

The students completing the course will have an

CO1	insight to sustainable development and cleaner production concept
CO2	ability to plan and implement cleaner production program
CO3	ability to conduct waste audit in an industry and implement waste minimization techniques

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H	H	H	H	H			H	M
CO2	H	H		H	H	H	H	H			H	M
CO3	H	H		H	H	H	H	H			H	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E10 **CLEANER PRODUCTION**

UNIT I : INTRODUCTION **9 Hrs**

Sustainable Development - Indicators of Sustainability - Sustainability Strategies - Barriers to Sustainability –Cleaner Production (CP) in Achieving Sustainability - Environmental Policies and Legislations - Regulations to Encourage Pollution Prevention and Cleaner Production – Regulatory versus Market Based Approaches

UNIT II : CLEANER PRODUCTION CONCEPT **9 Hrs**

Definition - Importance - Benefits - Promotion - Barriers - Role of Industry, Government and Institutions - Environmental Management Hierarchy - Source Reduction Techniques - Process and equipment optimisation, reuse, recovery, recycle, raw material substitution.

UNIT III: CLEANER PRODUCTION PROJECT DEVELOPMENT AND IMPLEMENTATION 9 Hrs

Overview of CP Assessment Steps and Skills, Preparing for the Site Visit, Information Gathering, and Process Flow Diagram, Material Balance, Establishing a Program - Organizing a Program - Preparing a Program Plan - Measuring Progress - Pollution Prevention and Cleaner Production Awareness Plan - Waste audit - Environmental Statement.

UNIT IV: LIFE CYCLE ASSESSMENT **9 Hrs**

Elements of LCA - Life Cycle Costing - Eco Labelling - Design for the Environment – International Environmental Standards - ISO 14001 - Environmental audit.

UNIT V: CASE STUDIES **9 Hrs**

Industrial applications of CP, LCA, EMS and Environmental Audits.

Total No of Hours : 45

REFERENCES

* Paul L Bishop (2000) " Pollution Prevention: Fundamentals and Practice " McGraw-Hill International New York.

*World Bank Group (1998) "Pollution Prevention and Abatement Handbook"

*"Towards Cleaner Production ", World Bank and UNEP, Washington D.C.

*Prasad modak, C.Viswanathan and Mandar parasnis (1995)"Cleaner Production Audit ", Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok.

Subject Code: BCE17E11	Subject Name: ARCHITECTURE AND TOWN PLANNING	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NONE	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge on architectural design of structures as per the zoning regulations

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	perform architectural design of structures
CO2	suggest the land requirement as per the zoning regulations
CO3	perform Land scape design

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M			H	H	H	M		H	M
CO2	H	H	M			H	H	H	M		H	M
CO3	H	H	M			H	H	H	M		H	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E11 ARCHITECTURE AND TOWN PLANNING

UNIT I: ARCHITECTURAL DEVELOPMENT: 9Hrs

Natural and built environment, historic examples, factors influence architectural development.

UNIT II: PRINCIPLES OF ARCHITECTURAL DESIGN: 9Hrs

Design methods, primary elements, form, space, organization, circulation, proportion and scale, ordering principles;

UNIT III: FUNCTIONAL PLANNING OF BUILDINGS: 9Hrs

Planning, designing and construction, general building requirements, permit and inspection (as per the National building Code);

UNIT IV: EVOLUTION OF TOWNS: 9Hrs

History and trends in town planning: origin and growth, historical development of town planning in ancient valley civilizations; Objects and necessary of town planning; Surveys and analysis of a town; New Concepts in town planning: Garden city movement, Linear city and Satellite city concepts, Neighborhood Planning;

UNIT V: PLANNING PRINCIPLES, PRACTICE AND TECHNIQUES: 9Hrs

Elements of City plan, Estimating future needs, Planning standards, Zoning - its definition, procedure and districts, height and bulk zoning, F. A. R., Master Plan; Concepts of Urban planning, Design and Landscaping.

Total No of Hours: 45

TEXT BOOKS

* B. Gallion and S. Eisner, The Urban Pattern: City planning and Design - C B S publishers, 5th edition, 2005.

*D. K. Francis Ching, Architectures: Form, Space and Order, John Wiley, 2nd edition 1996.

REFERENCES

*****National Building Code of India 2005, BIS, New Delhi.

*S. Eisner, A. B. Gallion and S. Eisner, The Urban Pattern: City planning and Design, John Wiley 6th edition 1996.

Subject Code: BCE17E12	Subject Name: DAM ENGINEERING	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Irrigation Engineering	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart a knowledge on types of dam,its functions and design principles.

COURSE OUTCOMES (COs) : (3- 5)

At the end of the course, the student will be able to:

CO1	Analyse and design gravity dams
CO2	Analyse and design earth and rockfill dams
	Design spillways and energy dissipation structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M	H		H			M	M
CO2	H	H	H	H	M	H		H			M	M
CO3	H	H	H	H	M	H		H			M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
Co3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval	

BCE17E12 **DAM ENGINEERING**

UNIT I: INTRODUCTION **9Hrs**

Types of Dam, merits and demerits, dam site selection, selection of dam, Forces acting on gravity Dam, Methods of analysis of gravity Dam, Modes of failure and stability requirements, Design criteria and factor of safety.

UNIT II: GRAVITY DAM **9Hrs**

Elementary profile of a gravity dam, Low and high gravity dams, Zoning of dams, Galleries in dams,Temperature control in mass concrete; gravity dams subjected to earthquakes.

