

**Course Structure**  
**and**  
**Detailed Syllabus**  
**for**  
**Bachelor of Architecture**  
**2013-14**



**DEPARTMENT OF ARCHITECTURE**  
**राष्ट्रीय प्रौद्योगिकी संस्थान पटना**  
**NATIONAL INSTITUTE OF TECHNOLOGY PATNA**

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## COURSE STRUCTURE FOR B. ARCH. PROGRAM

Semester wise compulsory courses

	Deptt.	Semester	Course Code	Course Title and Batches to whom applicable in different Semesters	L	T	P	Credits	Contact Hours	Exam. Hrs	
										Mid Semester	End Semester
<b>SEMESTER - I</b>											
1.	ARCH	1	GE101	PARICHAY	0	0	1	0	1		
2.	ARCH	1	HS101	English Literature	2	1	0	3	3		
3.	ARCH	1		or							
4.	ARCH	1	HS103	Remedial English	2	0	0	2	2		
	ARCH	1	HS104	Language Lab	0	0	2	1	2		
5.	ARCH	1	MA103	Engineering Mathematics	3	1	0	4	4		
6.	ARCH	1	CS101	Introduction to computing	2	1	0	3	3		
7.	ARCH	1	CS102	Computing Lab	0	0	3	1	3		
8.	ARCH	1	ME102	Workshop Practice	0	0	3	1	3		
9.	ARCH	1	AR101	Basic Design 1	2	0	4	3	6		
10.	ARCH	1	AR102	Architectural Graphics I	1	0	6	3	7		
11.	ARCH	1	AR103	History of Art, Architecture & Culture	2	0	2	3	4		
12.	ARCH	4	GE105	EAA-I NSS	0	0	3	0	3		
					<b>12</b>	<b>3</b>	<b>24</b>	<b>22</b>	<b>34/35</b>		
<b>SEMESTER - II</b>											
13.	ARCH	2	HS102	Communication Skills Development & Technical writing	0	1	3	2	4		
14.	ARCH	2	CE101	Engineering Mechanics	3	1	0	4	4		
15.	ARCH	2	HS105	Science Society and Ethical Values	2	0	0	2	2		
16.	ARCH	2	AR111	Basic Design II	1	1	6	4	8		
17.	ARCH	2	AR112	Architectural Graphics II	1	0	6	3	7		
18.	ARCH	2	AR113	Architectural workshop	0	0	4	1	4		
19.	ARCH	2	AR114	History of Architecture-I	2	0	2	3	4		
20.	ARCH	2	AR115	Principle of Architecture	2	1	0	3	3		
21.	ARCH	2	AR119	Seminar/Educational Tour/NASA/Zonasa-I	0	0	0	1	0		
22.	ARCH	4	GE105	EAA-II NSS	0	0	3	0	3		
					<b>11</b>	<b>4</b>	<b>24</b>	<b>23</b>	<b>39</b>		

SEMESTER - III										
23.	ARCH	3	AR121	Architectural Design - I	3	0	6	5	9	BoS
24.	ARCH	3	AR122	Building Construction-I	2	0	4	3	6	
25.	ARCH	3	AR123	History of Architecture-II	2	0	2	3	4	
26.	ARCH	3	AR124	Building Materials (Material Science & Technology)	1	1	0	2	2	
27.	ARCH	3	AR125	Climatology and Solar Passive Architecture	2	1	0	3	3	
28.	ARCH	3	AR127	Structure, Form & Architecture	2	1	0	3	3	
29.	ARCH	3	AR126	Computer Application in Architecture	0	0	4	1	4	
30.	ARCH	3	CE102/ CH104	Green Chemistry (Environmental Science)	3	0	0	3	3	
31.	ARCH	4	GE105	EAA-III NSS	0	0	3	0	3	
					<b>15</b>	<b>3</b>	<b>19</b>	<b>23</b>	<b>37</b>	
SEMESTER - IV										
32.	ARCH	4	AR131	Architectural Design-II & Field Study	3	0	6	5	9	BoS
33.	ARCH	4	AR132	Building Construction-II	2	0	4	3	6	
34.	ARCH	4	AR133	Contemporary Architecture	2	1	0	3	3	
35.	ARCH	4	AR142	Building Services (Water Supply and Sanitation)	2	1	0	3	3	
36.	ARCH	4	AR149	Seminar/Educational Tour/NASA/Zonasa-II	0	0	0	1	0	
37.	ARCH	4	CE108	Surveying	3	0	3	4	6	
38.	ARCH	4	CE116	Theory of Structure/MOS	2	0	2	3	4	
39.	ARCH	4	GE102	Bio Science	3	0	0	3	3	
40.	ARCH	4	GE105	EAA-IV NSS	0	0	3	0	3	
					<b>17</b>	<b>2</b>	<b>18</b>	<b>25</b>	<b>37</b>	
SEMESTER -V										
41.	ARCH	5	AR141	Architectural Design-III & Field study	3	0	6	5	9	BoS
42.	ARCH	5	AR143	Building Construction-III	1	0	4	2	5	
43.	ARCH	5	AR144	Human Settlement & Vernacular Architecture	3	0	0	3	3	
44.	ARCH	5	AR145	Building Services (Illumination, Electrical	3	0	0	3	3	

				Services and Acoustics)							
45.	ARCH	5	AR146	Quantity Survey & Specifications	2	1	0	3	3		
46.	ARCH	5	HS106	Sociology and Building Economics	3	0	0	3	3		
47.	ARCH	5	CE107	Structural Analysis	2	0	2	3	4		
48.	ARCH	4	GE105	EAA-V NSS	0	0	3	0	3		
					<b>17</b>	<b>1</b>	<b>15</b>	<b>22</b>	<b>33</b>		
				<b>SEMESTER - VI</b>							
49.	ARCH	6	AR151	Architecture Design-IV and Field Study	3	0	6	5	9		BoS
50.	ARCH	6	AR152	Building Construction-IV	1	0	4	2	5		
51.	ARCH	6	AR153	Housing	2	0	2	3	4		
52.	ARCH	6	AR154	Departmental Elective-I	2	1	0	3	3		
53.	ARCH	6	ME120	Building Services (HVAC)	3	0	0	3	3		
54.	ARCH	6	AR155	Building Byelaws and Codes of Practice	2	0	0	2	2		
55.	ARCH	6	CE123	Concrete Structure	2	0	2	3	4		
56.	ARCH	6	XX1XX	Engineering/HSS/Science/department (Elective-1)	3	0	0	3	3		
57.	ARCH	6	GE106	EAA-VI NSS	0	0	3	0	3		
					<b>18</b>	<b>1</b>	<b>17</b>	<b>24</b>	<b>36</b>		
				<b>SEMESTER - VII</b>							
58.	ARCH	7	AR161	Architectural Design-V & Field Study	3	0	6	5	9		BoS
59.	ARCH	7	AR162	Architecture Detailing	2	0	4	3	5		
60.	ARCH	7	AR163	City Planning	2	0	2	3	4		
61.	ARCH	7	AR164	Urban Design	2	0	2	3	4		
62.	ARCH	7	AR2XX	Department Elective-II	3	0	0	3	3		
63.	ARCH	7	CE129	Design of Steel Structure / Concrete str.	3	0	0	3	3		
64.	ARCH	7	XX1XX	Engineering/HSS/Science/Department (elective-2)	3	0	0	3	3		
					<b>18</b>	<b>0</b>	<b>14</b>	<b>23</b>	<b>31</b>		
				<b>SEMESTER - VIII</b>							
65.	ARCH	8	AR171	Architectural Design-VI & Field Study	3	0	6	5	9		BoS



66.	ARCH	8	AR172	Working Drawing	1	0	4	2	5		
67.	ARCH	8	AR173	Landscape Design and Ecological Architecture	2	0	2	3	4		
68.	ARCH	8	AR174	Disaster Resistance Architecture and Management	2	1	0	3	3		
69.	ARCH	8	AR2xx	Departmental Elective-III	3	0	0	3	3		
70.	ARCH	8	AR175	Project Planning and Management	2	1	0	3	3		
71.	ARCH	8	xx1xx	Engineering/HSS/Science/Department (Elective-3)	3	0	0	3	3		
72.	ARCH	8	GE107	EAA-III NSS	0	0	0	0	0		
					<b>16</b>	<b>2</b>	<b>12</b>	<b>22</b>	<b>30</b>		
				<b>SEMESTER - IX</b>							
73.	ARCH	9	AR192	Architectural Training	0	0	60	20	60		
					<b>0</b>	<b>0</b>	<b>60</b>	<b>20</b>	<b>60</b>		
				<b>SEMESTER - X</b>							
74.	ARCH	10	AR194	Project (Thesis)	0	0	60	20	60		
75.	ARCH	10	AR193	Professional Practice, Valuation and Management	3	0	0	3	3		
76.	ARCH	10	AR2XX	Departmental elective-IV	3	0	0	3	3		
					<b>6</b>	<b>0</b>	<b>60</b>	<b>26</b>	<b>66</b>		
				<b>Cumulative Total</b>	<b>130</b>	<b>16</b>	<b>263</b>	<b>230</b>	<b>403/404</b>		

List of Electives for B. Architecture

S. No.	Deptt .	Electives	Course Code	Course Title	L	T	P	Credits	Exam. Hrs	
									Mid Semester	End Semester
<b>List of Electives</b>										
1.	ARCH	EL-1	AR201	Design for Barrier Free Environment	3	0	0	3		
2.	ARCH	EL-1	AR202	Building Software lab	3	0	0	3		
3.	ARCH	EL-1	AR203	Vastushastra	3	0	0	3		
4.	ARCH	EL-1	AR204	Art In Architecture	3	0	0	3		
5.	ARCH	EL-2	AR211	Architectural Conservation	3	0	0	3		
6.	ARCH	EL-2	AR212	Sustainable Architecture	3	0	0	3		
7.	ARCH	EL-2	AR213	Visual Simantics	3	0	0	3		
8.	ARCH	EL-2	AR214	Modular Co-ordination	3	0	0	3		
9.	ARCH	EL-2	AR215	Facility planning and Specialized Building Design	3	0	0	3		
10.	ARCH	EL-3	AR221	Interior Design	3	0	0	3		
11.	ARCH	EL-3	AR222	Intelligent Buildings	3	0	0	3		
12.	ARCH	EL-3	AR223	Building Automation and Management System	3	0	0	3		
13.	ARCH	EL-3	AR224	Behavioral Studies in Architecture	3	0	0	3		
14.	ARCH	EL-3	AR225	Ergonomics and Product Design	3	0	0	3		
15.	ARCH	EL-4	AR231	Energy Conscious Architecture	3	0	0	3		
16.	ARCH	EL-4	AR232	Appropriate Building Technology	3	0	0	3		
17.	ARCH	EL-4	AR233	Futuristic Architecture	3	0	0	3		
18.	ARCH	EL-4	AR234	Marketing skill	3	0	0	3		

**Detailed Syllabus for Course Curriculum of B. Arch. Program**

GE 101 PARICHAY	<b>L-T-P 0-0-1 0 credit</b>

HS 101 English Literature	<b>L-T-P 2-1-0 3 credit</b>
The primary objective of the English literature Course which is being offered to students having a fair knowledge of English and a study of literature will enhance their flair in written and verbal expression. The recommended any one novels will be covered as described below: <b>28 Lectures</b>	
<b>1. Oliver Twist – Charles Dickens</b>	
(a) Discussion of the Victorian age in English fiction and the role of Charles Dickens as a novelist during this	

period.

- (b) Introduction to Charles Dickens – his life and works.
- (c) Oliver Twist as a criticism of the industrial Age.
- (d) Oliver Twist as an analysis of Victorian poverty and condition of children.
- (e) Discussion of the Art of Plot and Characterization.

## **2. Julius Caesar – William Shakespeare**

- (a) Introduction to the author.
- (b) A discussion of the socio political structure of the 20th century Europe up to the rise of Communism and World War 2.
- (c) Animal Farm as a political satire.
- (d) Satire and Fable.
- (e) Animal Farm as a fusion of Political purpose and artistic vision of the author.

## **3. Julius Caesar – William Shakespeare**

- (a) Life of Shakespeare.
- (b) Shakespeare as a Dramatist.
- (c) Synopsis of the play.
- (d) Justification of the title of the play.
- (e) Theme of the play.
- (f) Fate as the Hero of “Julius Caesar”.
- (g) Superstitions in Julius Caesar.
- (h) Caesar as a Marlowean Hero.
- (i) Characters: Julius Caesar, Mark Antony, Marcus Brutus, Cassio.
- (j) Shakespeare’s conception of tragedy.

## **4. Macbeth – William Shakespeare**

- (a) Introduction to William Shakespeare and Historical introduction to Elizabethan and Jacobean periods.
- (b) The play as a tragedy.
- (c) Definition of tragedy as in Aristotle and its application to Elizabethan tragedies.
- (d) Analysis of its plot structure.
- (e) Analysis of major characters such as Macbeth, Lady Macbeth and Banquo.
- (f) The Elements of supernatural in the play Macbeth.
- (g) The role of the Witches in the play.

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- (h) An analysis of figures of speech, poetic imagery and various dramatic conventions in the play.

### **Text book (Novel)**

1. Oliver Twist – Charles Dickens
2. Animal farm – George Orwell
3. Julius Caesar – William Shakespeare
4. Macbeth – William Shakespeare


HS 103	<b>L-T-P</b> <b>2-0-0</b> <b>2 credit</b>
Remedial English	
<i>The primary objective of the Course detailed for Remedial English is being offered to students weak in language who will benefit in their language skill since the syllabus is supported by the language Lab.</i>	
<b>1. Basic Grammar - Structural Pattern</b>	<b>6 Lectures</b>
(a) Articles	
(b) Verbs: Auxiliaries, Finite & Non Finites.	
(c) Time and Tense	
(d) Subject: Verb Agreement (concord).	
(e) Active & Passive Voice.	
(f) Narration	
<b>2. (i) Single word / verb substitution</b> (ii) Editing	<b>6 Lectures</b>
<b>3. Common Error, Comparison</b>	<b>3 Lectures</b>
<b>4. Antonym, homonym, Sentence, Building (Vocabulary)</b>	<b>5 Lectures</b>
<b>5. Précis, Essay, Paragraph Writing &amp; Comprehension</b>	<b>4 Lectures</b>
<b>6. Official Correspondence, Memorandum; Circular Letter</b>	<b>4 Lectures</b>
<b>Text Books:</b>	
1. English Grammar- N.D. Turton, ABC of Common Grammatical Error for learners & Teachers.	
2. English Grammar- Dr. D. Thakur	
3. English Grammar- Dr. K.K. Ramchandranetal; business Communication.	
4. Technical English- Sharon j Gerson and Steven M Gerson	
5. Angela Burt, Quick Solutions to common Error in English.	
6. W. Foulsham, The Complete letter writer.	
7. John East wood- Oxford guide to English Grammar.	
<b>Reference Books:</b>	
1. Communication in English for Technical Student- Orient Longman.	
2. G. Nagroj, English Language Teaching.	
3. N. Saraswati, English language Teaching; principles & practices.	
4. English for Engineers- Orient Blackswan	

HS 104	<b>L-T-P</b> <b>0-0-2</b> <b>1 credit</b>
Language Lab	
<i>The primary objective of the Course detailed for Remedial English is being offered to students weak in language who will benefit in their language skill since the syllabus is supported by the language Lab</i>	

- (i) Phonetics: 10 Lectures
  - (a) Sound of English (Vowels, short, Vowels, Long Vowels & consonants)
  - (b) Stress, Rythm, Pitch & Intonation, Accent.
- (ii) English in formal situation 4 Lectures
  - (a) Greetings
  - (b) Making a Telephone Call
  - (c) Making apology
  - (d) At college
- (iii) English in formal situation 4 Lectures
  - (a) At the Doctor's
  - (b) Outside the class
  - (c) Introducing self and other

MA 103	<b>L-T-P</b>
Engineering Mathematics	<b>3-1-0</b>
	<b>4 credit</b>
<p><b><u>Matrix Algebra:</u></b> Elementary transformation inverse of the matrix, rank of a matrix, solution of simultaneous equations, characteristic equation, eigen values &amp; eigen vectors, Caley-Hamilton theorem. <b>6 lectures</b></p> <p><b><u>Differential Calculus:</u></b> Higher order derivatives (successive differentiation) and Leibnitz theorem, indeterminate form, tangent and normal, Concavity and convexity of a curve, points of inflexion, asymptote and curvature, Functions of Several Variables, partial derivatives, Euler's theorem on homogeneous functions, harmonic function, Taylor's expansion of several variables, maxima &amp; minima of two variables – Lagrange's method for undetermined multipliers. <b>14 lectures</b></p> <p><b><u>Differential equation I:</u></b> First order equation, separable, homogeneous, exact, linear and Bernoulli's for solution. <b>4 lectures</b></p> <p><b><u>Integral Calculus:</u></b> Double &amp; Triple integrals, Computation of surfaces &amp; volumes, Rectifications. <b>5 lectures</b></p> <p><b><u>Vector calculus:</u></b> Scalar and vector fields, level surfaces, directional derivatives, gradient, Curl, Divergance and curl. Green, Gauss and Stoke's theorems(only Statemants). <b>4 lectures</b></p> <p><b><u>Probability and Statistics:</u></b> Theorems on Probability, including Baye's rule, Random Variable – cumulative distribution function, probability mass function, probability density function, mathematical expectation, mean, variance standard probability models Binomial, Poisson. <b>9 lectures</b></p>	

**Text Books:**

1. Advance Engineering Mathematics – R. K. Jain & S.R.K. Iyenger, Narosa Publishing House
2. Higher Engineering Mathematics – B.S. Grewal, Khanna Publishers
3. Fundamentals of Mathematical Statistics – V.K. Kapoor & S.C. Gupta – Sultan & Sons

**Reference Books:**

1. Advance Engineering Mathematics - E. Kreyszig, 8<sup>th</sup> Edition, John Wiley & Sons, New York
2. Advance Engineering Mathematics – Wylie & Barrett – Tata McGraw Hill
3. Introduction to Probability & Statistics for Engineers – S. M. Ross – John Wiley and Sons, New York

CS 101 Introduction to Computing	<b>L-T-P</b> <b>2-1-0</b> <b>3 credit</b>
<p><b>Introduction to Programming, Algorithms and Flow Chart 1 hour</b>          Generation of programming languages, steps involved in Problem Solving, Algorithm, Flow chat, Pseudo code</p> <p><b>Basics of C 3 hours</b>          A Simple C program, Header files, data types and sizes, Constants, variables, token, identifiers, Operators: arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators; expressions, L-value, r-value, type Detailed Syllabus B.Tech. Program, NIT Patna Session 2013-14</p> <p>conversions, conditional expressions, precedence and order of evaluation, data type conversion, mixed-mode operation, Managing Input and Output operation (formatted and unformatted)</p> <p><b>Control Statements 4 hours</b>          Conditional control statement—if, if-else, nested-if, switch; Go-to-statement; Looping—while, do-while, for, nested for; jumps in loops—break and continue statement</p> <p><b>Arrays 3 hours</b>          Definition, one-dimensional arrays—declaration and initialization, two—dimensional arrays, multidimensional arrays, dynamic arrays</p> <p><b>Strings 3 hours</b>          Introduction, Declaring and initializing strings, reading and writing strings, String Handling Function, Implementation of string functions, Arithmetic operation on strings, comparison of Strings</p> <p><b>Functions 4 hours</b>          Function definition, arguments and parameters, categories of function, scope and extent, Storage classes, static and register variables, parameter passing mechanism, Inline function, nesting of function, recursion, passing arrays to function, passing strings to function, variable length argument list.</p> <p><b>Pointers 9 hours</b></p>	

Understanding memory address, declaring and initializing pointer variables, void pointer, null pointer, accessing a variable through pointer, array and pointer, pointer and string, pointer as function arguments, Pointer arithmetic, pointers to pointer, function returning pointer , pointers and structure, Dynamic memory allocation (Malloc , Calloc, releasing the used space, Realloc), Memory leak and memory corruption.