UNIT III: BUTTRESS AND ARCH DAMS **9Hrs**

Buttress and Arch dams, Types, selection, merits and demerits, Elementary design Principles of Arch and Buttress dams.

UNIT IV: EARTH DAM **9Hrs**

Earth Dam their component and functions, causes of failure. Factors influencing the design of an earthdam. Design criteria for Earth Dam.

UNIT V: SPILLWAY **9Hrs**

Elementary idea of design for spillway and energy dissipaters.

Total No of Hours: 45

TEXT BOOKS

* R.S. Varshney “Concrete Dams”, by 1982, NCB, Roorkee
*Design of Small Dams, USBR 1960, Calcutta, Oxford and IBH
*W.P. Creager, J. Justin,.Daud Hinds, “Engineering for Dams” Vol. I-III, Wiley, N.Y., USA.
* IS: 6512-1984, Criteria for Design of solid Gravity Dams.
*IS:1893-1984, , Criteria for Earthquake resistant Design of structures.

REFERENCES

* NPTEL course materials from different IITs

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Subject Code: BCE17E13	Subject Name: STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Structural Analysis I & II	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To develop systematically from basic principles of structural dynamics the characteristic of dynamic behaviour of the structure, namely, response spectrum;

To expose important aspects of various theories of cause of earthquake and measurement of its effects on the structure as loads

COURSE OUTCOMES (COs) : (3- 5)

At the end of the course, student will be able to

CO1	Identify, formulate and solve free and forced vibrations response of structural systems
CO2	The knowledge to analyse structures subjected to dynamic loading
CO3	The knowledge to design the structures for seismic loading as per code provisions.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H		M				M
CO2	H	H	H	H		H		M				M
CO3	H	H	H	H		H		M				M
COs / PSOs	PSO1		PSO2									
CO1	H		H									
CO2	H		H									
CO3	H		H									

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval	

BCE17E13 STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING

UNIT I : SINGLE DEGREE OF FREEDOM SYSTEMS 9 hrs

Formulation of equation of motion-free and forced vibrations-response to dynamic Loading-effect of damping

UNIT II : MODAL ANALYSIS 9 hrs

Free and forced vibration of un-damped and damped MDOF systems- equation of Motions- evaluation of natural frequencies and modes

UNIT III : INTRODUCTION TO EARTH QUAKE ENGINEERING 9 hrs

Elements of engineering seismology- characteristics of earth quake engineering- earth quake history- Indian seismicity.

UNIT IV : BEHAVIOUR OF STRUCTURES AND SOIL 9 hrs

Performance of structures under past earth quakes- lessons learnt from past earth Quakes- behavior of soil under earth quake loading- soil liquefaction- soil structure Interaction effects.

UNIT V : EARTH QUAKE RESISTANT DESIGN 9 hrs

Concept of Earth quake resistant design- provisions of seismic code IS-1893 (part I)- 2002- response spectrum-design spectrum- seismic coefficient- design of buildings.

Total No of Hours: 45

TEXT BOOKS

1. Clough R. W, and Penzien J, Dynamics of structures, Second Edition, Mc Graw- Hill International edition,New Delhi, 1993
2. Mario Paz, structural dynamics- theory and computations, Third Editions CBS Publishers,New Delhi, 1990.

REFERENCES

1. Minoru Wakabayashi, Design of earth quake resistant buildings,Mc Graw- Hill book company, New York 1986
2. Anil K Chopra, Dynamics Of Structures- Theory and applications to Earth quake engineering, Prentice hall inc, 2001

Subject Code: BCE17E14	Subject Name: BRIDGE STRUCTURES	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Design of concrete structures I & II	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To make the student to know about various bridge structures, selection of appropriate bridge structures and design it for given site conditions.

COURSE OUTCOMES (COs) : (3- 5)

At the end of the course, students will be able to

CO1	understand the basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
CO2	identify the sizing of bridge elements ie., develop a clear understanding of conceptual design
CO3	understand the load flow mechanism and identify loads on bridges and carry out a design of bridge starting from conceptual design, selecting suitable bridge, geometry to sizing of its elements

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H		H			M	M
CO2	H	H	H	H		H		H			M	M
CO3	H	H	H	H		H		H			M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval	

BCE17E14 **BRIDGE STRUCTURES**

UNIT I: INTRODUCTION **9Hrs**

Design of through type steel highway bridges for IRC loading - Design of stringers, cross girders and main girders - Design of deck type steel highway bridges for IRC loading - Design of main girders.

UNIT II: STEEL BRIDGES **9Hrs**

Design of pratt type truss girder highway bridges - Design of top chord, bottom chord, web members - Effect of repeated loading - Design of plate girder railway bridges for railway loading - Wind effects - Design of web and flange plates - Vertical and horizontal stiffeners.

UNIT III: REINFORCED CONCRETE SLAB BRIDGES **9Hrs**

Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges - Design of panel and cantilever for IRC loading.

UNIT IV: REINFORCED CONCRETE GIRDER BRIDGES **9Hrs**

Design of tee beam - Courbon's theory - Pigeaud's curves - Design of balanced cantilever bridges - Deck slab - Main girder - Design of cantilever - Design of articulation.

UNIT V: PRESTRESSED CONCRETE BRIDGES **9Hrs**

Design of prestressed concrete bridges - Preliminary dimensions - Flexural and torsional parameters -Courbon's theory - Distribution coefficient by exact analysis - Design of girder section - Maximum and minimum prestressing forces - Eccentricity - Live load and dead load shear forces - cable zone in girder –Check for stresses at various sections - Check for diagonal tension - Diaphragms - End block - Short term and long term deflections.

Total No. of Hours: 45

TEXT BOOKS

* Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 1990.
* Ponnuswamy S., " Bridge Engineering ", Tata McGraw Hill, New Delhi, 1996.

REFERENCES

* Phatak D.R., " Bridge Engineering ", Satya Prakashan, New Delhi, 1990.

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Subject Code: BCE17E15	Subject Name: STORAGE STRUCTURES	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Design of steel structures Design of concrete structures I & II	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To introduce the student to basic theory and concepts of design of storage structures like steel and concrete tanks, bunkers and silos.

COURSE OUTCOMES (COs) : (3- 5)

At the end of the course the student shall be able to

CO1	design concrete storage structures
CO2	design steel material storage structures
CO3	Design prestressed water tanks

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H	M	H	M			M
CO2	H	H	H	H		H	M	H	M			M
CO3	H	H	H	H		H	M	H	M			M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval	

BCE17E15 STORAGE STRUCTURES

UNIT I: STEEL WATER TANKS 15Hrs

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays – Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder – Design of staging and foundation.

UNITII: CONCRETE WATER TANKS 15Hrs

Design of Circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of under ground tanks – Design of base slab and side wall – Check for uplift.

UNIT III: STEEL BUNKERS AND SILOS 5Hrs

Design of square bunker – Jansen's and Airy's theories – IS Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – stiffeners.

UNIT IV: CONCRETE BUNKERS AND SILOS 5Hrs

Design of square bunker – Side Walls – Hopper bottom – Top and bottom edge beams – Design of cylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction.

UNIT V: PRESTRESSED CONCRETE WATER TANKS 5Hrs

Principles of circular prestressing – Design of prestressed concrete circular water tanks.

Total No. of Hours: 45

TEXT BOOKS

*****Rajagopalan K., Storage Structures, Tata McGraw-Hill, New Delhi, 1998.

*Krishna Raju N Advanced Reinforced Concrete Design, CBS Publishers, New Delhi, 1998.

Subject Code: BCE17E16	Subject Name: TALL BUILDINGS	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Structural analysis I & II	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To introduce various aspects of planning of Tall Buildings ; To know about different types of loads ; To introduce various structural systems for medium rise buildings with their behaviour and analysis; To introduce various structural systems for high rise buildings with their behaviour and analysis; To impart knowledge about stability analysis of various systems and to know about advanced topics.

COURSE OUTCOMES (COs) : (3- 5)

CO1	At the end of this course the student should have an understanding on the behaviour of tall buildings subjected to lateral building.
CO2	The students should have knowledge about the rudimentary principles of designing tall buildings as per the existing codes.
CO3	implement design philosophies for the development of high rise structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H	H	H	M		M	M
CO2	H	H	H	H		H	H	H	M		M	M
CO3	H	H	H	H		H	H	H	M		M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval	

BCE17E16 **TALL BUILDINGS**

UNIT I: INTRODUCTION **9Hrs**

The Tall Building in the Urban Context - The Tall Building and its Support Structure - Development of High Rise Building Structures - General Planning Considerations. Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading –Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material - Impact and Dynamic Loads - Blast Loads -Combination of Loads.

UNIT II: THE VERTICAL STRUCTURE PLANE **9Hrs**

Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - Shear Wall Arrangement - Behaviour of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing- Composite Floor Systems The High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel – Frame Systems - Multistory Box Systems.

UNIT III: Common high-rise building structures and their Behaviour under load **9Hrs**

The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response.

UNIT IV: APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDING **9Hrs**

Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading – Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings-Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.

UNIT V: OTHER HIGH-RISE BUILDING STRUCTURE **9Hrs**

Deep - Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame Applied to High - Rise Buildings - Capsule Architecture.

Total No. of Hours :45

TEXT BOOKS

*Wolfgang Schueller " High-Rise Building Structures", John Wiley&Sons.

*Bryan Stafford Smith And Alex Coull, " Tall Building Structures ", Analysis And Design, John Wiley And Sons, Inc., 1991.

REFERENCES

*Coull, A. and Smith, Stafford, B. " Tall Buildings ", Pergamon Press, London, 1997.

*LinT.Y. and Burry D.Stotes, " Structural Concepts and Systems for Architects and Engineers ", John Wiley, 1994.

*Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.

Subject Code: BCE17E17	Subject Name: HYDROLOGY	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Applied Hydraulics	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To get exposure in the field of hydrology; To know the basic concepts in hydrology. To study the features of precipitation, evaporation and infiltration; To learn basics, estimation, and modeling of runoff;. To understand estimation, forecasting and control of flood; To familiarize computer applications in hydrology

COURSE OUTCOMES (COs) : (3- 5)

CO1	The students gain the knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation
CO2	The students are able to apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing
CO3	The students will know the basics of groundwater and hydraulics of subsurface flows

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H	H	H		H			M	M
CO2	H	H		H	H	H		H			M	M
CO3	H	H		H	H	H		H			M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E17 HYDROLOGY

UNIT I: INTRODUCTION 9Hrs

Definition & Scope- Practical applications-Hydrological cycle – Transitory systems- formation, Types and forms of precipitation – Winds and their movement–Climate & weather season in India-Catchment area

UNITII: PRECIPITATION 9Hrs

Measurement of Precipitation-Recording & Non- Recording Rain Gauges-Intensity duration Analysis-Intensity frequency duration Analysis- Average depth of precipitation over an areas-Depth area duration analysis-Rain gauge network.