**User defined data Types: 4 hours**

Structure- defining, declaring, initializing; accessing structure members, processing of structure , array of structures, structures within structure, structure and function, type definition; Union—definition, declaration, accessing union members , initializing union

**Pre-processor 1 hours**

Introduction, macro substitution, File Inclusion, Compiler control Directives

**Files 4 hours**

Introduction, file declaration, opening and closing a file, working with text and binary files, I/O operations on file, error handling, random access to files

**Graphics programming 3 hours**

Introduction, Command line argument, function used in graphics, drawing shapes, designing using graphics

**Text Books:**

**1. Programming in C by PradipDey and ManasGhosh, Oxford**

**References:**

1. Programming in C by Ashok kamthane, Pearson Education
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.  
Detailed Syllabus B.Tech. Program, NIT Patna Session 2013-14
4. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
5. Practical C Programming (3rd Edition) by Steve Oualline, O'reilly Press
6. C: The Complete Reference by Herbert Schildt, TMH

CS 102	L-T-P 0-0-3
Computing Lab	1 credit

ME 102	L-T-P 0-0-3
Workshop Practice	1 credit

Introduction to carpenter's tools, Wood working machines, use of different kinds of wood, Sawing, Planning and Shaping of wood, Making of selected joinery used in construction work, polishing of wood. Demonstration and practical lesson on soldering, brazing, forging and gas welding. Demonstration of foundry shop practice-introduction to molder's tools, preparation of moulding sand. Introduction to machine tools with demonstration of cutting, drilling, grinding, slotting, shaping, bending etc. Names and uses of different kinds of fitter's tools and measuring instruments, care and maintenance, practice in chipping, filling, scraping and fitting.

AR 101	<b>L-T-P</b>
Basic Design - I	<b>2-0-4</b>
	<b>3 credit</b>
Objective: To provide the basic understanding of design in terms of design principles and develop an understanding of anthropology.	
<b>Unit-1 (Understanding of Building Design Principles)</b>	
1. Basic elements of design; (2 lecture) Basic elements of Building; (1 lecture)	
2. The principles of design; (2 lecture)	
3. Exercises to demonstrate graphical composition through use of point, line, form, shape & size, colour, Texture etc; (1 lecture)	
<b>Unit-2 (Graphical Expression of design and non design objects using design principles)</b>	
4. The inherent visual property of any physical object or enclosure and their composition; (1 lecture)	
5. Comparison of designed and non-designed objects; (1 lecture)	
6. Techniques of graphic expression to present innovative design ideas; (1 lecture)	
7. Factors of design regarding elementary forms, enveloping, contained and residual spaces and structure in three-dimensional composition; (1 lecture)	
8. Anthropological studies and important dimensions. Sanitary appliances and fixtures; (2 lectures)	
9. Exercises to demonstrate the principles of design such as proportions, rhythm, harmony, composition, unity, balance, scale etc; (3 lectures)	
<b>Unit-3 (Graphical Expression of geometrical patterns like 2D and 3D objects)</b>	
10. Various aspects of spatology with transformation of forms and spaces towards the appraisal of existing forms and creation of unique design solutions; (2 lectures)	
11. Dynamics in geometrical pattern and creation of architectural spaces with specific functions; (1 lecture)	
12. Relationship between 2D and 3D compositions; (1 lecture)	
13. Studies of sciography with exercises of block models in plan and elevation; (1 lecture)	
14. Design exercises like 2D thematic mural, screens, voids, grills and floorscape designs; ( 2 Lecture )	
15. 3D composition with regular forms (lines, planes or volumes); (1 lecture)	
<b>Unit-4 (Signage &amp; Sculpture design techniques)</b>	
16. Signage design; (1 lecture)	
17. Sculpture design; (1 lecture)	
18. Introduction to Architecture: Basic architectural services rendered by an Architect and knowledge of Other disciplines associated with the profession; (3 lectures)	
Outcomes: Developed understanding of design principles and basics of design processes.	
Reference Books :	



1. Space. Time and Architecture/ Gideon
2. Elements of Architecture from Form to place/ Von Meiss, Pierre
3. Frank Lloyd Wright on Architecture/Wright
4. Free Spirit in Architecture/Papadakis
5. Traditions in Architecture/Data Planning, Crouch June. Johnson
6. Introduction to Architecture/Snyder, James
7. Colour for Architecture/Porter, Tom

AR 102	<b>L-T-P</b>
Architectural Graphics-I	<b>1-0-6</b>
	<b>3 credit</b>
Objective: To develop the understanding of sheet presentation techniques and study of architectural forms and shapes.	
<b>Unit-1 (To develop the basic skill of free hand sketching and rendering)</b>	
1. Development of freehand sketching skills and techniques; (1 lectures)	
2. Free hand drawing of objects in two dimension & three dimension; (1Lectures)	
3. Basic rendering techniques ;(1 lectures)	
<b>Unit-2 (Understanding of object angles and views)</b>	
4. Views of building facades from different angles;(1 lectures)	
5. Visual presentation of plants, trees, objects, furniture, human beings etc ;(1Lectures)	
<b>Unit-3 (To develop the skill of sheet presentation)</b>	
6. Introduction to IS code drawing, drawing instruments, sheet layout, lines, lettering, dimensioning, conics and curves (ellipse, parabola, hyperbola, cycloid, trochoid, involutes, spiral) ;(2Lectures)	
<b>Unit-4 (Introduction to projection theories)</b>	
7. Orthographic projection: Projection of straight lines-traces, true length;(2Lectures)	
8. Projection of planes;(2Lectures)	
9. Projection of solids (cube, prism, pyramid, cylinder, cone and sphere) ;(2Lectures)	
Outcomes: Developed understanding of free hand drawing and visual presentation techniques.	
<b>Reference Books:</b>	
Architecture in Pen and Ink/ Chen John S M	
Detailed Syllabus B. Arch Program, NIT Patna Session 2013-14 f	
Graphic details for Architects/ Kemmerich, Carl	
Manual of Graphic Techniques for Architects, Graphic Designers and Architects/ Kemmerich Carl	
New Metric Handbook; Planning and Design Data	
A Textbook of Perspective and Sciography/ Shankar Mulik	
Architectural Rendering / Alibert O. Halse	
Engineering Graphics/N.D. Bhatt	
Graphics for Architects and Planners/ Russel, James E	
1. Architecture in Pen and Ink/ Chen John S M	
2. Graphic details for Architects/ Kemmerich, Carl	
3. Manual of Graphic Techniques for Architects, Graphic Designers and Architects/ Kemmerich Carl	
4. New Metric Handbook; Planning and Design Data	
5. A Textbook of Perspective and Sciography/Shankar Mulik	
6. Architectural Rendering / Alibert O. Halse	
7. Engineering Graphics/ N.D. Bhatt	

8. Graphics for Architects and Planners/Russel, James E

AR 103	L-T-P 2-0-2 3 credit
History of Art, Architecture and Culture	
Aim: Introduction to relation between art, architecture and culture of ancient civilization	
<b>Unit-1 (Understanding for relationship between architecture, art and culture w.r.to ancient civilizations)</b>	
1. Definition and relation of Art, Architecture and culture; (2 Lecture)	
2. Pre-historic Art and Culture: Evolution (2 Lecture)	
3. Relation of culture with architecture civilization and history; (2 lectures)	
<b>Unit-2 (Introduction to Art and Architecture of Indus valley to Byzantine Civilization)</b>	
4. Ancient river valley civilization of India, Egypt, Mesopotamia, China, their socio-cultural belief and reflection of it in their building and built environment; (4 lectures)	
5. Ancient Greek Civilization, Ancient Roman Civilization. (2 lectures)	
6. Early Medieval Architecture-Byzantine and Romanesque period; (2 lecture)	
<b>Unit-3 (Introduction to Art and Architecture of Gothic to Rococco Civilization)</b>	
7. Evolution of Gothic forms – how it influenced later development of modern architecture; (2lectures)	
8. Renaissance: Art, Architecture (2 lectures)	
9. Baroque and Rococco; (2 lectures)	
<b>Unit-4 (Introduction to Art and Architecture during industrial revolution to Modern days)</b>	
10. Birth of neo-classical and eclectic architecture prior to industrial revolution; (2 lectures)	
11. Sculptures & Cave Painting: Indian and Western; (2 lectures)	
12. Modern Trends in Art; (2 lectures)	
13. Impressionism/Expressionism/Cubism/ Futurism/Abstract Art; (2 lectures)	
Outcomes: Knowledge of art and architecture of ancient civilizations	
Reference Books :	
1. History of Indian and Eastern Architecture/ Fergusson James	
2. Sir Bannister Fletcher's A history of Architecture /Musgrove, John	
3. Living architecture Volume 1 & 2 /A Volwahren	
4. Janson,H.W.,History of Art, New York,1978	
5. Tomory Edith, A History of Fine Arts in India and the West, Orient Longman,1995	

HS 102	L-T-P 0-1-3 2 credit
Communication Skill Development & Technical Writing	
<b>1. Communication: What is communication?</b>	
Theory: Importance of communication.	
Process of communication	
(i) Verbal	
(ii) Non – Verbal	
<b>Practical:</b>	9 Lectures
(a) How to face an interview.	
(b) Group Discussion.	
(c) How should the interview plan & conduct the interview.	

- (d) Body Language and Gesture.
- (e) Eye contact.
- (f) Appearance.

**1. Listening: Its importance & Barriers to listening**

Theory:

- (a) Listening
- (b) Developing Reading skills.
- (c) Developing Conversational skills. 5 Lectures

**English in formal situations**

- (a) Interview (b) At the Bank (c) At the Airport (d) At the police station (e) Customer care (f) At the Embassy. 6 Lectures

**English in informal situations**

- (a) At a dinner party (b) Booking a room at a hotel (c) At a travel agency (d) At the Hospital (e) Ask for an opinion. 5 Lectures

**2. Technical writing 3 Lectures**

**Text Books:**

1. Sreevalsam MC; Spoken English, Vikash Publishing House, New Delhi.
2. Communication skills; Sanjay Kumar, Pushplata, Oxford University press.
3. English for Engineers & Technologists, Orient Blackswan.
4. Krishna Mohan and NP Singh, Speaking English effectively.
5. Krishna Mohan & Meera Bannerjee, Developing Communication skills.
6. Frank O'Connor, Phonetics, Penguin.
7. Business Correspondence & Report writing Sharma & Krishna Mohan, Tata McGraw.
8. Technical communication – Raman, Oxford University press.
9. Personality Development and soft skills, Mitra, Oxford University press.
10. Pronunciation of English – A C Gilson.

**Reference books:**

1. Sardanand K, Teaching, Listening & speaking (with audio CD), Orient Blackswan, Hyderabad.

CE 101	<b>L-T-P</b>
Engineering Mechanics	<b>3-1-0</b>
<b>4 credit</b>	
<b>Module -I</b>	
<ol style="list-style-type: none"> <li>1. <b>Statics:</b> Force systems: Moment of a force about a point and about an axis; Equivalent forces and moment, Wrench. <b>[6 Lectures]</b></li> <li>2. <b>Equilibrium:</b> Free body diagram; equations of equilibrium; problems in two and three dimensions; Supports and reactions <b>[3 Lectures]</b></li> <li>3. Method of sections for evaluating internal forces in bodies; axial force, shear and bending moment diagrams: <b>[3 Lectures]</b></li> <li>4. Trusses and frames <b>[3 Lectures]</b></li> </ol>	
<b>Module -II</b>	

5. **Friction:** Laws of Coulomb friction, impending motion problems involving large and small contact surfaces [3 Lectures]
6. Principle of virtual work [3 Lectures]

**Module - III**

7. **Dynamics:** Kinematics and Kinetics of particles: Particle dynamics in rectangular coordinates cylindrical coordinates and in terms of path variables. [4 Lectures]
8. Kinematics and Kinetics of rigid bodies: Chasle's Theorem; General Plane motion; D' Alembert's Principal, Work & Energy and Impulse Momentum methods, Impact. [6 Lectures]

**Module - IV**

9. Simple Stress and Strain, Hook's Law [2 Lectures]
10. Analysis of stresses, Equilibrium Equations, Generalized Hook's Law, Elastic constants [3 Lectures]
11. Analysis of strains, Normal and Shear Strains, Volumetric Strain [3 Lectures]
12. Axially loaded members [3 Lectures]

**Text Books:**

1. Engineering Mechanics by Shames, Pearson's Education.
2. Mechanics for Engineers, Beer, F.P. and Johnston, Tata McGraw Hill, New Delhi
3. Engineering Mechanics, Meriam, Wiley Pub.
4. Engineering Mechanics, R .C. Hibbler.
5. Mechanics of Solids, Timoshenko and Gere, McGraw Hill Inc
6. E.P. Popov, Mechanics of Solids, Pearson Education pub.

**Reference Books:**

1. Engineering Mechanics, Timoshenko, McGraw Hill Inc.

HS 105	<b>L-T-P</b>
Science, Society & Ethical Values	<b>2-0-0</b>
<b>2 credit</b>	
<p><i>The primary objective of the Course detailed in the successive paragraphs for Science, Society &amp; Ethical values is keeping in view the present day scenario an urgent need to introduce this subject as part of the class room curriculum was felt and hence included in the syllabus. The aim is to inculcate the right values during the period that a youngster is preparing to step into the professional world and still in the process of understanding the society and the relevance of science in the right perspective.</i></p>	
<p><b>Professional Ethics:</b> Aim of Professionals, Responsibilities of Professionals, Right of Professionals, Impediments to responsibilities, Honesty, Integrity, Reliability, Risk, Safety and Liability, Global Issues.</p>	
<p><b>Personal Ethics:</b> Value of Self, Others and Society, Compliance with law, Social Norms.</p>	
<p><b>Service to Community,</b> Corruption, Indian and Western Culture, Simple living and high thinking, Science and Spirituality.</p>	
<p><b>Reference Books:</b></p>	
<p>1. Charles E. Harris et al, Engineering Ethics, Cengage, 2009</p>	
<p>2. N. N. Das, Ethical Considerations.</p>	
<p>3. Professional Ethics by R. Subramaniam, Oxford University Press</p>	

AR 111 Basic Design - II	<b>L-T-P</b> <b>1-1-6</b> <b>4 credit</b>
Objective: To provide the basic understanding of design in terms of design principles from transformation of forms to building block modeling.	
<p><b>Unit-1 (Introduction to geometric transformation and grouping)</b></p> <p>1. Transformation of forms in geometric composition.(1 Lectures)  2. Taxonomy of spaces through small functional groupings.(1 Lectures)  3. Behavioral inputs.(1 Lectures)</p> <p><b>Unit-2 (Understanding of architectural design aesthetic through simple projects)</b></p> <p>4. Aesthetic criteria in three-dimensional architectural design. .(1 Lectures)  5. Literature studies of simple design projects.(1 Lectures)  6. measured drawings of simple projects and .(1 Lectures)</p> <p><b>Unit-3 (Understanding of 3D composition with blocks and portfolio preparation)</b></p> <p>7. preparation of portfolio of literature studies.(1 Lectures)  8. Minimum one 3D composition of different form. (1 Lectures)  9. Block model. (1 Lectures)</p> <p><b>Unit-4 (Assignments involving design of simple functions)</b></p> <p>10. Design assignments involving simple and single function such as: (5 Lectures)  11. Milk booth, Cycle stand, A.T.M. Booth, bus-stop shelter, Kiosk design, Memorial etc.  (Minimum 1 major and 2 minor projects rendered in ink/colour with model of atleast one project)(6 Lectures)</p>	
Outcomes: Developed understanding of design principles and Model making process.	
<p><b>Reference Books</b></p> <p>1. Space. Time and Architecture/ Gideon  2. Elements of Architecture from Form to place, von Meiss, Pierre  3. Frank Lloyd Wright on Architecture/ Wright  4. Free Spirit in Architecture Papadakis  5. Traditions in Architecture/Data Planning, Crouch June. Johnson  6. Introduction to Architecture/Snyder, James  7. Colour for Architecture/Porter , Tom  8. Architecture in Pen and Ink/Chen John S M  9. Graphic details for Architects/Kemmerich, Carl  10. Manual of Graphic Techniques for Architects, Graphic Designers and Architects/Kemmerich Carl  11. New Metric Handbook; Planning and Design Data  12. A Textbook of Perspective and Sciography/Shankar Mulik  13. Architectural Rendering /Alibert O. Halse  14. Engineering Graphics/N.D. Bhatt  15. Graphics for Architects and Planners/Russel, James E</p>	
AR 112 Architectural Graphics-II	<b>L-T-P</b> <b>1-0-6</b> <b>3 credit</b>
Objective: To develop the understanding of sheet presentation techniques from Objects scaling and composition of drawings to projections theories.	