UNITIII EVAPORATION & INFILTRATION 9Hrs

Introduction- Evaporation process- Factors affecting Evaporation- Evaporation Eestimation-Evaporation measurement- Evapotranspiration- Factors affecting infiltration-measurement of infiltration- Infiltration Equations

UNITIV: STREAM FLOW MEASUREMENT & HYDROGRAPH ANALYSIS 9Hrs

Introduction-Measurement of stage-discharge measument –area velocity method (Current meter method)-moving boat method- Stage discharge relationships – Flow measurements – Features of hydrograph- base flow-Hydrograph seperation

UNIT V: GROUND WATER HYDROLOGY 9Hrs

Occurrence of ground water – Types of aquifer – Dupuit's assumptions – Darcy's law – Estimation of aquifer parameters – Pump tests.

Total No. of Hours : 45

REFERENCES

* Jeya Rami Reddy.P,Hydrology, Laxmi Publications, New Delhi, 2004.

*Subramanya K.,Hydrology,Tata McGraw Hill Co., New Delhi, 1994

*Patra.K.C, Hydrology and Water Resources Engineering, Narosa Publications, 2008, 2 nd Edition, New Delhi.

* Chow V.T., Maidment D.R., Mays L.W., "Applied Hydrology,McGraw Hill Publications, New York, 1995

Subject Code: BCE17E18	Subject Name: MUNICIPAL SOLID WASTE MANAGEMENT	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Environmental Engineering	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The student is expected to know about the various effects and legislations for the municipal solid waste.

To understand the various sources, characterization, processing and the disposal methods of municipal solid wastes.

COURSE OUTCOMES (COs) : (3- 5)

After completion of the course, student will be able to:

CO1	understand the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management
CO2	ability to plan waste minimisation and design storage, collection, transport, processing and disposal of municipal solid waste
CO3	identify and design waste containment systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			H	H	H	H	H	M		M	H
CO2	H			H	H	H	H	H	M		M	H
CO3	H			H	H	H	H	H	M		M	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E18 MUNICIPAL SOLID WASTE MANAGEMENT

UNIT I: SOURCES AND TYPES 9Hrs

Sources and types of solid wastes in a Municipality; Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization; Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs; Legislation.

UNIT II: ON-SITE STORAGE & PROCESSING 9Hrs

On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

UNIT III: COLLECTION AND TRANSFER 9Hrs

Methods of Collection – types of vehicles – Manpower – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions.

UNIT IV: OFF-SITE PROCESSING 9Hrs

Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, options under Indian conditions.

UNIT V: DISPOSAL 9Hrs

Dumping of solid waste; sanitary landfills – site selection, design and operation of sanitary landfills.

Total No. of Hours : 45

TEXT BOOKS

*George Techobanoglous et.al., Integrated Solid Waste Management, McGraw Hill Publishers, 1993.

*B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, Waste Management, Springer, 1994.

REFERENCES

*Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 200

*R.E.Landreth and P.A.Rebers, Municipal Solid Wastes – problems and Solutions, Lewis Publishers, 1997

*Bhide A.D. and Sundaresan, B.B., Solid Waste Management in Developing Countries; INSDOC, 1993.

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Subject Code: BCE17E19	Subject Name: PRESTRESSED CONCRETE STRUCTURES	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Deisgn of concrete structures I & II	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : Prestressing methods, principles and concepts are essential for the basic concept of the subject .
Analysis of prestress and the resultant stresses using different concepts is dealt here;
Determination of losses in concrete & Anchorage zone stresses in end block can be brought out using IS method

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student shall have a knowledge on methods of prestressing
CO2	Student should be able to design various prestressed concrete structural elements.
CO3	Possesses a knowledge on composite construction

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H	H	H	M		M	M
CO2	H	H	H	H		H	H	H	M		M	M
CO3	H	H	H	H		H	H	H	M		M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E19 PRESTRESSED CONCRETE STRUCTURES

UNIT I : INTRODUCTION – THEORY AND BEHAVIOUR 9Hrs

Basic concepts – Advantages – Materials required – Systems and methods of pre -stressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons .

UNIT II : DEFLECTION 9Hrs

Deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of pre-stress – Losses of prestress - types - losses due to elastic deformation of concrete - shrinkage of concrete - creep of concrete - friction - anchorage slip – Estimation of crack width

UNIT III : DESIGN 9Hrs

Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic concepts in selection of cross section for bending – stress distribution in end block, Design of anchorage zone reinforcement – Limit state design criteria.

UNIT IV : CIRCULAR PRESTRESSING 9Hrs

General features & Design of prestressed concrete tanks – Prestressed concrete Poles, Shapes, Features &

Design- Prestressed concrete sleepers – Development – Types- Design, Static & dynamic loads

UNIT V : COMPOSITE CONSTRUCTION 9Hrs

Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members– General aspects – pretension pre-stressed bridge decks – Post tensioned pre-stressed bridge decks –Advantages over R.C.C bridges- Design Principles of post tensioned prestressed concrete slab bridge deck, T Beam slab bridge deck & Continuous two span beam deck

Total No of Hours: 60

TEXT BOOKS

*Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi, 2011

* S.Ramamrutham, Prestressed concrete,Dhanpatrai Publishing company,2014

*Mallic S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH Publishing Co.Pvt. Ltd. 1997.

*Rajagopalan.N, Prestressed Concrete, Alpha Science, 2002.

REFERENCES

*Ramaswamy G.S., Modern Prestressed Concrete Design, Arnold Heinimen, New Delhi, 1990

*Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay 1995

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Subject Code: BCE17E20	Subject Name: PREFABRICATED STRUCTURES	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge to students on modular construction, industrialised construction and design of prefabricated elements and construction methods.

COURSE OUTCOMES (COs) : (3- 5)

The student shall be able to

CO1	design some of the prefabricated elements
CO2	Understand the construction methods in using prefabricated elements
CO3	utilize the various code provisions regarding progressive collapse.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H		M			M	M
CO2	H	H	H	H		H		M			M	M
CO3	H	H	H	H		H		M			M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval	

BCE17E20 PREFABRICATED STRUCTURES

UNIT I: INTRODUCTION 9Hrs

Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection.

UNIT II: PREFABRICATED COMPONENTS 9Hrs

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls.

UNIT III: DESIGN PRINCIPLES 9Hrs

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV: JOINT IN STRUCTURAL MEMBERS 9Hrs

Joints for different structural connections – Dimensions and detailing – Design of expansion joints.

UNIT V: DESIGN FOR ABNORMAL LOADS 9Hrs

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

Total No. of Hours: 45

TEXT BOOKS

*****CBRI, Building materials and components, India, 1990

*Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

REFERENCES

*****Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.

*Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

Subject Code: BCE17SE1	Subject Name: REPAIR AND REHABILITATION OF STRUCTURES	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Concrete and Construction Technology	TY	1	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

1. To make the students to gain the knowledge on quality of concrete, durability aspects, causes of deterioration.

2. To make the students to gain the knowledge on assessment of distressed structures, repairing of structures and demolition procedures.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	suggest maintenance and repair strategies
CO2	assess the durability of concrete due to various climatic conditions
CO3	suggest the suitable materials for repair, rehabilitation and retrofitting techniques

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	H			H	H
CO2	H	H	H	H	H	H	H	H			H	H
CO3	H	H	H	H	H	H	H	H			H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17SE1 REPAIR AND REHABILITATION OF STRUCTURES

UNIT I MAINTENANCE AND REPAIR STRATEGIES **9** hrs

Maintenance- Repair and Rehabilitation. Facts of Maintenance - Importance of Maintenance- Various aspects of Inspection- Assessment procedure for evaluating a damaged structure, Causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE **9** hrs

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness.

UNIT III SPECIAL CONCRETES **9** hrs

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength and High-performance concrete, Vacuum concrete, Self-compacting concrete, Whisper concrete Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS **9** hrs

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, Cathodic protection.

UNIT V RETROFITTING AND DEMOLITION TECHNIQUES **9** hrs

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – Engineered demolition methods - Case studies.

Total No of Hours: 45

TEXTBOOKS:

* Shetty M.S., "Concrete Technology - Theory and Practice", S. Chand and Company, 2008.
* Gambhir. M.L., "Concrete Technology", McGraw Hill, 2013
* Denison Campbell, Allen and Harold Roper, “Concrete Structures, Materials, Maintenance and Repair”, Longman Scientific and Technical UK, 1991.

REFERENCES:

* Ravi Shankar. K. Krishnamoorthy. T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
* Dov Kominetzky. M.S., "Design and Construction Failures”, Galgotia Publications Pvt. Ltd., 2001
* CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.
* Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987

Department of Civil Engineering

Subject Code: BCE17SE2	Subject Name: INTELLIGENT BUILDINGS	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NONE	TY	1	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

1. To enable students to establish a broad knowledge on the concepts of intelligent buildings.
2. To enable students to understand that intelligence of a building can be achieved by integration and optimization of building structure, services systems, information technology, management and valued-added services.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student will possess sound knowledge on interdisciplinary concepts
CO2	Student understand the requirements for intelligent buildings characteristics
CO3	Student will learn the modern security system in buildings

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H					M	
CO2	H	H	H	H	H	H					M	
CO3	H	H	H	H	H	H					M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Sthrength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17SE2 **INTELLIGENT BUILDINGS**

UNIT I : Intelligent building characteristics: **9 Hrs**

Features and benefits of intelligent buildings. The anatomy of intelligent buildings. Environmental aspect. The marketplace and other driving forces behind the emergence of intelligent buildings.

UNIT II : Building automation systems & controls: **9 Hrs**

Philosophy, system configuration, system modules, distributed systems, communication protocol and on-line measurements. Fire protection, security and energy management. Control objectives. Sensors, controllers and actuators. Control system schematics system design. Microprocessor based controllers & digital controls. Examples of sub-systems such as: Digital Addressable Lighting Interface (DALI)

UNIT III : Modern intelligent vertical transportation systems: **9 Hrs**

Sky lobby, double-deck lifts, twin lifts, advanced call registration systems, large scale monitoring systems, applications of artificial intelligence in supervisory control, energy saving measures related to lift systems/escalator systems, other modern vertical transportation systems, such as: gondola systems, materials handling systems, etc.

UNIT IV : Communication and security systems: **9 Hrs**

Voice communication systems, local area network, wireless LAN, Digital TV, CCTV, digital CCTV, teleconferencing, cellular phone system, and CABD. SMATV. Data networking. Short- and long-haul networks. Wideband network. Office automations. Public address/sound reinforcement systems. Digital public address system. Modern security systems

UNIT V : Integrating the technologies and systems: **9 Hrs**

The impact of information technology on buildings and people. Shared tenant services. Interaction and integration between building structure, systems, services, management, control and information technology. Application & design software packages.