**Unit-1 (Development of presentation techniques by understanding of Scale and 2D-3D objects relationship)**

1. Introduction to presentation techniques, .(1 Lectures)
2. Scaling objects, Composition of drawings on different sizes of sheets, .(1 Lectures)
3. Study of 2D & 3D visual relationships, simple perspective and various geometric forms.(1 Lectures)
4. Study of objects in light and shade, sketching techniques and its applications.(1 Lectures)
5. Three dimensional compositions of forms and their graphic expression.(1 Lectures)

**Unit-2 (Understanding of rendering techniques for architectural drawings along with siographic studies)**

6. Basic rendering techniques , rendering of Plans , elevations ,sections & graphic Objects in 2D & 3D (ink and colour), (1 Lectures)
7. Perspective views of simple geometric forms (one and multi points) .(1 Lectures)
8. Sciography of geometrical and architectural forms-shades and shadows on building facades .(1 Lectures)
9. Plan & elevation: Plants, trees, objects, furniture, human beings .(1 Lectures)

**Unit-3 (Indoor outdoor exercises to understand the graphics of a building as well as surroundings)**

10. landscape studies, (1 Lectures)
11. building studies, Indoor and Outdoor exercises in colour and black & white,(1 Lectures)
12. Use of line weight and colour in plan, elevation and sections. (1 Lectures)
13. Photography techniques. (1 Lectures)

**Unit-4 (Study of solid geometry, their sections and projections theories)**

14. Section of solids – true shape of section
15. Development of surfaces
16. Intersection of surfaces
17. Isometric projection, isometric scale

Outcomes: Developed understanding of sheet presentation techniques and projection theories.

Reference Books:

1. Architecture in Pen and Ink/Chen John S M
2. Graphic details for Architects/Kemmerich, Carl
3. Manual of Graphic Techniques for Architects, Graphic Designers and Architects/Kemmerich Carl
4. New Metric Handbook; Planning and Design Data
5. A Textbook of Perspective and Sciography/Shankar Mulik
6. Architectural Rendering /Alibert O. Halse
7. Engineering Graphics/N.D. Bhatt
8. Graphics for Architects and Planners/Russel, James E

AR 113

Architectural Workshop

L-T-P

0-0-3

1 credit

Objective: To understand the processes of detail and block model making.

**Unit-1 (Preparation of Block model for various shapes using various materials)**

1. Preparation of Block model of geometrical objects using various types of materials like paper, hardboard, soft board, plastic pvc sheet, thermocole, clay, plaster of Paris etc);
2. Different types of arches roof structures like dome, vault, hipped roof, pitched roof etc;
3. Clay and sand modeling of organic forms.

**Unit-2 (Creation of openings in surfaces & use of landscape elements)**

4. Openings in surface 5. Landscape elements <b>Unit-3 (Design of furnitures)</b> 6. Furniture <b>Unit-4 (On scale model making)</b> 7. Model of important structure on scale
Outcomes: Developed understanding of model making. Selection of material and scale for proposed models

AR 114 History of Architecture-I	<b>L-T-P</b> <b>2-0-2</b> <b>3 credit</b>
Aim: Introduction to Hindu Architecture and its development through time period with consideration of social, religious, customs, building materials and techniques	
<b>Unit-1 (History of Indian architecture from Vedic to Buddhist period)</b> 1. Introduction of architectural developments in India 2. Development of architectural principles and materials used during vedic period. 3. Buddhist architecture (Sanchi group, Ajanta, Armavati)	
<b>Unit-2 (History of Indian architecture from Jain to Aihole period)</b> 4. Jain temples-Maninath, Dilwara temples (Mount Abu) 5. Early Hindu Group-Gupta architecture and Aihole group	
<b>Unit-3 (Understanding of Vastushastra)</b> 6. Vastushastra in context to evolution of Temples 7. Evolution of Indo-Aryan (Orissan style, Khajuraho Group) and Dravidian style and analysis of examples of each group	
<b>Unit-4 (History of Rajputana Architecture)</b> 8. Rajput Architecture	
Expected outcome: Development of understanding of evolution of Hindu architecture over time	
Reference Books: 1. History of Indian and Eastern Architecture/Fergusson James 2. Sir Bannister Fletcher's A history of Architecture Musgrove John 3. Living Architecture Vol 1 & 2/A Volwahren 4. Indian Architecture (Islamic Architecture)/Brown Percy 5. Indian Architecture in Indian/SatishGroover	

AR 115 Principle of Architecture	<b>L-T-P</b> <b>2-1-0</b> <b>3 credit</b>
Aim: Introduction to principles of architecture	
<b>Unit-1 (Concept &amp; basic principles of Architecture)</b> 1. Definition and concept of Architecture through ages-Man-Environment relationship; (2 Lectures) 2. Principles of space organization; (2 Lectures) 3. Fundamentals of visual arts: line, form, texture, color, tones etc; (2 Lectures) 4. Concept of composition and unity; (3 Lectures)	
<b>Unit-2 (Use of scale, proportion, composition and mass in architectural design)</b> 5. Proportion and its application to design; (3 Lectures) 6. Scale- types and their use in Architectural design(3 Lectures)	

7. Principles of composition. Composition of masses, (3 Lectures)
8. The elements of contrast, Contrast in form and mass (3 Lectures)
<b>Unit-3 (Visual perception of color, size and 2D-3D objects)</b>
9. Qualities of architectural spaces in relation to size, scale, and proportion and relationship between 2D and 3D spaces. (3 Lectures)
10. Composition of the plan and relation between plan and elevation (3 Lectures)
11. Psychology of perception-Visual sense, colour perception. Attention and its role in perception (3 Lectures)
12. The perception of objects and events; organization and perception(3 Lectures)
<b>Unit-4 (Understanding of peoples perception, color, schemes and harmony)</b>
13. Factors responsible for perceptual organization, perception of people (3 Lectures)
14. Colour- definition, types, dimensionalities, Colour wheel, (3 Lectures)
15. Colour Schemes Study of colours with reference to colour theory, Harmony, Rhythm, Balance (3 Lectures)
Expected outcome: Development of understanding of architectural principles
Reference : The principles of Architectural Composition by Robertson Howard-Architectural press, UK, qsasa
Practical: Working in Windows environment, Internet, C programming based on above syllabus.
Text Books: 2. Introduction to Information Technology, by ITL Education Solution Ltd., Pearson Education 3. Programming in ANSI C by E Balagurusamy 4th Ed
Reference Books 1. Fundamental of Computer & IT By A. Jaiswal (Weily India) 2. The C Programming Language, 2e, by Brian W. Kernighan & Dennis M. Ritchie, PHI/Pearson Education 3. Mastering C by K.R. Venugopal, & S.R. Prasad, Tata McGraw Hill

AR 119	<b>L-T-P</b> <b>0-0-0</b> <b>0 credit</b>
Seminar /Architectural Tour/ NASA/ ZONASA-I	
Presentations based on the subjects taught in the Semester. Students are expected to submit hard and soft copies of their presentation.	

AR 121	<b>L-T-P</b> <b>1-1-6</b> <b>4 credits</b>
Architectural Design-I& Field Study	
Aim: To understand the design methodologies, systematic approach in design concept, consideration of role of climatic aspect in design processes, Introduction to structural principles.	
<b>Unit-1 (Understanding of design methodology)</b>	
Understanding design methodology through small studio assignments. Relevant literature review and similar case studies. Programming and formulation of concept in assignment. Generation of bubble diagram and activity proximity matrix to establish functional relationship among various spaces.	
<b>Unit-2 (Understanding of climatic data, social aspects and basic structural elements for architectural design)</b>	
Application of climatic data, basic structural and social consideration in architectural design.	



<p>Field study tour of historical buildings with emphasis on measured drawing.</p> <p><b>Unit-3 (Use of Bye-Laws for design preparation and Design Assignment 1)</b> Confirmation with Byelaws, open Space, height, set backs etc. Design assignments such as residential building, Petrol filling stations, restaurants, guest houses, Panchayat Bhawan.</p> <p><b>Unit-4 (Design Assignment 2)</b> Multipurpose hall, Primary school, Bank building, Shopping plaza, Nursing home etc. (Minimum 1 major and 2 minor projects with interior and exterior perspective view and 3D model of at least one project) Guest lectures by practicing architects.</p> <p>Expected outcome : Development of design methodologies through small studio assignments, Schematic Design building of single function building,</p> <p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Space , Time &amp; Architecture/Gideon</li> <li>2. Elements of Architecture from Form to place/Von Meiss Pierre</li> <li>3. Free Spirit in Architecture/Papadakis</li> <li>4. Introduction to Architecture/Snyder, James</li> <li>5. Colour for Architecture/Porter, Tom</li> <li>6. Time Savers Standards A handbook of Architectural Design Callender, J Hancock</li> <li>7. Time Savers Standards For Building Type De Chiara J</li> <li>8. Time Savers Standards For Landscape Architecture Harris</li> <li>9. Time Savers Standards For Interior Design and Space Planning De Chiara Joseph</li> <li>10. National Building Code</li> </ol>
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AR 122	<b>L-T-P</b>
Building Construction-I	<b>2-0-4</b>
<b>3 credit</b>	
Aim: Introduction to building construction and various components of buildings; General details of various types of construction system (brick, stone, wood, etc.)	
Outcome: The course will enable the student to understand the actual execution of building on the site, practically.	
<p><b>Unit-1 (Basics of Foundation works)</b> Definition, safe bearing capacity of soils and methods of improving the depths and width of foundations; causes of failure and remedies. Simple, stepped, combined and cantilevered footing, RCC footing and raft foundation.</p> <p><b>Unit-2 (Understanding of construction temporary works)</b> Excavation and timbering of trenches with special reference to loose soils and sub soil water. Shoring, underpinning and scaffolding</p> <p><b>Unit-3 (Basics of Basement Construction)</b> Water Proofing – different types of water proofing techniques and material used, their compositions and application (stone cladding, powders, asphalt, bitumen, asbestos, bituminous felts caulking compounds etc.) Constructional details of walls, floors, foundations etc. with particular emphasis of their damp</p>	

<p>proofing and natural ventilation. Masonry walls in bricks and stone; hollow and panel walls; Advantage over load bearing walls and the practical considerations during. Basic of underwater constructions process and their details</p> <p><b>Unit-4 (Exposure to construction site)</b> Guest lectures by Industry experts and site visits.</p>
Expected outcome : Understanding of Construction methodologies for brick, stone and wood works.
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1.B.C. Punamia ``Building Construction'', Laxmi Publications, Delhi.</li> <li>2.R. Chudley, ``Construction Technology-Vol 1 2'' 2nd Edition, Longman. UK, 1987.</li> <li>3.W.B. Mckay, ``Building Construction-Vol 1, 2, 3 and 4,`` 5th Edition, Orient Longman, UK, 1993.</li> <li>4.National Building Code of India, Indian Standards Institution, New Delhi.</li> </ol>

AR 123	<b>L-T-P</b>
History of Architecture-II	<b>2-0-2</b>
	<b>3 credit</b>
Aim: Introduction to Islamic Architecture and development of architecture through time period with consideration of social, religious, customs, building materials and techniques	
<b>Unit-1 (Islamic Architecture)</b>	
Development of Islamic architecture in India	1
Lecture	
<b>Unit-2 (Dynastic Style)</b>	
Features of Dynastic style (Slave dynasty, Khiljis, Tughluq, Lodis etc.)	8
Lectures	
<b>Unit-3 (Provincial Styles)</b>	
Features of Provincial styles such as Bijapur, Golkunda, Gujarat, Malwa, Jaunpur, Bengal, Punjab	8
Lectures	
<b>Unit-4 (Mughal Architecture and sher Shah Suri period)</b>	
Architecture under Sher Shah Suri	2
Lecture	
Mughal Architecture	9
Lectures	
Expected outcome: Development of understanding of evolution of Islamic architecture over time	
Reference Books:	
1.History of Indian and Eastern Architecture/Fergusson James	
2.Sir Bannister Fletcher's A history of Architecture/ Musgrove. John	
3.Living Architecture Vol. 1 & 2 A Volwahren	
4.Indian Architecture : Buddhist and Hindu Periods Brown Perry	

AR 124	<b>L-T-P</b>
Building Materials (Material Science & Technology)	<b>1-1-0</b>
	<b>2 credit</b>
Aim: Introduction to Building Material Science and Technology	
<b>Unit-1 (Classification of building materials and knowledge of Natural building materials)</b>	
Introduction to building materials-classification and special features.	

<p>Natural materials: Their properties, forms and availability, defects, strength, limitation and utility  Clay and clay materials, terracotta  Brick-Types, methods of manufacturing, physical and chemical properties, essential qualities of structurally good brick, roof tiles  Building stone-Types of stones, properties, essential factors responsible for durability of stone.  Timber-Different types of timber, conversion from trees to usable timber, Seasoning and preservation.</p> <p><b>Unit-2 (Hybrid Building materials)</b>  Cement: types-Portland, pozzolana, rapid hardening, coloured cements &amp; special cements  Concrete-types of concrete (cement concrete, lime concrete etc.), methods of preparation with reference to proportion of mixes for different uses, special properties for use in R.C.C. work. Concrete composition-properties of PCC and RCC, methods of concrete construction, pre-cast concrete and ferro-concrete.  Processed materials Plywood, laminated wood, fibre-boards and light weight boards, panels  Ceramic materials and components, sanitary ceramic items.  Mortars-definition, types of mortars, methods of preparation with a special reference to quality, ingredients of mortar.</p> <p><b>Unit-3 (Ferrous, non ferrous and acoustical building materials)</b>  Ferrous metals-pig iron, cast iron. Mild steel, Tor steel and stainless steel  Non Ferrous Metals: Aluminium, copper, leads, etc.  Heat insulating and acoustic materials. Organic binders, adhesives and glues, glass and polymer materials.  Flooring materials, roof tiles, wall tiles.</p> <p><b>Unit-4 (Use of paint and glass as a building materials)</b>  Paints varnishes and distempers, Miscellaneous materials: Asbestos, asphalt, adhesive, bitumen.  Glass-Types of glass-sheet, float, plate and toughened, ingredients and manufacture of Glass, forms, properties of Glass for building purposes and structural uses.  Modern building materials, ready to use modular material.  Fibre reinforced plastics</p> <p>Expected outcome: Understanding of Building Material Science and Technology</p> <p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. A Text Books of Building Construction/Arora, S P Bindra</li> <li>2. Materials and Methods in Architecture/Holmes</li> <li>3. Engineering Materials/Rangwala</li> <li>4. Architectural Material Science/D Airapetov</li> <li>5. Construction Material/ Ghosh</li> </ol>
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AR 125	<b>L-T-P</b>
Climatology and Solar Passive Architecture	<b>2-1-0</b> <b>3 credit</b>
Aim: To understand climatology and climatic design principles and their influence on building design through solar passive techniques	
<p><b>Unit-1 (Introduction to climate and its impact on buildings and indoor comfort)</b>  Climatology and its relation to designing of buildings.  Climate and weather, earth, atmosphere, rotation and seasons.  Climatic elements-Sun, solar radiation, temperature, wind, humidity, cloud, precipitation and their effect on comfort conditions.</p> <p><b>Unit-2 (Knowledge of various climatic zone from Macro to Micro climate)</b>  Macro Climate and Micro-climate.  Types of tropical climate, climatic control systems in tropical climate.</p>	