Total No of Hours: 45

REFERENCES

*Clements-Croome, Derek, Intelligent Buildings: An introduction, Routledge, 2014

*Shengwei Wang, Intelligent Buildings and Building Automation, Spon Press, 2010

*Jim Sinopoli, Smart Building Systems for Architectures, Owners and Builders, Elsevier, 2010 4. P. Manolescue, Integrating Security into Intelligent Buildings, Cheltenharn, 2003

*Dobbelsteen, Smart Building in a Changing Climate, Techne Press, 2009

*Oliviero, Cabling [electronic resource]: The Complete Guide to Copper and Fiberooptic Networking, John Wiley & Sons, 2014

*W.T. Grondzik, & A.G. Kwok, Mechanical and Electrical Equipment for Buildings, Wiley, 2015

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Department of Civil Engineering

Subject Code: BCE17SE3	Subject Name: FINITE ELEMENT ANALYSIS	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Structural analysis I & II	TY	1	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

The objective is to equip students with fundamentals of finite element principles so as to enable them to understand the behaviour of various finite elements and to be able to select appropriate elements to solve physical and engineering problems with emphasis on structural and thermal engineering applications.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Students will be in a position to develop computer codes for any physical problems using FE techniques
CO2	apply the concept of the differential equilibrium equations and their relationship in the analysis of structures
CO3	apply numerical methods to FEM for structural analysis

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H							H	H
CO2	H	H	H	H							H	H
CO3	H	H	H	H							H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17SE3 FINITE ELEMENT ANALYSIS

UNIT I: INTRODUCTION – VARIATIONAL FORMULATION 8Hrs

General filed problems in Engineering – Modelling – Discrete and Continuous models – Characteristics – Difficulties involved in solution – The relevance and place of the finite element method – Historical comments – Basic concept of FEM, Boundary and initial value problems – Gradient and divergence theorems – Functionals – Variational calculus – Variational formulation of VBPS. The method of weighted residuals – The Ritz method.

UNIT II: FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS 8Hrs

One dimensional second order equations – discretisation of domain into elements – Generalised coordinates approach – derivation of elements equations – assembly of elements equations – imposition of boundary conditions – solution of equations – Cholesky method – Post processing – Extension of the method to fourth order equations and their solutions – time dependant problems and their solutions – example from heat transfer, fluid flow and solid mechanics.

UNIT III: FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS 9Hrs

Second order equation involving a scalar-valued function – model equation – Variational formulation – Finite element formulation through generalised coordinates approach – Triangular elements and quadrilateral elements – convergence criteria for chosen models – Interpolation functions – Elements matrices and vectors – Assembly of element matrices –boundary conditions – solution techniques.

UNIT IV: ISOARAMETRIC ELEMENTS AND FORMULATION 10Hrs

Natural coordinates inn 1, 2 and 3 dimensions – use of area coordinates for triangular elements in - 2 dimensional problems – Isoparametric elements in 1,2 and 3 dimensional – Largrangean and serendipity elements – Formulations of elements equations in one and two dimensions - Numerical integration.

UNIT V: APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSION 10 hrs

Equations of elasticity – plane elasticity problems – axis symmetric problems in elasticity Bending of elastic plates – Time dependent problems in elasticity – Heat – transfer in two dimensions – incompressible fluid flow.

Total No. of Hours : 45

TEXT BOOKS

*J.N.Reddy, “An Introduction to Finite Element Method”, McGraw-Hill Book Co., Intl. Edition, 1985.

REFERENCES

*Rienkiewics, “The finite element method, Basic formulation and linear problems”, Vol.1, 4/e, McGraw-Hill,Book Co.

*S.S.Rao, “The Finite Element Method in Engineering”, Pergaman Press, 1989.

*C.S.Desai and J.F.Abel, “Introduction to the Finite Element Method”, Affiliated East West Press 1972

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(An ISO 9001 : 2008 Certified Institution)

Department of Civil Engineering

Subject Code: BCE17SE4	Subject Name: ENVIRONMENTAL IMPACT ASSESSMENT	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Environmental Engineering	TY	1	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

To know the objectives, capability, and limitations of environmental impact assessment.

To learn methodologies and legal aspects of environmental impact assessment;

COURSE OUTCOMES (COs) : (3- 5)

CO1	carry out scoping and screening of developmental projects for environmental and social assessments
CO2	explain different methodologies for environmental impact prediction and assessment
CO3	plan environmental impact assessments and environmental management plans

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H	H	H	H	H			H	H
CO2	H	H		H	H	H	H	H			H	H
CO3	H	H		H	H	H	H	H			H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17SE4 ENVIRONMENTAL IMPACT ASSESSMENT

UNIT I: INTRODUCTION 9Hrs

Impact of development on environment and Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) – Objectives – Historical development – EIA capability and limitations – Legal provisions on EIA.

UNIT II: METHODOLOGIES 9Hrs

Methods of EIA – Strengths, weaknesses and applicability – Appropriate methodology – Case studies.

UNIT III: PREDICTION AND ASSESSMENT 9Hrs

Socio Economic Impact – Assessment of Impact on land, water and air, energy impact; Impact on flora and fauna; Mathematical models; public participation – Reports – Exchange of Information – Post Audit – Rapid EIA.

UNIT IV: MATHEMATICAL MODELS FOR ASSESSMENT 9Hrs

Use the mathematical models in EIA – Water quality, air quality and noise; assumptions and limitations.

UNIT V: ENVIRONMENTAL MANAGEMENT PLAN 9Hrs

Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, flora and fauna, addressing the issues related to the project affected people.