<p>Sun path diagram.  Design of windows, openings and shading devices.  Heat flow through design elements.</p> <p><b>Unit-3 (Selection of building materials and orientation of a Building)</b>  Building Materials and constructions in the tropics.  Orientation of buildings.</p> <p><b>Unit-4 (Understanding the concepts behind Solar passive and active architecture)</b>  Concepts of solar architecture, utilization of solar energy in cooling, heating and lighting the buildings by passive and active methods, photovoltaic cell etc.  Application of solar energy in water heating and related technology.  Design integration and considerations for application of solar energy in buildings.</p> <p>Expected Outcome : Development of understanding climatic design principles and their influence on building design</p> <p>Reference Books :</p> <ol style="list-style-type: none"> <li>1. Manual of Tropical Housing and Building/Koenigsberger</li> <li>2. Design with Climate/ V. Olgay A Y</li> <li>3. Solar Control and Shading Devices /Olgay and Olgay</li> <li>4. Climatic Responsive Architecture- A Design Handbook for energy Efficient Bldg./Arvind Krishna, Nick Baker/Tata McGrawhill</li> </ol>
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AR 127	<b>L-T-P</b>
Structure, Form & Architecture	<b>2-1-0</b>
<b>3 credit</b>	
<p><b>COURSE OBJECTIVES :</b>  Introduce the design process as a synthesis of a variety of factors, analyzed and studied.  Develop a perception of space and a sense of visualization with the help of tools like sketches, drawings, models, computer animation etc.</p>	
<p><b>COURSE OUTLINE :</b></p> <p><b>Unit-1 (Understanding of Architectural structures)</b></p> <ul style="list-style-type: none"> <li>• Conceptual outline of scope of Architectural structures.</li> <li>• Brief outline of Basic components of Architectural structure.</li> </ul> <p><b>Unit-2 (Load and stress situations to determine a form using various materials)</b></p> <ul style="list-style-type: none"> <li>• Structural efficiencies of materials, Loads and Stress – Situations.</li> <li>• Principal determinants of ‘Form’</li> </ul> <p><b>Unit-3 (Performance analysis and formal characteristics of building materials)</b></p> <ul style="list-style-type: none"> <li>• Performance analysis of conventional material, structural efficiencies.</li> <li>• ‘Formal’ characteristics of ‘Supporting’ and ‘Supported’ elements of conventional structural materials.</li> </ul> <p><b>Unit-4 (Conceptual comparison of various structural systems and their components)</b></p> <ul style="list-style-type: none"> <li>• Conceptual comparison of various structural systems.</li> <li>• Process of Architectural Designing, underlining its implicit need to match the emphasis on structural components</li> </ul>	
<p><b>RECOMMENDED READINGS :</b></p> <ol style="list-style-type: none"> <li>1. Structure in Architecture – Heller Robert and Salvadori Mario</li> </ol>	

2. Design Fundamentals in Architecture – Prammar  
 3. Architecture : Form, Space and order – Francis D. K. Ching

AR 126	<b>L-T-P</b> <b>0-0-4</b> <b>1 credit</b>
Computer Application in Architecture	
Aim: To acquaint students with AutoCAD, application of computer graphics in architectural drawing	
<b>Unit-1 (To understand the use of CAD tools for design preparation)</b> Application of Auto-CAD in preparation of two and three dimensional architectural drawings (models/Views/Walkthroughs)	
<b>Unit-2 (To understand the various commands used in Auto-Cad and 2D drawing preparation)</b> UCS generations Auto-CAD Commands Creation of entities, dimensioning.	
<b>Unit-3 (Use of solid surfaces)</b> Application of solids and surfaces. Customization of AutoCAD	
<b>Unit-4 (Use of architectural library and 3D-Imaging softwares)</b> Introduction to AutoLisp and creation of architectural library elements Applications of 3D-Imaging softwares.	
Expected Outcome : Developed skill for working on CAD	
Reference Books: 1.Mastering Auto Cad-2007/Tickoo, Sham 2.Mastering Auto Cad -2007 Bible/Finkelstein, Ellen.	

CE 102	<b>L-T-P</b> <b>3-0-0</b> <b>3 credit</b>
Green Chemistry (Environmental Science)	
OBJECTIVE: To impart knowledge and Awareness among the student about the Environmental Pollution, introduction about the various resources and sustainable development. Understanding about the ecology, biodiversity.	
EXPECTED OUTCOME:  The students would be able to understand how to stop the degradation of environment, and way of utilization of the resources so that environment may develop in sustainable way.	
DETAILED COURSE OUT LINE: <ol style="list-style-type: none"> <li>1. Definition, scope and importance of Environmental Studies, Need for public awareness. <b>(2 lectures)</b></li> <li>2. Environmental Pollution (water, air, noise etc): Definition, Causes, effects and control measures. <b>(7 lectures)</b></li> <li>3. Solid waste management <b>(2 lectures)</b></li> <li>4. Natural resources and associated problems. Renewable and Non-renewable energy resources. <b>(2lectures)</b></li> <li>5. Concept of an ecosystem: Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains and ecological</li> </ol>	

- pyramids. **(4 lectures)**
6. Biodiversity and Its Conservation. **(3 lectures)**
  7. Social Issues and Environmental ethics **(3 lectures)**
  8. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, disaster management. **(6 lectures)**
  9. Wasteland reclamation. **(2 lectures)**
  10. Consumerism and waste products. **(1 lectures)**
  11. Acts related to Environment Protection, Issues involved in enforcement of environmental legislation. **(3 lectures)**
  12. Human Population and the Environment. **(2 lectures)**
  13. Field work equal to 5 lecture hours. **(5 lectures)**

**TEXT BOOKS:**

1. Introduction to Environmental Engineering and Science, G.M. Masters, Pearson Education.
2. R. Rajagopalan, Environmental Studies, Oxford IBH Pub ,2011.
3. Benny Joseph, Environmental Studies, McGraw Hill Pub ,2008.
4. ErachBharucha, Text Book for Environmental Studies, Pub., UGC ,2004.

**REFERENCE BOOKS:**

1. Environmental Science by Botkin Keller, Eight edition Wiley publisher

**END SEMESTER EXAMINATION:**

*The end semester examination will be of a predetermined duration covering the entire syllabus covering both theoretical upon the instructors discretion where all questions will need to be answered.*

AR 131 Architectural Design - II& Field Study	<b>L-T-P</b> <b>1-1-6</b> <b>4 credit</b>
Aim : In continuation to the previous semester, the students are exposed to Design theories and their application for comparatively complex problems with emphasis on interrelationship of different elements of building and application of structural principles.	
Design theory and application based on Passive Solar Systems. Application of climatic data, bio-climatic design principles in orientation of buildings, social and structural considerations in more complex design problems such as house, Secondary school, Exhibition, Pavilions, Resort buildings, Club buildings, Motels community centre, students' dormitory Understanding of inter-relationship of different elements of a building. Analysis of a given design (landmarks in architecture and buildings in India). Design emphasizing forms. Field study tour for historical and modern buildings (Minimum 1 major and 2 minor projects with 3D model of at least one project) Guest lectures by practicing architects.	
Expected Outcome : Development of understanding of Design theories with emphasis on interrelationship of different elements of building and application of structural principles.	
Reference Books : 1. Space , Time & Architecture/Giedion 2. Elements of Architecture from Form to place/Von Meiss Pierre	

<ol style="list-style-type: none"> <li>3. Free Spirit in Architecture/Papadakis</li> <li>4. Introduction to Architecture/Snyder, James</li> <li>5. Colour for Architecture/Porter, Tom</li> <li>6. Time Savers Standards A handbook of Architectural Design Callender, J Hancock</li> <li>7. Time Savers Standards For Building Type De Chiara J</li> <li>8. Time Savers Standards For Landscape Architecture Harris</li> <li>9. Time Savers Standards For Interior Design and Space Planning De Chiara Joseph</li> <li>10. National Building Code</li> </ol>
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AR 132	<b>L-T-P</b>
Building Construction-II	<b>2-0-4</b>
<b>3 credit</b>	
Objective: It will enable the students to learn detailing of foundations, masonry works, flooring, and temporary works	
<p><b>Unit-1 (Construction of Foundation)</b></p> <ol style="list-style-type: none"> <li>1. Pile foundation (piling and sheet piling)</li> <li>2. Grillage foundation</li> </ol> <p><b>Unit-2 (Construction of Masonary Works)</b></p> <ol style="list-style-type: none"> <li>1. Hollow panel walls- Advantage over solid load bearing walls</li> <li>2. Light weight concrete blocks</li> <li>3. Glass block construction</li> <li>4. Precast panel walls</li> <li>5. Stone panel walls.</li> </ol> <p><b>Unit-3 (Construction of Floors)</b></p> <ol style="list-style-type: none"> <li>1. Common types of floors</li> <li>2. Method of laying and finishing of floors for pcc, Mosaic, Terrazo tiles, paving stones and marble tiles and floors</li> </ol> <p><b>Unit-4 (Construction related temporary works and Finsishing work)</b></p> <ol style="list-style-type: none"> <li>1. Formwork for column and beams</li> <li>2. Shuttering for slab and cantilever</li> <li>3. Wooden doors, windows and ventilators (Flush, panelled and glazed doors, windows, ventilators and fan lights) and joinery details.</li> <li>4. Guest lectures by Industry experts.</li> </ol>	
Suggested Text Books:	
<ol style="list-style-type: none"> <li>1. Barry. R, Construction of Buildings</li> <li>2. Allen. E, Fundamentals of building construction materials and methods</li> <li>3. Mekay. W. B, Building construction I, II, III and IV</li> </ol>	

AR 133	<b>L-T-P</b> <b>2-1-0</b> <b>3 credit</b>
Contemporary Architecture	
Aim : To expose the students to the development of contemporary architecture and enrich their knowledge about contemporary design philosophies in the global scenario	
<p>Beginning of contemporary architecture.</p> <p>Industrial revolution. Inventions of building materials and techniques, its influence on prevailing styles. The Great exhibitions. Broad outline of the architectural developments during and after industrial revolution.</p> <p>Precedence of modern Architecture-its qualities and influence on eclectic tendencies of early 19th century.</p> <p>Search for new forms, rationalism, engineering tradition-Portland cement, development of Ferro-concrete upto 1900 and development of RCC, frame construction and its impact on architecture.</p> <p>Special utilities and span problems of 19th century, Movement in arts and architectural relationship, expression and the art Nouveau movement in Europe</p> <p>American development, Chicago School, Louis Sullivan, architectural system of Frank Lloyd Wright-Prairie houses. Responses to mechanization-DeutscherWerkbund and Futurism, De stijl and Amesterdam School. New space conceptions, Cubism, Le Corbusier's quest for ideal form, Bahaus and the international style, Walter Gropius, Mies Van Der Rohe, Philip Johnson, Robert Mallart, P.L. Nerve, Salvadori, etc. Development of surfaces and long span system. Louis Kahn, Hennibique, AugustePerretetc-their works and influences. Problems of Regional Identity-movements in Scandinavia and Japan.</p> <p>Works of Indian Master Architects-A P Kanvinde, B.V. Doshi, Charles Correa, Raj Rewal-emphasis on Modernity and Tradition in the regional context and contemporary trends in Indian Architecture.</p> <p>Birth of post modernism. Deconstruction and architecture in the age of electronic media, emerging concepts. Present revolution in science and technology, as a futuristic vision, emerging concepts of human habitat, possible changes and future possibilities in architecture. Some ongoing experiments by leading architects of today are highlighted as path finder.</p>	
Expected Outcome : Enrichment in knowledge about the contemporary architectural scene	
Reference Books:	
1. Space, Time and Architecture/ Gideon	

AR 142	<b>L-T-P</b> <b>2-1-0</b> <b>3 credit</b>
Building Services (Water Supply & Sanitation)	
Aim : Development of knowledge about various aspects of water-supply, drainage, sewerage system and solid waste disposal from the buildings	
<p><b>Unit-1 (Elements of public water supply system)</b></p> <p>Sources of water supply, standard of purity. Conventional water treatment-sedimentation, coagulation, filtration and disinfection. Different distribution systems, booster pumps, underground &amp; overhead tanks, capacity of pumping plants, ferrule, water meters, stopcocks, bib cocks and pipe appurtenances.</p> <p>Hot water supply systems in buildings, their design, materials, joints, fittings and valves. Direct and indirect systems, special installation in multistoried buildings.</p> <p>Recycling process for water- Primary, Secondary and Tersarysystems.</p> <p>Modern fire fighting systems in multi-storied buildings.</p> <p><b>Unit-2 (Knowledge of Bylaws and rules related to santiation of a building)</b></p> <p>Model bye laws and rules of sanitation of building, sewage and garbage disposal systems.</p> <p><b>Unit-3 (Knowledge of various sanitary fixtures)</b></p>	



Specification of various sanitary fittings and fixtures-taps, wash basins, water closets, urinals, bidets, sinks, mechanism of flush cistern. Fall and laying of drainage, conditions of flow in building drainage pipes, traps, vents and details of pipe joints.

Design of drainage and vent pipes, system for low-rise and high-rise buildings, storm water drainage, design of storm drains, building drains, sewers, gully traps, inspection chambers, manholes, connection to public sewers.

**Unit-4 (Basic principles of sanitation and disposal of waste matters from building)**

Septic tanks, soak pits and anaerobic filters, on-site processing and disposal methods. Design of sewerage systems, conventional waste-treatment, activated sludge, trickling filters, oxidation ponds, etc.

Solid waste management (collection and disposal) system.

Expected Outcome : Developed understanding of various aspects of water-supply, drainage, sewerage system and solid waste disposal from the buildings

Reference Books :

1. Water Supply /Garg S. K
2. Sewage Disposal and Air Pollution Engineering /Garg S. K

AR 149	<b>L-T-P</b>
Seminar /Architectural Tour/ NASA/ ZONASA-II	<b>0-0-0</b>
Presentations based on the subjects taught in the Semester. Students are expected to submit hard and soft copies of their presentation.	
<b>0credit</b>	

CE 108	<b>L-T-P</b>
Surveying	<b>3-0-3</b>
<b>4 credit</b>	
<b>OBJECTIVE: To impart knowledge and skill of surveying theory and practice.</b>	
<b>EXPECTED OUTCOME:</b> <i>The students would be able to understand about chain surveying, compass traversing, leveling, theodolite and tachometric survey, plane tabling, total station and curves.</i>	
<b>DETAILED COURSE OUTLINE:</b>	
<ol style="list-style-type: none"> <li>1. Introduction: importance of Surveying, Types of surveying, Principle of surveying, Scales (Plain &amp; Diagonal), Plan &amp; Map, Shrinkage of maps, Mapping concepts, Map projections, Total station uses and applications. <span style="float: right;"><b>4 lectures</b></span></li> <li>2. Chain Surveying: Purpose, Chaining accessories (chains, Tape, arrows, pegs, ranging rods, offset rods, plumb bob etc), ranging and its type, error due to incorrect chain, chaining on uneven ground, errors in chaining, tape corrections, survey stations and lines, well-conditioned triangle, Basic problems in chaining, Obstacle in chaining, Field book entry, standard conventional symbols for different objects <b>6 lectures</b></li> <li>3. Compass: Introduction and Purpose, Definitions: True meridian and true bearing, magnetic meridian and magnetic bearing, Prismatic compass and surveyor's compass, Designation of magnetic bearing (WCB &amp; QB), Magnetic Declination, Isogonic and Agonic</li> </ol>	

lines, Local attraction and its adjustment

**4lectures**

4. Plane Table Surveying: Equipments and uses, Principle of surveying, Methods of Plane Tabling, Closing error and its adjustment, Two point problem and three point problem  
**3lectures**

5. Levelling: Objects and use of levelling, Equipments, Types of levelling, Adjustment of dumpy level, Methods of levelling, Level book and computation, Missing data, Curvature and refraction correction, Reciprocal leveling. Contouring: Definition, Methods of contour survey and Plotting of contour  
**6lectures**

6. Theodolites and Theodolite traversing: Scope, Types, Temporary adjustment of transit theodolite, Measurement of horizontal angles, Errors and its elimination, Methods of traversing, Calculation of latitude and departure, Balancing of traverse: Gale's traverse table, Bowditch's method, Transit method, Graphical method and Axis method  
**6lectures**

7. Tacheometric survey: Instruments used in tacheometry, principles of tacheometry, determination of tachometry constants, methods of tacheometry: stadia method and tangential method, field work in tacheometry  
**4lectures**

8. Curve: Simple curve – scope, Degree of curve, characteristics, offset from tangent, offset from chord produced, Rankin's method, obstacles. Compound and reverse curve – Introduction of cases. Transition curve – Combined curve, super elevation, length of transition curve, characteristics, equations, shift, tangent length and curve length of combined curve, computation for setting out of combined curve. Vertical curve – scope, assumption of vertical curve, equations, computation for setting out curve, summit and valley curve.  
**9 lectures**

**Text Books:**

1. Surveying and Levelling by N.N.Basak, TMH Publication
2. Surveying by B.C. Punamia, A.K. Jain and A.K. Jain, Vol. 1, Laxmi Publications (P) Ltd., New Delhi
3. Textbook of Surveying by C.Venkatramaiah, University Press

**Reference Books:**

1. Surveying and levelling by T.P.Kanetkar and S. Kulkarni, Vol-I
2. Surveying by K.R. Arora, Standard Book House, Delhi
3. S.K.Duggal, Surveying, Vol-I, TMH Publications, New Delhi
4. A.M.Chandra, Higher Surveying, New age international Publications, Delhi

CE 116	L-T-P 2-0-2 3 credit
Theory of Structure / MOS	
Pure Bending. Theory, assumptions and equation of bending. Concept of Sectional modulus, Distribution of bending stress in beam cross-section. Bending Stress <b>6 Lectures</b>	
Distribution in composite beam cross section, Concept of Modular Ratio. <b>6 Lectures</b>	
Assumptions and equation of shear in beam section, Shear stress in the Beam cross-section Differential equation of the elastic curve – Deflection of beams (due to bending only) by double integration method – Area moment theorems – Applications to simply supported, cantilever and overhanging beams. <b>6 Lectures</b>	
Strain energy for axial load, bending Castigliano’s First theorem. Applications to find beam deflection and deflection of Statically Determinate Truss. <b>6 Lectures</b>	
Theory of Torsion, Equation of Torsion, Solid & Hollow shaft under pure torsion, percentage of savings, stresses due to combination of Torsion and Bending Moment. <b>6 Lectures</b>	
Theory of Columns – Euler’s theory for different support conditions – Rankin’s Formula. <b>6 Lectures</b>	
Analysis of three hinged arches of parabolic and circular shape, Eddy’s theorem. Bending moment, Normal thrust and radial shear. <b>6 Lectures</b>	
<b>Recommended Books:</b>	
1. B.C. Punmia, Laxmi Publication; Strength of Material and Theory of Structures (Vol-I).	
2. S. Timoshenko: Strength of Material, Tata McGraw Hill, New Delhi.	
3. S. Ramamurtham, Strength of Material, Dhanpat Rai Publication.	
4. Singer; Strength of Material. R.K. Rajput; Strength of Material, S. Chand Publication	
GE 102	L-T-P 3-0-0 3 credit
Bio Science	
GE 105	L-T-P 0-0-0 0 credit
EAA-I NSS	
CE 116	L-T-P 2-0-2 3 credit
Theory of Structure / MOS	
Pure Bending. Theory, assumptions and equation of bending. Concept of Sectional modulus, Distribution of bending stress in beam cross-section. Bending Stress	

<p><b>6 Lectures</b> Distribution in composite beam cross section, Concept of Modular Ratio.</p> <p><b>Lectures</b> Assumptions and equation of shear in beam section, Shear stress in the Beam cross-section Differential equation of the elastic curve – Deflection of beams (due to bending only) by double integration method – Area moment theorems – Applications to simply supported, cantilever and overhanging beams.</p> <p><b>6 Lectures</b> Strain energy for axial load, bending Castigliano’s First theorem. Applications to find beam deflection and deflection of Statically Determinate Truss.</p> <p><b>6 Lectures</b> Theory of Torsion, Equation of Torsion, Solid &amp; Hollow shaft under pure torsion, percentage of savings, stresses due to combination of Torsion and Bending Moment.</p> <p><b>6 Lectures</b> Theory of Columns – Euler’s theory for different support conditions – Rankin’s Formula.</p> <p><b>6 Lectures</b> Analysis of three hinged arches of parabolic and circular shape, Eddy’s theorem. Bending moment, Normal thrust and radial shear.</p> <p><b>6 Lectures</b></p> <p>Recommended Books:</p> <ol style="list-style-type: none"> <li>1. B.C. Punmia, Laxmi Publication; <i>Strength of Material and Theory of Structures (Vol-I)</i>.</li> <li>2. S. Timoshenko: <i>Strength of Material</i>, Tata McGraw Hill, New Delhi.</li> <li>3. S.Ramamurtham, <i>Strength of Material</i>, DhanpatRai Publication.</li> <li>4. Singer; <i>Strength of Material</i>. R.K.Rajput; <i>Strength of Material</i>, S. Chand Publication</li> </ol>	<b>6</b>
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AR 141	<b>L-T-P</b>
Architectural Design - III& Field Study	<b>1-0-8</b>
	<b>4 credit</b>
<p>Aim: In continuation to the previous semester, the students are exposed to multifunctional complex problem of design with emphasis on circulation, socio-cultural factor, behavioural aspect with application of building services (water supply and sanitation)</p>	
<p>Design theory and application based on Active Solar Systems. Method of space programming, behavioural survey, Formulating design criteria of multifunction buildings involving circulation and efficiency, application of climatic data, socio-cultural factors, behavioural aspects and structural considerations, application of building services; site analysis and design concept. Inter-relationship of a functions of a building such as Community centre, Secondary school, Mall and shopping centre, Village fair, Group houses, Temple, Museum, Library, Banks, District level post office, Health Centre, etc. Critical appraisal of a building of similar nature and presentation in a form of report Guest lectures by practicing architects. (Minimum 1 major and 2 minor projects with 3D model of atleast one project)</p>	
<p>Expected Outcome : Development of understanding to multifunctional complex problem of design with emphasis on circulation, socio-cultural factor, behavioural aspect with application of building services (water supply and sanitation)</p>	
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Space , Time &amp; Architecture / Giedion</li> <li>2. Elements of Architecture from Form to place/Von Meiss Pierre</li> </ol>	

3. Free Spirit in Architecture/Papadakis
4. Introduction to Architecture/Snyder, James
5. Colour for Architecture/Porter, Tom
6. Time Savers Standards A handbook of Architectural Design Callender, J Hancock
7. Time Savers Standards For Building Type De Chiara J
8. Time Savers Standards For Landscape Architecture Harris
9. Time Savers Standards For Interior Design and Space Planning De Chiara Joseph
10. National Building Code

AR 143	<b>L-T-P</b>
Building Construction-III	<b>1-0-4</b>
<b>2 credit</b>	
Aim: It will enable the students to learn detailing of roof, stairs, partitions, metal windows and temporary work.	
<p><b>Unit-1 (Form works for complex structures)</b> Centering for arches, vaults and domes.</p> <p><b>Unit-2 (Detail for openings constructions)</b> Opening: Metal windows (Z sections &amp; L sections)</p> <p><b>Unit-3 (Detail for partitions constructions)</b> Various types of glazed and wooden partitions and panelling; Curtain walls; Sound proof and light weight partitions.</p> <p><b>Unit-4 (Detail for Staircases)</b> Stairs: Principles of stair case construction and its elements and construction; Details of various stair cases in wood, stone, steel and RCC. Guest lectures by Industry experts.</p> <p style="text-align: center;">.....</p>	

AR 144	<b>L-T-P</b>
Human Settlement & Vernacular Architecture	<b>3-0-0</b>
<b>3 credit</b>	
Objectives: To introduce and expose students to the complex inter-relationship between man and the built environment and theoretical and practical aspects of vernacular architecture	
<p><b>Unit-1 (Man &amp; Environment)</b> Biological and behavioural responses to human settlements; Design for living, natural and built environment.</p> <p><b>Unit-2 (Ancient settlement and area planning in India)</b> Human settlements during ancient, medieval and modern periods in India, Europe and other parts of the world</p> <p><b>Unit-3 (Approaches and concepts in Vernacular Architecture)</b> Forms and architectural types and its uses, examples for different Geo-climatic regions of India. Environment and its impact on the local architecture.</p> <p><b>Unit-4 (Technological and cultural heritage of India)</b> Local materials and building resources. Regional architectural features and method of construction, detailing and craftsmanship. Ecology and environmental aspects of traditional built forms and settlement systems. Services. Study of vernacular shape, grammar and allied Geo-anthropological Studies (variations in the Indian sub-continent)</p>	

Architecture and social relation.
Expected Outcome : Developed understanding about development of patterns of settlements
<p>Reference Books :</p> <ol style="list-style-type: none"> <li>1.UDFI guidelines</li> <li>2.Reading Materials from ITPI</li> <li>3.Urban pattern/Gallion and Eisner/CBS-Publication</li> <li>4.Urban Landscape Design/Garret Eckbo/McGraw Hill</li> <li>5.G.Cooper and B Dowson , Traditional Buildings of India</li> <li>6.History of Indian and Eastern Architecture/Fergusson James</li> <li>7.Sir Bannister Fletcher’s A history of Architecture /Musgrove, John</li> <li>8.Living architecture Volume 1 &amp; 2 /A Volwahren</li> <li>9.Encyclopedia of Vernacular Architecture</li> </ol>

AR 145	<b>L-T-P</b> <b>3-0-0</b> <b>3 credit</b>
Building services (illumination, Electrical Services and Acoustics)	
Objective: To develop the understanding of students about light, electrical services and sound theory and their application to building design	
<p><b>Unit-1 (Lighting in buildings)</b> Light and its sources, lighting criteria, the visual field , day light prediction methods Artificial lighting , lighting levels for various activities , Calculation for lighting levels.</p> <p><b>Unit-2 (Electrical fittings and their installation)</b> Unit of consumption, earthing, building protection. Electrical fittings and accessories and their installations. Electric wiring system, conduit system, non-conduit system, wiring lay-out, diagrammatic representation, Electric services to domestic premises, circuit outlets and switch, switch points, fittings and symbols. Utility services for large building/office complex. Planning and layout of installations within a building complex. Different meters and protection units. Different type of loads and their individual protections. Selection of cable/wire sizes; potential sources of fire hazards and precautions. Emergency supply-standby (generators, invertors) &amp; UPS. A specific design problem on this aspect.</p> <p><b>Unit-3 (Building Acoustics basics)</b> Acoustics terminology, definitions, propagation, reflection, absorption, diffusion, velocity, characteristic intensity etc. Properties of sound, decibel, scale, directionality and sound sources, hearing noise effects, diffraction and reflection. Behaviour of sound in an enclosed space-resonance, echo and reverberation. Principles of acoustics. Acoustical problems in contemporary architectural design. Principles of room acoustics-terminology, diffusion, growth and decay of sound, reverberation, Sound absorbing and sound-reflecting materials-description and characteristics. Choice of absorbers-measurement of absorption-frequency dependence.</p> <p><b>Unit-4 (Acoustical requirements in auditorium design)</b> Acoustical design of rooms for speech, music studios. Acoustical correction of existing auditoriums. Environmental noise control-noise sources-air borne and structure borne noise, transmission of noise in buildings. Methods of environmental noise control- Control of mechanical noise and vibrations. Noise control in specific types of buildings like-auditoriums, residential buildings, hotels, schools, hospitals, offices and libraries. Sound amplification systems, speaker’s high frequency, and moderation, special studies of cinema. Theatres, open-air theatres. Design of shape, volume per seat etc.</p>	

<p>-----</p> <p>Reference Books :</p> <ol style="list-style-type: none"> <li>1. Architectural Lighting Design Steffy Carry</li> <li>2. Building Acoustics/Smith. T</li> <li>3. Room Acoustics/Heinrich Kuttruff</li> <li>4. Architectural Lighting Graphics Elynn John</li> </ol>
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AR 146	L-T-P 2-1-0 3 credit
Quantity Survey & Specifications	
Objectives: To introduce to the students cost estimation of building construction work,	
<p><b>Unit-1 (Introduction to procedure of estimating)</b> Study of modes of measurement adopted by Indian Standard Institution, various methods for cost estimation of buildings (Approximate and detailed estimates). Abstracts of estimate, bill of quantities, contingencies.</p> <p><b>Unit-2 (Plinth area method)</b> Calculation of Plinth area and cubic contents including estimation and their bases for different buildings. Calculating quantities for earth work building items, abstracting of quantities and item rate (considering the current market rate for building material and labour wages as well as schedule of rates.</p> <p><b>Unit-3 (Analysis of rates and contract clauses)</b> Pricing and bill of quantities and preparation of tender documents. Measuring up of work for interior and final certificates of payment to the contractors. Definition, importance and use of specification; principles and practices, drafting of general and special specification clauses.</p> <p><b>Unit-4 (General abbreviations used in specifications)</b> Specification of common building materials and simple construction. Study and use of standard specification issued by Bureau of Indian Standards and other organizations/institutions. Application of these specifications in Practice. Specification for special finishes, advanced/new building materials and direct construction elements. Inspection of work in progress. Points to be noted and methods of checking the specifications factors of affected cost.</p>	
Expected Outcome : Developed understanding of cost estimation of building construction work,	
<p>Reference Books :</p> <ol style="list-style-type: none"> <li>1. B.N. Dutta, Estimating and Costing, TagorPalli, Lucknow</li> <li>2. P.L. Basin, Quantity Surveying, S.Chand and Company, Delhi</li> <li>3. G.H. Cooper, Building Construction and Estimating, McGraw-Hill</li> <li>4. BIS codes</li> </ol>	

HS 106	L-T-P 3-0-0 3 credit
Sociology & Building Economics	
<ol style="list-style-type: none"> <li>1. Definition and use of sociology, its application in architecture <b>(2 Lectures)</b></li> <li>2. Basic concept of sociology, society, groups, community, association, institution, culture, civilization and personality in terms of their characteristics and types. <b>(5 Lectures)</b></li> <li>3. Social structure of India: caste and class and marriage and family, their characteristics. <b>(5 Lectures)</b></li> </ol>	

4. Rural and Urban Societies – their characteristics, features and problems, like crime, slum and poverty. **(4 Lectures)**
5. Social change – Biological, Technological and cultural factors of social change, social aspects of housing and neighbourhood in the context of changing society and growing population. **(4 Lectures)**
6. Elements of Economics – concept of utility, total utility and average utility, law of equi – marginal utility, concept of demand factors of governing demand for building. **(4 Lectures)**
7. Production – concept of production, factors of production, land, labour, capital, entrepreneur and organization. Their characteristics, laws of diminishing returns, division of labour, efficiency of labour. **(5 Lectures)**
8. Distribution of National income – Rent, wages, interest and profits – inequalities in income distribution – causes and courses, role of demand supply in the determination of price and under perfect condition. **(5 Lectures)**
9. Money and Banking – Function of money – Inflation and Deflation, and their affects on building industry, functions of central and commercial bank. **(5 Lectures)**
10. Concept of economic Planning, objectives of the five years plans with special reference of housing. **(3 Lectures)**

**Text Books:**

1. H.L. Ahuja – Modern Micro Economics Theory – S.Chand.
2. M.L. Jhingan – Advance Economics Theory – Konark Publication
3. Economics – Samuelson and Nordhous – Tata McGraw Hills

**Reference Books:**

Stonier & Hague – A textbook of Economic Theory – Pearson

**The electivecourse** structure has been recommended keeping in mind the need of understanding the fundamentals of subjects which are indirectly but deeply related to the practitioner of science and technology.

**The objective of each elective is as follows:**

1. Industrial Economics and financial management. The impact of Economics including finance has to be well understood by the engineers since it has a deep impact on the decision making ability of an engineer and also in selecting the best possible alternative out of the ones available to him. The student must understand micro and macro-economic and their variants to understand the production and cost indicator like breakeven point, depreciation, inflation etc.
2. For any developing country, innovation, entrepreneurship and intellectual property rights hold the key to the entry in the league of developed countries. Equipped with the scientific knowledge and the right training, the engineer is an important building block of a nation.
3. Understanding of organisational behaviour and industrial psychology is a must for an engineer since it directly affects the industry in the larger sense. The functioning of an organisation right from the floor to the top management level has to be understood well from the OBIP perspective in order to make a positive contribution to the growth of the organisation.
4. Economics and its impact on science and technology have to be well understood by the engineers to ensure success of any technological venture.



5. To understand the growth process of any discipline one has to be conversant with the history of the subject which has been recorded. One is able to appreciate the various factors that have influenced and inspired the growth of science and technology. We reflect on giants like Newton, Einstein, Edison, Vishveshwarya, and JC Bose et al.