Total No. of Hours: 45

TEXT BOOKS

*Canter, R.L. Environmental Impact Assessment, McGraw Hill Inc., New Delhi, 1996.

*S.K.Shukla and P.R.Srivastava, Concepts in Environmental Impact Analysis, Common Wealth Publishers, New Delhi, 1992.

REFERENCES

* John G.Rau and David C Hooten (Ed)., Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1990.

* Environmental Assessment Source book, Vol. I, II & III. The World Bank, Washington, D.C., 1991.

* Judith Petts, Hand book of Environmental Impact Assessment Vol. I & II, Blackwell Science, 1999.

Subject Code: BCE17OE1	Subject Name: PROFESSIONAL ETHICS	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	TY	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

This Code of Ethics provides guidance for car sharing organizations by establishing shared expectations and professional business While this Code of Ethics establishes objectives for the signatories' businesses, it does not dictate how these objectives should be reached, leaving those decisions up to each signatory to best operate in each of our communities.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	understand the ethical theories and concepts
CO2	understanding an engineer‟ s work in the context of its impact on society
CO3	understand the professional responsibilities and rights of Engineers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M		H	H	H	H	H
CO2						M		H	H	H	H	H
CO3						M		H	H	H	H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

Approval	

BCE17OE1 **PROFESSIONAL ETHICS**

UNIT I : ENGINEERING ETHICS **9 Hrs**

Senses of engineering ethics – variety of moral issues – types of inquiry – moral dilemmas. Moral autonomy – kohlberg's theory – gilligan's theory – consensus and controversy – professions and professionalism – professional ideals and virtues – theories about right action – self-interest – customs and religion – use of ethical theories

UNIT II : ENGINEERING AS SOCIAL EXPERIMENTATION **9Hrs**

Engineering as experimentation – engineers as responsible experimenters – codes of ethics – a balanced outlook on law – the challenger case study.

UNIT III : ENGINEER'S RESPONSIBILITY FOR SAFETY **9 Hrs**

Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk – the three mile island and chernobyl case studies

UNIT IV: RESPONSIBILITIES AND RIGHTS **9 Hrs**

Collegiality and loyalty – respect for authority – collective bargaining – confidentiality – conflicts of interest – occupational crime – professional rights – employee rights – discrimination.

UNIT V : GLOBAL ISSUES **9 Hrs**

Multinational corporations – environmental ethics – computer ethics – weapons development – engineers as managers – consulting engineers – engineers as expert witnesses and advisors – moral leadership – sample code of conduct.

Total No of Hours : 45

TEXT BOOKS

* Mike martin and Roland Schinzinger, Ethics In Engineering, McGraw hill, New York, 1996
* Charles D Fledderman, engineering ethics, prentice hall, New Mexico, 1999

REFERENCES

* Laura Schlesinger, How Could You Do That: The Abdication Of Character, Courage, And Conscience, Harper Collins, new york, 1996.
* Stephen Carter, Integrity, Basic Books, new york 1996.
* Tom Rusk, The Power Of Ethical Persuasion: From Conflict To Partnership At Work And In Private Life, Viking, New York, 1996

Subject Code: BCE17OE2	Subject Name: ENVIRONMENT, HEALTH AND SAFETY IN INDUSTRIES	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	TY	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

To understand the basic needs of safety in human health, environmental safety, electrical safety, safety against accidents and fire safety in various industries

COURSE OUTCOMES (COs) : (3- 5)

CO1	Students learn the occupational safety and hygiene
CO2	They understand the workplace safety and their responsibility.
CO3	Student possesses an awareness on environment, health and safety in industries

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H				H	H	H	H			H	H
CO2	H				H	H	H	H			H	H
CO3	H				H	H	H	H			H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

Approval	

BCE17OE2 ENVIRONMENT, HEALTH AND SAFETY IN INDUSTRIES

UNIT I : INTRODUCTION 9 Hrs

Need for developing Environment, Health and Safety systems in work places, Status and relationship of Acts, Regulations and Codes of Practice, Role of trade union safety representatives .International initiatives, Ergonomics and work place.

UNIT II: OCCUPATIONAL HEALTH AND HYGIENE 9 Hrs

Definition of the term occupational health and hygiene, Categories of health hazards, Exposure pathways and human responses to hazardous and toxic substances, Advantages and limitations of environmental monitoring and occupational exposure limits, Hierarchy of control measures for occupational health risks, Role of personal protective equipment and the selection criteria.

UNIT III: WORKPLACE SAFETY AND SAFETY SYSTEMS 9 Hrs

Features of the satisfactory design of work premises HVAC, ventilation. Safe installation and use of electrical supplies, Fire safety and first aid provision, Significance of human factors in the establishment and effectiveness of safe systems, Safe systems of work for manual handling operations, Control methods to eliminate or reduce the risks arising from the use of work equipment, Requirements for the safe use of display screen equipment, Procedures and precautionary measures necessary when handling hazardous substances, Contingency arrangements for events of serious and imminent danger.

UNIT IV: TECHNIQUES OF ENVIRONMENTAL SAFETY 9 Hrs

Functions and techniques of risk assessment, inspections and audits, Investigation of accidents- Principles of quality management systems in health and safety management.

UNIT V: EDUCATION AND TRAINING 9 Hrs

Factors to be considered in the development of effective training programmes, Principles and methods of effective training, Feedback and evaluation mechanism.