CE 107	<b>L-T-P</b> <b>2-0-2</b> <b>3 credit</b>
Structure Analysis	
Prestressed Concrete: Analysis and approximate design of determinate beams, and losses of prestressing	<b>4 Lectures</b>
Multistoried Buildings: Introduction, load action on high-rise buildings, various structural systems, approximate structural analysis and design. (no analytical problems).	
<b>4 Lectures</b>	
Cable Structures: Basic principles, various forms, their merits and demerits.	<b>5</b>
<b>Lectures</b>	
Special Structures: Grids, Domes, shells, folded plates	<b>5</b>
<b>Lectures</b>	
Bulk active structures, form active structures, Vector active structures, surface active structures.	
<b>5 Lectures</b>	
Membrane structures, kinetic, mobile structures.	<b>5</b>
<b>Lectures</b>	
Recommended Books:	
1. P.Dayaratnam, <i>Prestressed Concrete Structures</i> ; Oxford and IBM Publishing Co.;New Delhi,1982	
2. Wolfgang Schuller- <i>High Rise Building Structures</i> , John Wiley & Sons; New York1976.	
3. Frei Otto; <i>Tensile Structures; Vol-II, Pneumatic Structures, Cable Structures</i> : The MIT Press London.	
4. N.Subramaniam; <i>Principles of Space Structures</i> : Wheeler& Co.; Allahabad 1983.	
5. Reinforced Concrete Design/N. KrishnaRaju	
6. Design of steel structures/L.S.Negi	

AR 151	<b>L-T-P</b> <b>1-0-8</b> <b>4 credit</b>
Architectural Design - IV& Field Study	
Aim: In continuation to the previous semester, the students are exposed to Nursing home, workshop, Gymnasium, student's hostel, star hotels, apartment buildings, housing complex, intelligent office buildings, sports stadiums etc.	
Synthesis of building sciences and architectural space programme into a design matrix. Introduction of preliminary site planning techniques drawing knowledge from climatology, solar architecture, landscaping, environmental behavior.	
Application of both rendering skills and 3-dimensional presentation techniques to clarify the final design in totality.	
Suggested building types are Nursing home, workshop, Gymnasium, student's hostel, star hotels, apartment buildings, housing complex, intelligent office buildings, sports stadiums etc. Choice of problem	

<p>may be given to students such that more than one type of problem can be dealt at a time with groups to enable them to approach to another problem within the same Working Details and three dimensional studies of smaller project where possible. Two major projects with one /two sketch design. Model of one and coloured perspective of the other Study report with free hand sketches of at least 2 minor projects. (Minimum 1 major and 2 minor projects with 3D model of atleast one project)</p>
<p>Expected outcome : Development of understanding of space programming into a design matrix and site planning techniques with details</p>
<p>Reference Books :</p> <ol style="list-style-type: none"> <li>1. Space , Time &amp; Architecture / Gideon</li> <li>2. Elements of Architecture from Form to place/Von Meiss Pierre</li> <li>3. Free Spirit in Architecture/Papadakis</li> <li>4. Introduction to Architecture/Snyder, James</li> <li>5. Colour for Architecture/Porter, Tom</li> <li>6. Time Savers Standards A handbook of Architectural Design/Callender, J Hancock</li> <li>7. Time Savers Standards For Building Type/De Chiara J</li> <li>8. Time Savers Standards For Landscape Architecture /Harris</li> <li>9. Time Savers Standards For Interior Design and Space Planning/De Chiara Joseph</li> <li>10. National Building Code</li> </ol>

AR 152	L-T-P
Building Construction-IV	1-0-4
	2 credit
<p>It will enable the students to learn detailing of metal doors, fire proof structures, steel trusses and prefabrications.</p>	
<p><b>Unit-1 (Construction of metal doors and steel frames)</b> Metal Doors: Steel doors (sliding, revolving, collapsible and connections). Aluminum doors, windows and glazing Steel Frames: M.S. Steel frame structure components and connections.</p>	
<p><b>Unit-2 (Construction of Steel Trusses)</b> Steel Trusses: Tubular truss, North light glazing and its covering and drainage details.</p>	
<p><b>Unit-3 (Construction of Fibre proofing)</b> Fibre proofing: Fire proof structure, classification of buildings and code provisions; Fire protection of building elements and fire protection devices.</p>	
<p><b>Unit-4 (Construction Prefabrications)</b> Prefabrications: Advantages and disadvantages of on-site and off-site prefabrication w.r.t. Indian conditions Simple details in prefabrication. Guest lectures by Industry experts.</p>	

AR153	L-T-P
Housing	2-0-2
	3 credit
<p>Objectives : Objective of the course is to acquaint the students with various concepts , issues and consideration of housing condition, housing design and housing policies</p>	
<p><b>Unit-1 (The concept of house and housing)</b> Housing demand-qualitative and quantitative. Housing situation: Impact of industrialization and</p>	

<p>urbanization. Housing design and standards, rural housing. Housing density as related through environmental and climatic aspects of housing, locational aspects and layouts.</p> <p><b>Unit-2 (Slums and squatter settlements)</b> Case studies from India and abroad. Housing for the poor people, sites and services, self-help housing, integrated slum improvement and slum networking.</p> <p><b>Unit-3 (Housing for new communities &amp; Neighbourhood concept)</b> Housing for new communities-norms and standards for dwelling, shopping, education, health &amp; recreational facilities. Neighbourhood concept: Densities and their optimization.</p> <p><b>Unit-4 (Housing Policies)</b> Housing policies, housing finance, resources mobilization, housing, institutions, housing co-operatives. Housing programs and schemes-national and local level. Situation in developing countries.</p>
<p>Expected Outcome : Understanding of various concepts , issues and consideration of housing condition, housing design and housing policies</p>
<p>Reference Books :</p> <p>4.Housing: An Environment for Living / Keiser, Marjorie Branin</p> <p>5.Housing and Building In Hot-Humid and Hot-Dry Climate</p> <p>6.Low Cost Housing in Developing Countries / Mathur, G.C.</p>

AR154	<b>L-T-P</b>
Departmental Elective-I	<b>2-1-0</b>
	<b>3 credit</b>

ME120	<b>L-T-P</b>
Building Services (HVAC)	<b>3-1-0</b>
	<b>3 credit</b>
<p>Definition of basic terms used in air-conditioning system and plants 5</p> <p>Lectures</p> <p>Air-conditioning and Air-cooling principles-their implications on Architectural Forms and details. 5 Lectures</p> <p>Systems and Equipments of Air conditioning. 6</p> <p>Lectures</p> <p>Lifts, escalators and Conveyors. 4</p> <p>Lectures</p> <p>Inter-communication, Monitoring Devices, Fire-protection and Alarm Systems, Building Automation. 5 Lectures</p> <p>Applications of Air-conditioning. System for High Tech Buildings, modern security systems. 3</p> <p>Lectures</p>	
<p>Reference Books:</p> <p>1.Heating, Cooling and Lighting Design for Architects/Norbert Lechner.</p>	

AR 155	<b>L-T-P</b>
Building Byelaws and Codes of Practice	<b>2-0-0</b>
	<b>2 credit</b>

CE123	<b>L-T-P</b>
Concrete Structure	<b>2-0-2</b>
	<b>3 credit</b>
<p>Basic Material Properties &amp; Design Concept: Introduction to Concrete Technology, Composition of Concrete and the properties, Strength and Durability, Modulus of Rupture, Creep and Shrinkage of Concrete, Reinforcing Bars, Types and grade, Stress-Strain Diagram of Steel and Concrete. Concrete Mix Design: Nominal Mix and Design Mix. Design Philosophies, Working Stress Method, Limit State Method, Various Limit States. 4 Lectures</p> <p>Design for Flexure: Introduction, assumption, flexure design of singly reinforced &amp; doubly reinforced and T- beams by Limit State Methods. IS-Coded provisions, Numerical Problems. 4 Lectures</p> <p>Design for Shear, Bond: Shear failure of beams. Shear reinforcement, Curtailment of reinforcement. Bond, Anchorage and Development length, IS-Code provisions, Design of a beam with flexural and shear consideration. Reinforcement Detailing, Numerical Problems. 4 Lectures</p> <p>Design of Compression Members: Short and Long Columns, IS-Code Provisions, Design of Short Columns under Axial compression, Design of Columns under bi-axial bending, use of interaction diagram for design. Lateral ties. Reinforcement Detailing, Numerical Problems. 4 Lectures</p> <p>Design of Footing: Isolated footings for rectangular and circular columns. Reinforcement Detailing, Numerical Problems. 4 Lectures</p> <p>Design of Slabs &amp; Stairs: Effective span, one way and two way slabs. Design of Slabs with various boundary conditions by IS-Code methods. Reinforcement Detailing, Numerical Problems. Types of stairs, Design of Dog Legged &amp; Open Wall Stairs. Reinforcement Detailing, Numerical Problems. 4 Lectures</p> <p>Introduction to Pre-stressed Concrete: Introduction to Pre-stressed Concrete, Pre and Post tensioning systems, Advantages, Basic design concept of Pre-stressed concrete beam, Analysis of prestress and bending stress, Resultant Stress, Thrust Line, Concept of Load balancing, Various losses of stresses. Simple Numerical Problems 4 Lectures</p>	
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1.IS 465: 2000.</li> <li>2.SP-16</li> <li>3.SP-34</li> </ol> <p>Note:</p> <ol style="list-style-type: none"> <li>1. All the Design of Concrete Structural Elements must be based on "Limit State Method"</li> <li>2. Students are allowed to bring IS 465: 2000 and SP-16 in the examination hall for referring the design solutions.</li> </ol> <p>1.B. C. Punmia; Reinforced concrete structure (Vol - I).</p>	

- 2.S. Unnikrishna Pillai & Devdas Menon; Reinforcement Concrete Design, Tata McGraw Hill, New Delhi.
- 3.N.Krishna Raju; Structural Design and Drawing, Reinforced Concrete and Steel, University Press (India) Ltd.
- 4.A.M.Nevill; Properties of Concrete
- 5.Mallick and Gupta; Reinforced Concrete.
- 6.P.C.Varghese; Limit State Design of Reinforced Concrete Structures.
- 7.M.K.Hurst, Prestressed Concrete Design, Chapman Hall.
- 8.James R. Libby, Prestressed Concrete Design and Construction, The Ronald Press Company.
- 9.N.Krishna Raju; Prestressed Concrete, Tata McGraw Hill, New Delhi.

GE106	<b>L-T-P</b>
EAA-II NSS	<b>0-0-0</b>
	<b>0 credit</b>

AR 161	<b>L-T-P</b>
Architectural Design - V& Field Study	<b>1-0-8</b>
	<b>4 credit</b>
Objective : To expose the students to design a multifunctional building on an intermediate scale, with emphasis on the building bye-laws , cost effectiveness and innovative structural considerations	
Methods of space programming, analysis, evaluation of design criteria and fundamentals of composite site planning. Introduction to building services, utilities and building automation and facility planning. Exposure to techniques of post occupancy evaluation and measurement of users' satisfaction. The design project should deal with complex circulation patterns, services and layouts. Emphasis on design of circulation pattern, application of cost effective techniques, innovative structural systems, building materials and system and application of urban design elements in campus design. Introduction can be made towards the development of the original research work, new or special types of Project. Suggested building types are housing complex, university campus, hospital, transport terminal, office cum commercial complex, hotels and resorts-involving various buildings within the same site. Field study tour to construction sites or similar projects. Group work or teamwork, as in the case of complex urban projects, should be experimented. Two major problems, two minor problems. Detail model of at least one project and block model of one project. Guest lectures by practicing architects.	
Expected Outcome : Developed understanding of designing a multifunctional building on an intermediate scale, with emphasis on the building bye-laws , cost effectiveness and innovative structural considerations	
Reference Books :	
<ol style="list-style-type: none"> <li>1. Space , Time &amp; Architecture/Giedion</li> <li>2. Elements of Architecture from Form to place/Von Meiss Pierre</li> <li>3. Free Spirit in Architecture/Papadakis</li> <li>4. Introduction to Architecture/Snyder, James</li> <li>5. Colour for Architecture/Porter, Tom</li> <li>6. Time Savers Standards A handbook of Architectural Design /Callender, J Hancock</li> <li>7. Time Savers Standards For Building Type/ De Chiara J</li> </ol>	

8. National Building Code

AR162	<b>L-T-P</b>
Architecture Detailing	<b>1-0-4</b> <b>2 credit</b>
Objective : To enable the students to learn advanced construction detailing	
<p><b>Unit-1 (Architectural detailing of interior and exterior finishes)</b>            Architectural detailing of brick and concrete parapet, coping, cornices, string course, chajja, plinth course, plinth protection, treatment of sloped roof with tiles, plaster, paving; steps.            Detailing of balconies and canopies, contemporary kitchen and toilet. Contemporary staircase including free standing staircase and details. Railing details for staircase, balcony and at roof with timber, metal and plastic etc.</p> <p><b>Unit-2 (Wall paneling &amp; partitions)</b>            Stone, glazed tiles, earthen tiles &amp; plastic tiles etc. Acoustic and thermo-insulating wall paneling with different materials. Suspended ceiling with different materials and finishing including fixing details of lighting fixtures and diffusers for ventilation and air-conditioning. Different types of resilient and vibration resistive floors.            Partitions with timber, metal stone, PVC/plastic etc. Glass curtain walls, general introduction, types of fixing, weather protection, different materials and form of curtain panels.</p> <p><b>Unit-3 (Special doors and windows)</b>            Sliding, folding, revolving, swinging and rolling etc. with hardware details.            Details of lift shaft and machine room, escalator, conveyor belts            Shop front details.</p> <p><b>Unit-4 (Layout detail of water supply and sanitation)</b>            Layout and details related to water supply, drainage and sanitation: a case study of a small residential building.            Detailing of different building parts and elements to be coordinated with architectural design studio.</p>	
Expected outcome : Developed understanding of advanced construction detailing	

AR163	<b>L-T-P</b>
City Planning	<b>2-0-2</b> <b>3 credit</b>
Objective : To provide the knowledge of Town Planning and Urban Design principles	
<p><b>Unit-1 (Definitions of town planning and urban design)</b>            Levels of planning and steps for preparation of a town plan.            Review of urban design through historical evolution and the roots of modern concepts (related to garden city, satellite towns and ribbon development).</p> <p><b>Unit-2 (Surveys Techniques in planning and urban design)</b>            Introduction to analytical techniques in town planning and urban design.            Urban design principles and criteria, urban scale and spaces, urban activities and circulation pattern, design for pedestrians.</p> <p><b>Unit-3 (Urban aesthetics, design regulations and control)</b>            Urban aesthetics and its application to various parts of the town.            Waterfront development. Principles of streetscape design.            The comprehensive role of urban design in town planning process.            Principles of organizing outdoor spaces, on site and off-site consideration in organization of spaces.</p>	

<p>Concepts, functions, components and preparation of a development plan.</p> <p>Concepts of regional and metropolitan planning, land subdivision regulations and zoning. Land use determinants-residential, trade and commerce, industry, recreation and transportation, educational, housing etc.</p> <p><b>Unit-4 (Development of Master Plan)</b></p> <p>Study of development plan/Master plan for selected towns. Planning of new towns-case study of Chandigarh, Bhuvaneshwar, New Mumbai, Gandhinagar, Industrial towns and other towns in India. New towns in other Countries like Brazil, Britain U.S.A., Netherlands, U.K. etc.</p> <p>Planning in existing towns, urban-redevelopment and renewal, problems of congestion.</p> <p>Seminar</p>
<p>Expected outcome : Developed understanding of Town Planning and Urban Design</p>
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Urban pattern/Gallion and Eisner/CBS-Publication</li> <li>2. Urban Landscape Design/Garret Eckbo/McGraw Hill</li> <li>3. Earthscape/Simonds/McGraw Hill</li> </ol>

AR164	L-T-P
Urban Design	2-0-2
	3 credit
<p>Objective : To provide the knowledge of Urban Design principles</p>	
<p><b>Unit-1 (Definitions of town planning and urban design)</b></p> <p>Levels of planning and steps for preparation of a town plan.</p> <p>Review of urban design through historical evolution and the roots of modern concepts (related to garden city, satellite towns and ribbon development).</p> <p><b>Unit-2 (Surveys Techniques in planning and urban design)</b></p> <p>Introduction to analytical techniques in town planning and urban design.</p> <p>Urban design principles and criteria, urban scale and spaces, urban activities and circulation pattern, design for pedestrians.</p> <p><b>Unit-3 (Urban aesthetics, design regulations and control)</b></p> <p>Urban aesthetics and its application to various parts of the town.</p> <p>Waterfront development. Principles of streetscape design.</p> <p>The comprehensive role of urban design in town planning process.</p> <p>Principles of organizing outdoor spaces, on site and off-site consideration in organization of spaces.</p> <p>Concepts, functions, components and preparation of a development plan.</p> <p>Concepts of regional and metropolitan planning, land subdivision regulations and zoning. Land use determinants-residential, trade and commerce, industry, recreation and transportation, educational, housing etc.</p> <p><b>Unit-4 (Development of Master Plan)</b></p> <p>Study of development plan/Master plan for selected towns. Planning of new towns-case study of Chandigarh, Bhuvaneshwar, New Mumbai, Gandhinagar, Industrial towns and other towns in India. New towns in other Countries like Brazil, Britain U.S.A., Netherlands, U.K. etc.</p> <p>Planning in existing towns, urban-redevelopment and renewal, problems of congestion.</p> <p>Seminar</p>	
<p>Expected outcome : Developed understanding of Urban Design principles</p>	
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Urban pattern/Gallion and Eisner/CBS-Publication</li> <li>2. Urban Landscape Design/Garret Eckbo/McGraw Hill</li> </ol>	

3.Earthscape/Simonds/McGraw Hill

AR2XX Departmental Elective - II	<b>L-T-P</b> <b>3-0-0</b> <b>3 credit</b>

CE129 Design of Steel Structure / Design of Concrete str	<b>L-T-P</b> <b>3-0-0</b> <b>3 credit</b>
<p>Basic Material Properties &amp; Design Concept: Material property of steel, Ductility, Behaviour of steel in cyclic loading, Different structural steel section used in India and their use. Different types of steel structural systems. Steel cable structural system, Structural configuration of tall steel structures Innovative use of structural steel, Hollow Tubular steel sections, Corrosion and fire resistance property of steel.</p> <p><b>4 Lectures</b> Rivet &amp; Weld: Rivet and Welded connections. Property and the merits and demerits of Rivet and Weld. Different types of joints, Failure of Rivet and Weld. Rivet value. Bracket connection with eccentricity with Rivet and Weld. Numerical Problems</p> <p><b>4 Lectures</b> Design of Beam: Design Fundamental of Beam, Laterally supported and laterally unsupported beam, IS code provisions, Built-up-beams. Numerical Problems</p> <p><b>4 Lectures</b> Design of Truss: Design fundamental of compression and tension member with angles. Design of simple trusses. Numerical Problems.</p> <p><b>4 Lectures</b> Design of Column: Design Fundamental of Axially and eccentrically loaded column, IS code provisions, Built-up-Columns, Lacing and battened column. Column Splice, Numerical Problems</p> <p><b>4 Lectures</b> Design of Connection: Framed connection; unstiffened and stiffened seated connections for the connection for beam-beam and beam-column-beam, Numerical Problems</p> <p><b>4 Lectures</b> Design of Foundation: Slab base and gusseted base, column base subjected to axial load and moment; design of isolated grillage foundation, Numerical Problems</p> <p><b>4 Lectures</b></p>	



**IS Codes:**

1. IS 800
2. Steel Section Handbook

**NB:** Students are allowed to bring IS 800 in the examination hall for referring the design solutions.

Recommended books:

1. S.K.Duggal; *Design of Steel Structures, Tata McGraw Hill, New Delhi.*
2. Ramchandra; *Design of Steel Structures (Vol. I).*
3. Negi; *Design of Steel Structures.*
4. SarwerAlamRaz; *Structural Design in Steel, New Age International Publication*
5. Thomas Burns; *Structural Steel Design, Delmar Publication.*
6. Reinforced Concrete Design/N. KrishnaRaju