Total No. of Hours: 45

REFERENCES

1. Environmental and Health and Safety Management by Nicholas P. Cheremisinoff and Madelyn L. Graffia, William Andrew Inc. NY, 1995

2. The Facility Manager's Guide to Environmental Health and Safety by Brian Gallant, Government Inst Publ. Effective Environmental, Health, and Safety Management Using the Team Approach by Bill Taylor, Culinary and Hospitality Industry Publications Services 2005

Subject Code: BCE17OE3	Subject Name: CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	TY	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

To understand the Earth's Climate System and the concept of Global Warming, the impact of climate change on society and its mitigation measures.

COURSE OUTCOMES (COs) : (3- 5)
At the end of the course the student will be able to

CO1	Understand the global climate change and its effects
CO2	Learn about climate change adaptation and various mitigation measures
CO3	Understand the concept of clean energy and energy conservation

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					H	H	H	H			H	H
CO2					H	H	H	H			H	H
CO3					H	H	H	H			H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

Approval	

BCE17OE3 CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT

UNIT I : EARTH'S CLIMATE SYSTEM 9 Hrs

Introduction-Climate in the spotlight –– Climate Classification - Global Wind Systems -Cloud Formation and Monsoon Rains – Storms and Hurricanes – The Hydrological Cycle – Global Ocean Circulation –Solar Radiation – The Earth's Natural Green House Effect – Green House Gases and Global Warming – Carbon Cycle.

UNIT II : OBSERVED CHANGES AND ITS CAUSES 9 Hrs

Observation of Climate Change – Changes in patterns of temperature, precipitation and sea level rise – Observed effects of Climate Changes – Patterns of Large Scale Variability – Drivers of Climate Change – Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC .

UNIT III : IMPACTS OF CLIMATE CHANGE 9 Hrs

Impacts of Climate Change on various sectors -Methods and Scenarios – Projected Impacts for Different Regions– Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

UNIT IV: CLIMATE CHANGE ADAPTATION AND MITIGATION MEASURES 9 Hrs

Adaptation Strategy/Options in various sectors -Key Mitigation Technologies and Practices –Carbon sequestration – Carbon capture and storage (CCS)- Waste (MSW & Bio waste, Biomedical, Industrial waste – International and Regional cooperation.

UNIT V : CLEAN TECHNOLOGY AND ENERGY 9 Hrs

Clean Development Mechanism –Carbon Trading examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power.

Total No. of Hours: 45

REFERENCES

1. Anil Markandya , Climate Change and Sustainable Development: Prospects for Developing Countries, Routledge, 2002

2. Heal, G. M., Interpreting Sustainability, in Sustainability: Dynamics and Uncertainty, Kluwer Academic Publ., 1998

3. Jepma, C.J., and Munasinghe, M., Climate Change Policy – Facts, Issues and Analysis, Cambridge University Press, 1998

4. Munasinghe, M., Sustainable Energy Development: Issues and Policy in Energy, Environment and Economy: Asian Perspective, Kleindorfor P. R. et. al (ed.), Edward Elgar, 1996

5. Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007.

Subject Code: BCE17OE4	Subject Name: INTELLIGENT TRANSPORTATION SYSTEMS	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	TY	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

To expose the recent advancements in Transport Systems

COURSE OUTCOMES (COs) : (3- 5) On completion of the course the students would have

CO1	Knowledge on the various principles and aspects of Intelligent Transport System.
CO2	Knowledge on intersection management
CO3	Knowledge on advanced transport system

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		H		H		H		H			H	H
CO2		H		H		H		H			H	H
CO3		H		H		H		H			H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval												

BCE17OE4 INTELLIGENT TRANSPORTATION SYSTEMS

UNIT I INTRODUCTION TO INTELLIGENT TRANSPORT SYSTEM 8 Hrs

Definition – Role and Responsibilities – Advanced Traveller Information System – Fleet Oriented ITS Services – Electronic Toll Collection – Critical issues – Security - Safety 21

UNIT II ITS ARCHITECTURE AND HARDWARE 9 Hrs

Architecture – ITS Architecture Framework – Hardware Sensors – Vehicle Detection – Techniques – Dynamic Message Sign – GPRS – GPS – Toll Collection

UNIT III INTERSECTION MANAGEMENT 10 Hrs

Video Detection – Virtual Loop - Cameras - ANPR – IR Lighting – Integrated Traffic Management – Control Centre – Junction Management Strategies

UNIT IV ADVANCED TRANSPORT MANAGEMENT SYSTEM 10 Hrs

ATMS – Route Guidance – Issues - Travel Information – Pre Trip and Enroute Methods – Historical – Current – Predictive Guidance – Data Collection – Analysis – Dynamic Traffic Assignment (DTA) – Components – Algorithm

UNIT V ADVANCED TRAVELLER AND INFORMATION SYSTEM 8 Hrs

Basic ATIS Concepts – Smart Route System – Data Collection – Process – Dessemination to Travelers – Evaluation of Information – Value of Information – Business Opportunities

Total No. of Hours: 45

REFERENCES:

1. Intelligent Transport Systems, Intelligent Transportation Primer, Washington, US, 2001

2. Henry F.Korth, and Abraham Siberschatz, Data Base System Concepts, McGraw Hill, 1992

3. E.Turban, ”Decision Support and Export Systems Management Support Systems", Maxwell Macmillan, 1998

4. Sitausu S.Mittra, "Decision Support Systems – Tools and Techniques", John Wiley, New York, 1986 5. Cycle W.Halsapple and Andrew B.Winston, "Decision Support Systems – Theory and Application‟ , Springer Verlog, New York, 1987