Design of steel structures/L.S.Negi

AR 171	<b>L-T-P</b>
Architectural Design - VI& Field Study	<b>1-0-8</b>
	<b>4 credit</b>
Objective : To expose the students to design a commercial complex, stadiums, 5-star hotel, multistoried Apartments and Hospitals, Civic Buildings, Terminal Buildings, Housing Layout and University Buildings on an intermediate scale, with emphasis on the building bye-laws , cost effectiveness and innovative structural considerations	
Methods of space programming, analysis, evaluation of design criteria and concepts for large projects. Detailed study of methodology for design concepts for large projects. Design problems at urban or metropolitan scales with emphasis on site planning, landscape, structure, building services, HVAC systems, architectural detailing including the national acts and codes. Projects like commercial complex, stadiums, 5-star hotel, multistoried Apartments and Hospitals, Civic Buildings, Terminal Buildings, Housing Layout and University Buildings Short field study tour for similar buildings, including site visit The architectural design work shall consist of the following stages: Data collection and literature survey, Analysis, Concept, Presentation Drawings and Models Sessional: One Major Project: One live Project with model, Project Reports.	
Expected Outcome : Developed understanding of designing a large scale building on an intermediate scale, with emphasis on the building bye-laws , cost effectiveness and innovative structural	

considerations
<p>Reference Books :</p> <ul style="list-style-type: none"> <li>Space , Time &amp; Architecture/Giedion</li> <li>Elements of Architecture from Form to place/Von Meiss Pierre</li> <li>Free Spirit in Architecture/Papadakis</li> <li>Introduction to Architecture/Snyder, James</li> <li>Colour for Architecture/Porter, Tom</li> <li>Time Savers Standards A handbook of Architectural Design/Callender, J Hancock</li> <li>Time Savers Standards For Building Type/De Chiara J</li> <li>Time Savers Standards For Landscape Architecture/Harris</li> <li>Time Savers Standards For Interior Design and Space Planning/De Chiara Joseph</li> <li>National Building Code</li> </ul>

AR 172	<b>L-T-P</b>
Working Drawing	<b>1-0-4</b>
	<b>2 credit</b>
Objective : To expose the students to the working detail of architectural drawings.	
Understanding of scale, dimensioning, texture and symbols for making construction drawings	
<b>Unit-1 (Site plan and foundation and floor plans)</b>	
1.Site plan/layout plan showing different buildings, internal roads, water supply, sewerage including area drainage plan	
2.Plans (Foundation layout plan, ground floor plan, upper floor plans, terrace or roof plan including roof drainage)	
<b>Unit-2 (Detail of toilets, kitchen, doors, windows, elevations)</b>	
3.Typical details of toilets, Kitchen, doors, windows etc.	
4.Elevations of all sides (front, rear, and both sides)	
<b>Unit-3 (Cross Sectional details)</b>	
5.Cross sectional Details (transverse and longitudinal sections)	
6.Sections through staircases, lifts, sanitary units and other full/part details as required.	
7.Typical details to explain intricacies of design.	
<b>Unit-4 (MEP details and Municipal drawings)</b>	
8.Electrical Layout	
9.Plumbing and Sewage Layout	
10.Preparation of drawings for municipal approval showing area statement, FAR calculations using local bye-laws	
Expected Outcome : Developed understanding of working details for architectural drawings	

AR 173	<b>L-T-P</b>
Landscape Design and Ecological Architecture	<b>2-0-2</b>
	<b>3 credit</b>
Objective : To expose the students to process of landscape and ecological design	
<b>Unit-1 (Landscape design definition)</b>	
objective and scope, History of landscape design, Review of Landscape designs/Styles (Mughal, Japanese, Chinese, Italian, French and English Gardens) and practice.	
Profession of landscape architects. Importance of Landscape in present times.	
<b>Unit-2 (Landscape Surveys)</b>	
Taking stock of natural and manmade elements, local ecology, land character, land forms, flora and fauna,	

existing and potential important elements.

Planting design principles, plant characteristics, form, shape, structure, texture etc. Types of plants. Trees, shrubs bushes, hedges, edges, annual creepers etc. and methods of their propagation, plant selection techniques.

**Unit-3 (Process of Landscape Design)**

Formal and informal landscape designs, rock garden, terrace garden, water garden, landscaping for interiors, landform design and grading, drainage design.

Landscape and its effect on climate and its use as a means to modify the environmental conditions (noise, soil erosion, land, air & water pollution, water logging and depletion of water resources) within and around the buildings. Landscape applications in gardens, indoor landscaping, terrace gardening, industrial landscaping, landscaping of residential areas and urban avenues, surface treatments, landscape elements of construction. Computer application in landscape. Multi-criteria landscape evaluation.

**Unit-4 (Energy, Water & Waste Management for Landscape)**

Alternative energy systems for buildings, energy from waste: bio-gas technology, energy from sanitary landfill, composting, vermi-composting.

Management of water in arid regions-principles of rain water harvesting, recycling of waste water.

Site planning techniques.

Expected Outcome : Developed understanding of landscape and ecological design process.

Reference Books:

- 1.An introduction to Landscape Architecture/Lauric Michael
- 2.An introduction to Landscape Architecture/Hubband H
- 3.Fundamentals of Landscaping and Sale Planning /Root James B
- 4.Landscape Detailing LilleucoodMichacl

AR 174	<b>L-T-P</b>
Disaster Resistance Architecture and Management	<b>2-1-0</b>
	<b>3 credit</b>
Objective : To expose the students to process of Disaster management, mitigation and preparedness; techniques of monitoring and design against the disasters.	
<b>Unit-1 (Disaster types, characteristics and their causes)</b>	
Concept of disaster. Building Safety from Natural Hazards/Types of Disaster (natural and manmade): Earthquake, Fire, Cyclone, Flood, Landslide, land subsidence etc.	
Seismology, Earthquake occurrence in the world, plate tectonics, faults, earthquake hazard maps in India Causes of earthquakes, seismic waves, magnitude intensity, and epicenter and energy release, characteristics of strong earthquake ground motions.	
<b>Unit-2 (Shape and form of building and their services to undertake the disaster)</b>	
Building shapes, Architectural features and design of building in seismic zones.	
Affects of Earthquake on buildings.	
Indian Seismic Codes.	
Different types of Building such as structures of - Brick Masonry, Stone Masonry, Reinforced concrete etc.	
Elements to make buildings Earthquake Safe.	
Fire: Causes and precautions for fire safety in different type of building. BIS code for fire safety.	
Flood: Design of building for flood zones.	
<b>Unit-3 (Issues and concern for various causes of disaster)</b>	
Disaster management, mitigation and preparedness; techniques of monitoring and design against the disasters	
Management issues related to disaster, mitigation through capacity building, legislative responsibilities of	

<p><b>Unit-4 (Disaster management)</b>  disaster mapping, assessment, pre-disaster risk and vulnerability reduction, post disaster recovery and rehabilitation; disaster related infrastructure development.  Remote-sensing and GIS applications in real time disaster monitoring, prevention and rehabilitation.</p>
<p>Expected Outcome : Developed understanding of Disaster management, mitigation and preparedness; techniques.</p>
<p>Reference Books:  1. BIS maps/ code books.  2. Manuals of National Disaster management Authority</p>

AR 175	<b>L-T-P</b>
Project Planning and Management	<b>2-1-0</b>
	<b>3 credit</b>
<p><b>Unit-1 (Concept of Construction Management)</b>  Objectives of Construction Management, Historical Background, Relevance and importance of management skills in the present day profession, Players and relationships between them in the building construction industry, Role of Architect in Construction Management, various building practices and the</p> <p><b>Unit-2 (Current management system)</b>  Scheduling of construction, Planning of construction site. Advantages of network Management, network analysis, elements of network, network rules, constraints, errors in network, construction of networks (a simple Building)</p> <p><b>Unit-3 (CPM &amp; PERT)</b>  CPM: Critical path analysis, Project duration, Construction of CPM Calendar, Activity times and FLOATS, Optimization through CPM Techniques,  PERT Technology: PERT AND Three time estimates, beta distribution curve , Slack in PERT, Critical Path Analysis of a PERT network, Central Limit Theorem, Probability of completion of projects,  CPM / PERT: Difference between CPM &amp; PERT, Bar chart versus network, resource allocation and resource leveling, Controlling and monitoring, Updating. Project time, cost and finance management.</p> <p><b>Unit-4 (Computer applications of project management)</b>  Computer applications of project scheduling and management.  Introduction to new trends and research in construction management.</p>	
<p>Reference Books :  Construction Planning and Management by DrU.K.Srivastava, Galgotia Publication Pvt Ltd, New Delhi</p>	

GE 107	<b>L-T-P</b>
EAA-III NSS	<b>0-0-0</b>
	<b>0 credit</b>

AR 192	<b>L-T-P</b>
Architectural training	<b>0-0-60</b>
	<b>20 credit</b>
<p>Critical appraisal: An exercise in critical observation on an existing project. A student may select any small project and trace down its development from early concept design. Procedures adopted in decision</p>	

making at inception level, series of changes in the process of approvals, constraints such as financial, human and building bye-law. Changes during the execution and changes done by the client after occupation-reasons thereof. Users reaction on different aspects, student's personal remarks based on the ability of balanced critical appraisal. The study is to be presented in the form of series of sketches, photographs, supported by brief analysis and observations etc.

Documentation of innovative details from personal observations, office records or field studies. This may include historical as well as contemporary details. Critical observations of performance, usefulness etc. The selection of details should be based on their special nature due to practical field situation and must be presented in a folder.

Field observation: Systematic study of any particular architectural phenomena or an element to see how it behaves. Idea is to systematically observe, record and analyse the observations and to draw lessons from the study of any particular aspect. Aspects can be Spaces, Types, - sloping roof in a particular place, System – movements in a shopping area, circulation system in a station, Material – paving material in public squares, flooring in a workshop, Visual Aspects – way-finding in a market, signage in a hospital. Study should emphasize on relationship between physical layout, details and efficiency, highlighting performance under different conditions, maintenance and fixing problems.

Office Training: Students are required to be involved in all aspects of office work for about 24 weeks in an architectural firm. They are expected to work on sketch design, presentation drawings, detail working drawing, model of the project, estimation and specification of small buildings, client meetings, coordination with structural, HVAC, sanitary, electrical and fire services consultants.

Site Supervision: During the office training, students are exposed to different stages of construction on the site and to learn how the drawings of design is executed at the site by preparing a report to facilitate set of drawings, sketches, annotated photographs etc. to supplement their observations.

Each candidate shall have to prepare a detailed report along with necessary drawings, sketches, measurement records, readings, observations, survey analysis, log sheets and models, if necessary on aforementioned aspects which are concerned, with practical training, Critical appraisal of any building that the candidate or his/her employer had designed and executed, the building shall be used and the students must record the reactions of the user to support his appraisal in addition to photographs, drawings etc. site supervision and practices: a detailed report of any major part of a small building that has been personally supervised by the candidate, it may include checking site measurement, preparation of a bill. Site instructions and checking of the executed work. Field observation: a report on the architectural use of the site conditions. For example electric poles, water tanks, slope of the site etc. Log sheet and Office certificate: a student shall submit all the working details prepared by him during the practical training along with the estimates of a small project, time syllabus to the office in-charge where he is undergoing the training with a request that he is allowed to work according to the syllabus so that none of the areas of the training are left.

AR194 Project (Thesis)	<b>L-T-P</b> <b>0-0-60</b> <b>20 credit</b>
STAGE-1: Project Proposal Each student shall submit three proposals for the project (such as cultural centre, educational campus,	

religious complex, industrial centre, recreational complex, civic centre, television studio, cinema studio, aquarium, zoological park, airport terminal, hotel or hospitals) that he or she wants to undertake, in the order of preference. The project shall be a Live project as far as possible. Each of the project should have the following information presented in from of typed/neatly hand written on A-4 size paper

- a. Title of project
- b. Authority proposing the project, with address
- c. Site, area, location
- d. Brief about the project giving broad requirements, cost etc.

The synopsis shall be properly bound.

#### STAGE-11 Data Collection

This stage shall have the following information about the project allotted to the student.

Site :Exact size of the site giving its dimension, cardinal points, topography, services,-electrical, sanitary, telephone etc, available at site, linkages of the site, with important landmarks of the city/country. The information should be supported with sufficient photographs, indicating the conditions of the site, position of tree, any important landmark such as temple, grave etc. there should be sufficient photographs of the surroundings of the site.

Climatic conditions : Information regarding, Macro and Micro climatic conditions, that might effect precautions to be taken in design must be recorded such as rainfall, wind direction, solar movement etc, giving their impact and the precautions to be taken in design,

Case studies: Maximum two similar project, must be studied, through site visits or literature, attempts shall be made to visit at least one similar project, information must be collected about the requirements, Salient design features, good or bad aspect of the design, Idea of the case study is to form a base for the candidates own drawings, the students should compare the requirements based on the same.

The entire Data collection stage should be supported with photographs; the total number of sheets shall be restricted to 15 imperial sizes the work shall be evaluated by an internal jury.

#### Stage III: Sketch Design

The student is required to work out his Design based on the data collection, the requirements giving due consideration to site and climatic studies. The work can be produced in any medium on any type of sheet-opaque or transparent; there should be sufficient sheets to explain the design clearly. Work shall be evaluated b y local experts.

#### STAGE-IV: Pre-Final Design

In the pre-final stage the student shall present complete design to be finally presented to the External jury. The corrections suggested are to be incorporated in the final drawing Students can prepare any number of sheets, sufficient to explain the design clearly, the work shall be supported by a block model. Internal jury shall evaluate work. If needed this stage can be divided into two stages each carrying equal marks.

#### STAGE-V: Final Design

The final design shall be on sheets not less than imperial size. The work shall be on tracing paper-film so that it can be reproduced. In case work is on opaque sheet the student shall have to submit one copy of the drawing, students can prepare any number of sheets,

Final design must have the following:

- a. Design proposal (Drawings sufficient to explain the design)
- b. Architectural/Construction details/working drawings (minimum two sheets)
- c. Service details-Electrical/Water Supply/Plumbing and water disposal-Minimum Two Sheets
- d. Perspectives/Interior layout-minimum two numbers,
- e. Presentation with complete rendered drawings, model(s) and perspectives to explain the design,

The project report shall be on A-4 size paper. It should have complete write up about the studies, literature survey, climatic studies, etc. It must contain design concept along with copies of design, copies

of all the sheets prepared-study or design, copies of all the sheets of all the sheets prepared-study or design, must be made part of the report. It should also contain the photographs of the model prepared; Every student shall have to submit three copies of the report out of which one copy shall be returned to the candidate after the results are declared.

<p>AR193 Professional Practice, Valuation and Management</p>	<p><b>L-T-P</b> <b>3-0-0</b> <b>3 credit</b></p>
<p>Architectural Practice and office organization: Code of professional conduct. Code relating to architectural competitions, fees for services. Client's psychology, Psychology of setting Methods, Resistance to change social and other factors, office practice, filling, recording, accounting and partnership. Government set up of Architectural office, service rules and creation of posts, proposals for Government staff Structures, Award of work by Government agencies and structures of fees and mode of payment. Forms and Appointment (Partial Work) its responsibilities, duration and termination of appointment. Authority of the architect implied and under IIA building contract. Architects Registration Act 1972, Licenses and related matters. Responsibilities of the architect in respect of Sketch Plan, final design and details and other related matters and estimate within owners prescribed limits. Ownership and copyright of Drawings, Defect Liability Period, Tender documents: Detail Quantities, Specifications, Contract Forms, etc. Various types of tenders, Inviting Tenders, Selection of Contractors, Building Contract and Analysis of Contract. Study of development control regulations, municipal acts Study of building bye-laws and Indian Standard Codes of Practice related to design, drawing and procedure for submission to concerned bodies. Municipal drawings, Municipal plans and plans for public authorities such as Municipality, Town Planning, Factory Inspector and other such authorities. Nomination of sub-contractor, Supervision and inspection of work measurement of work, Appointment of clerk of works, Variation of the contract work, Interim Certificate to building contractors, Final certificate. Fire prevention, safety measures and regulations, Fire insurance, Easement Rights Qualities of an Architect: Professional Leadership, Vision and perception. Organizational behavior Satisfaction as goal of adjustment</p> <p>Value &amp; Valuation: Factors affecting Value, the real market and its properties, The types of investors in the market and their interest, purposes of valuation. Mathematic of valuation: simple interest, compound interest, present value, amount of Rs. 1/-per annum, Annual sinking fund, present value of Re 1/- per annum, year of purchase in perpetuity, redemption of capital, Numerical Examples. Mortgage repayment and depreciation mortgage and mortgager, Relation between mortgage and annual repayment. Depreciation rates, Numerical examples. Interest rate and life of property, various market interest on capital, Concept of net income, Economic life of Building Rent- Various forms of rent Methods Valuation, direct comparison of capital cost, of land and cost of building, Rental Methods, Development Methods, belting. Arbitration: Arbitrator, Reference, submission, articles of Agreement, Award. Legal</p>	

Aspects of Valuation, Land ceiling Act, rent control act, Municipal Act, Zoning Laws, and Master Plan.

AR 201	<b>L-T-P</b>
Design for Barrier Free Environment	<b>3-0-0</b>
	<b>3 credit</b>
Types of disability, Mobility devices and controls Construction and maintenance standards, classifications of buildings and access provisions. Design elements within buildings, Site planning, parking, approach to plinth levels, corridors, entrance and exit, Windows, Stairways, Lifts, Toilets, Signage, Guiding and warning systems. Floor materials. Design elements outside the buildings-kerb at footpath, road crossing, public toilet, bus stop, toilet booth, and signage. Provisions in residential buildings. Auditorium, parks, restaurants, railway station. Access Audit and implication in building Byelaw.	
Reference Books: 1. National Building Code 2. Time Saver Standards for Building Types	

AR 202	<b>L-T-P</b>
Buliding Software Lab	<b>3-0-0</b>
	<b>3 credit</b>
Introduction to Building Information Modeling softwares and their application in Industry for the preparation of two and three dimensional architectural, Structural and Mechanical drawings, Energy Modelling and Construction Project Planning. Introdtion to softawres like, Revit (Architecture, Structure, MEP) , ECotect-11 and Naviswork, Excel and MS Office. Small design projects based on uses and understanding of these softwares.	

AR 203	<b>L-T-P</b>
Vastushastra	<b>3-0-0</b>
	<b>3 credit</b>
The importance of vastu in creating a harmonious built environment is growing in the architectural profession. The objective is to expose the students to the various theoretical and practical aspects of this area of architecture.	
Introduction to vastushatra, its purpose nature and scope Vastu principles and its affect, art of building as per vastu. Vastu principles and modern architecture. Application of Vastu, role of various mandalas and vastu-purushmandla. Site selection, shape of plots, orientation aspects: recommendation on sites, plots, location layouts, configuration of various areas, inner and outer spaces within and outside the building etc. Case studies and practical remedies for houses and commercial building as per vastu etc.	

AR 204	<b>L-T-P</b>
Art In Architecture	<b>3-0-0</b>
	<b>3 credit</b>
This elective course is designed to lead students to uncover how the symbolism of the Architectural Art is	



used in the interior and exterior designs of any buildings or structures.
<ol style="list-style-type: none"> <li>1. Produce a timeline showing the eras of art and architectural development: (New Testament church, Byzantine, Merovingian, Carolingian, Romanesque, Gothic, Renaissance, Baroque, and modern).</li> <li>2. Produce a map showing main locations for the early art and architectural robust buildings and the dominant areas for each of the eras.</li> <li>3. Conclude a core philosophy for the use of worship space, artwork, and furnishings.</li> <li>4. Differentiate the various religious symbolism (cross symbols of Christianity, swastika symbol of hindunism, muslim, budhistetc).</li> <li>5. Describe the symbols designed to designate the triune God, Father, Son and Holy Spirit.</li> <li>6. Identify the scenes of art and architecture from the life style of Indian kings.</li> <li>7. Identify how select Greek, Hebrew, and Latin letters and words are linked to Biblical truths</li> </ol>

AR 211	<b>L-T-P</b>
Architectural Conservation	<b>3-0-0</b>
	<b>3 credit</b>
<p>Definitions of conservation, preservation, restoration, reconstruction and adaptation</p> <p>Objectives. Principles and concepts of conservation and its application</p> <p>History of conservation movements in the world and Indian response to the movement</p> <p>Development of theory of conservation and various charters of international importance</p> <p>Values and Ethics in Conservation and degrees of intervention in historic buildings and monuments and why to conserve issue.</p> <p>Causes of decay and deterioration of cultural property: External causes of decay, Biological and botanical Causes, Natural disasters and man-made causes. The context of inspecting historic building-Inventory-initial inspections of buildings, Continued documentation and analysis. Preparation of inspection report.</p> <p>Techniques for restoration, preservation and rehabilitation.</p> <p>Concepts of historic towns, quarters and area concepts of heritage Zone and concept of integrated conservation.</p> <p>Planning and management aspects in conservation re-use and redevelopment of historic buildings and areas.</p> <p>Policies, legislations and agencies of conservation.</p>	
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. The conservation of Historic Buildings/B.M. Fieldon</li> <li>2. Peter J Larkham, Conservation and the City, 1996, Routledge, London &amp; New York.</li> <li>3. Graeme Aplin, Heritage Identification, Conservation and Management, 2002, Oxford University Press.</li> </ol>	

AR 212	<b>L-T-P</b>
Sustainable Architecture	<b>3-0-0</b>
	<b>3 credit</b>
<ol style="list-style-type: none"> <li>1. Historical background on the sustainable building movement</li> <li>2. The Scope of Sustainable Building</li> <li>3. Whole-systems thinking and integrated design; introduction to Rating systems</li> </ol>	

<ol style="list-style-type: none"> <li>4. Looking Beyond Buildings,sustainable building is about more than buildings</li> <li>5. Land-Use Planning</li> <li>6. The importance of land-use planning in creating sustainable communities</li> <li>7. Site and Landscape</li> <li>8. Integrating buildings into</li> <li>9. Water Management on the Site, Water Conservation</li> <li>10. Stormwater and innovative management practices</li> <li>11. Understanding and conserving what could become the greatest constraint to development</li> <li>12. Energy Conservation and Efficiency</li> <li>13. Green building starts with energy savingsand use of Renewable Energy.</li> <li>14. After reducing demand, considering our energy supply: renewable</li> <li>15. Indoor Environmental Quality</li> <li>16. An unhealthy building cannot be a green building</li> <li>17. Materials and Resources</li> <li>18. Understanding what goes into our buildings</li> <li>19. Building Durability, Longer-lasting buildings are greener buildings</li> <li>20. Looking Ahead: Climate Adaptation</li> <li>21. Today’s buildings must be adaptable to an uncertain future</li> </ol>
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AR 213	<b>L-T-P</b>
Visual Simantics	<b>3-0-0</b>
	<b>3 credit</b>
<p>Non-verbal communication-signs, symbols and metaphor, general concepts of image and schema  Theories of perception and ‘formal design’, Gestalt psychology of expression in architecture and built environment  Perception, cognition and evaluation, cognitive schemata and mental maps; imageability and human behavior  Cultural aspects and built environment-examples from India and abroad</p>	

AR 214	<b>L-T-P</b>
Modular Co-ordination	<b>3-0-0</b>
	<b>3 credit</b>
<p>Introduction to conventional modular principles and practices in the west in the early, medieval, industrial and post-industrial phases.  Vernacular theories of Modular principles in India.  Typologies, means and methods of various structural systems (Form-active systems like cables and arches, surface active systems like folded plates, vector-active like trusses, bulk active like trabeated means and complex structures) based on natural &amp; engineering knowledge-development.  The advanced and the contemporary themes of humane modular principles-new theories of pattern, group organization; centering processes, topology and 3-D mapping of space systems.  Non-linear theories, symmetry, hologram and graphics in modulation of various structures.</p>	

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<b>AR 215</b>	<b>L-T-P</b>
<b>Facility planning and Specialized Building Design</b>	<b>3-0-0</b>
	<b>3 credit</b>
<p>Flexibility and Facilities planning. Optimal space planning and cost minimization through facility layout. Knowledge based facility planning and decision support system</p> <p>Application of artificial intelligence. Graph theoretic approach to multi-floor building design</p> <p>Facility layout algorithm using graphics. Simulation in facility Planning and efficiency analysis.</p> <p>Computerized Space management. Computer methods in facility layout; computer Graphics and facility layout generation. Database management systems for multifunctional building projects.</p> <p>Integrated approach to specialized building design. Multi-criteria approach in building design. Project engineering management of specialized or large scale buildings.</p>	

<b>AR 221</b>	<b>L-T-P</b>
<b>Interior Design</b>	<b>3-0-0</b>
	<b>3 credit</b>
<p>Scope and purpose of interior design, elements of interior design and their transformation, optical illusion. Concept of space, enveloping space, contained space and residual spaces-space within space.</p> <p>Basic principles of interior design and planning with examples.</p> <p>Functional arrangement of spaces, furniture, material colour, texture, lighting, draperies, finishes, etc. balance and harmony in arrangement of interior spaces</p> <p>Floor coverings: selection, types, textures, carpets and rugs, resilient floors, linoleum, cork-tiles, rubber tiles, asphalt and vinyl tiles, mosaic, marble, stone.</p> <p>Wall and ceiling treatment: importance of walls in the décor, materials, used for walls and ceiling treatments</p> <p>Colours for interior: Physical and emotional effect of colours, effect of light on colour, colour fundamentals and symbolism, colour schemes for different spaces.</p> <p>Painting: Different types of paints and their application on different materials like, wood, masonry, concrete, metal, plaster</p> <p>Study of interiors of different nature such as residential, commercial, office, hospitality covering aspects like furniture, materials, finishes, upholstery, Interior accessories like pictures, paintings, sculpture, clocks, lamps etc.</p> <p>Decor: Styles of Interiors (Italian, English, French, Japanese styles) Exposure to eminent designers' works.</p> <p>Sessionals: Drawing room interior layout and view: kitchen and toilet interiors, interior schemes for small houses, interior of shop and commercial counters in chrome steel and plastic, glass, aluminium, laminates, marble etc., reception lounge of lobby interior of any public building, interior scheme for any restaurant. Office interior and commercial space/malls/multiplexes etc.</p> <p>All drawings on opaque sheet in colours, using water colour, colour pencils, poster colour, etc. can be used.</p> <p>Rendering and presentation techniques using different mediums and papers.</p> <p>Two computer simulations.</p>	
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Architectural Interior Systems; Lighting, Acoustics, Air Conditioning/Flynn J</li> <li>2. Colour in Interior Design and Architecture/Ladau R</li> </ol>	

AR 222	<b>L-T-P 3-0-0 3 credit</b>
Intelligent Buildings	
<ol style="list-style-type: none"> <li>1. Intelligent buildings: concepts, definitions of intelligent buildings, intelligent architecture and structure, evolution of intelligent buildings, IB assessment criteria.</li> <li>2. Building Automation System (BAS): binary data, digital controller, input and output units, sensors and actuators; architecture and configuration of BAS, BAS outstation and central station, programming environment and platform, monitoring interface and development platform, building energy management functions.</li> <li>3. Local Area Network (LAN) and BAS communications tandards: Local Area Network (LAN), protocol standards and OSI model, medium access schemes, LAN standards, Ethernet, ARCnet, LonTalk, wireless technologies, ZigBee, application s of wireless technologies in BAS.</li> <li>4. Applications of internet technologies in BMS: Internet and Internet protocols, convergence networks and total integration Central air-conditioningsystemcontrolandoptimisation:VAV and CAVsystem control and optimization, ventilation control and optimization, chillerperformanceand optimal control, optimal control of heat rejection systems,sequence control of multiple chiller plants, pump speed and sequence controlof chilled water systems.</li> <li>5. Lightingcontrolsystems:purpose of lighting control, basic components oflighting and lighting control systems, analogue control and digital control,DXM512-A, digital addressable lighting interface (DALI), systems based oncommon automation protocols, energy management and lighting controlstrategies.</li> <li>6. Security andsafetycontrolsystems:CCTV systems, analogue CCTVsystems and IP-surveillance systems; Access control system, different typesof access control, intelligent readers andsystem topologies; Burglar alarmsystem, functions of burglar alarm systems; Fire alarm systems, typical firedetectors, conventional fire panels, addressable fire panels.</li> </ol>	

AR 223	<b>L-T-P 3-0-0 3 credit</b>
Building Automation and Management System	
<p>Concept and application of Building Automation and Management system.  Design issues related to building automation and its effect on functional efficiency  Components of building automation system; HVAC, electrical, lighting, modern security system, alarm-system, fire-protection, inter-communication, monitoring devices, mechanical means of vertical and horizontal transportation etc.  Integrated approach in design, maintenance and management system. Current trend and innovation in building automation systems.  Impact of information Technology; Concept of artificial intelligence; Knowledge base and decision support systems.  Application of expert system in building automation. Stages in development of expert system. Expert system application in architecture. Computerising building management information.  System for hi-tech buildings.</p>	

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<b>AR 224</b>	<b>L-T-P</b>
<b>Behavioral Studies in Architecture</b>	<b>3-0-0</b>
<b>3 credit</b>	
<p>Man-environment relationship: Positive and normative theories.          Behavioral science and modern movement. Substantive theory on environment and human behavior, Social stimulation and interaction          The affordances of the built environment. Gestalt theory of perception, Cognition and effect, special behaviour.          Environmental Determinism, Environmental possibilism and environmental probabilism          Concept of FIT-adoptability and flexibility. Anthropometrics and Ergonomics, Barrier free environmental design. Territoriality, defensible space, and social space-the Westgate Theory          Behavioral concept in neighbourhood and urban design, Speculative esthetics and symbolic Esthetics, Semantic and semiotic approaches. Contemporary socio-physical issues in environmental design</p>	

<b>AR 225</b>	<b>L-T-P</b>
<b>Ergonomics and Product Design</b>	<b>3-0-0</b>
<b>3 credit</b>	
<p>Definition of human factors; application of human factors data          Human activities-their nature and effects          Man machine system and physical environment.          Human performance and system reliability; Information input and processing          Human control systems; Visual display-process of seeing; Visual codes and symbols          Auditory, tactual and olfactory human mechanism          Applied anthropometrics, physical space and arrangement          Human response to climate          Product design-form, colour, symbols, user specific criteria; Material, technology and recyclables          Packaging; Multiple utility oriented approach to product design          Design of household elements, tools and devices; Element design for the physically and mentally impaired.          Product publicity and management.</p>	

<b>AR 231</b>	<b>L-T-P</b>
<b>Energy Conscious Architecture</b>	<b>3-0-0</b>
<b>3 credit</b>	
<p>Energy classification, Sources and utilization, Principles of energy conversion          Energy demand and supply in various sectors of human settlement, Non-conventional Energy and its utility          Energy conservation in different climate.          Pricing of energy in developing countries, Energy utilization and efficiency in building design.          Options for energy saving in settlement planning and building design</p>	

AR 232 Appropriate Building Technology	<b>L-T-P</b> <b>3-0-0</b> <b>3 credit</b>
<p>Basic shelter issues in India. National Building Organization-Recommendation of housing &amp; Urban development Corporation.</p> <p>Traditional materials and techniques-pressed soil blocks, soil cement blocks and other alternate building materials-fly ash brick, by product gypsum, bamboo, jute stalk etc.</p> <p>Building process-different types of walling, roofing, foundation. Pre-cast blocks.</p> <p>Laurie Baker's experiments in low-cost housing. Modular construction. Experiments conducted by CBRI Roorkee.</p> <p>CE 804 A/B (b) COST EFFECTIVE BUILDING TECHNIQUES</p> <p>Module I</p> <p>Cost Reduction Techniques – Planning aspects</p> <p>Innovative techniques for foundation- ground improvement by rope drains-bamboo reinforcement-sand piles- Brick arch foundation- stub foundation</p> <p>Foundations in weak soil deposits</p> <p>Module II</p> <p>Locally available building materials and their usability, Corrugated roofing sheets from coir, Applications of bamboo in building construction-flooring-roofing-ceiling-Trusses.</p> <p>Innovative techniques for walls- Lato blocks-cellular concrete blocks-hollow concrete blocks-hollow clay blocks- Stabilized Soil blocks-Stone masonry blocks- Sand lime bricks. Straw-bale technology.</p> <p>Innovative technique for super structure- Rat trap bond masonry (Practical assignment)</p> <p>Module III</p> <p>Innovative techniques for roofing- Funicular shells-Precast reinforced concrete channel units- Precast reinforced concrete cored units- Prestressed concrete hollow cored units- Precast RCC joists flooring/roofing systems- roofing system with cellular units- Reinforced brick panel roofing system-Two-way spanning flooring system using precast units- Cellular light weight concrete roofing units- Ferro cement ribbed slabs and folded plates- Filler slabs .</p> <p>Innovative roofing technology- Filler slabs (Practical assignment)</p> <p>Module IV</p> <p>Mud Construction – Mud as building and building material – Field tests for identification of suitable soil for mud construction- Techniques for mud stabilization.- Techniques of mud construction- finishes and protective treatments</p> <p>Mud Construction- Production of mud blocks (Practical assignment)</p> <p>Module IV</p> <p>Prefabricated building components – advantages of prefabrication. Ferro-cement products. Applications of industrial wastes in building process – Fly ash-Lime sludge</p> <p>Prefabrication- Ferro-cement slab (Practical assignment)</p>	
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. A.G MadhavaRao and D.S Ramachandra Murthy : Appropriate Technologies for Low cost housing</li> <li>2. Mohan Rai and M.P Jaisingh: Advances in building materials and construction, CBRI Roorkee Publications</li> <li>3. F.S. Merrit: Building Construction Hand book.</li> <li>4.D.J.Perry&amp;P.S.Brandew: Cost planning of buildings.</li> </ol>	

AR 233	<b>L-T-P</b> <b>3-0-0</b> <b>3 credit</b>
Futuristic Architecture	
Definition, beginning of the movement and its approach towards architecture Themes and materials of futuristic architecture World War II and its impact on futuristic architecture Redefining of futuristic architecture in the context of space age, car culture and fascination with plastics. Retro-futurism/techno-utopianism and googie architecture. Examples of post WW-II futurism, Visionaries of futuristic architecture Developments in the recent past	

AR 234	<b>L-T-P</b> <b>3-0-0</b> <b>3 credit</b>
Marketing skill	
<ol style="list-style-type: none"> <li>1. Introduction to Marketing Management</li> <li>2. Understanding Client Behavior</li> <li>3. Segmentation, Targeting, and Positioning</li> <li>4. Case Studies- Marketing Project Presentations</li> <li>5. Pricing</li> <li>6. Marketing Communications</li> <li>7. Architecture as a Business</li> <li>8. Social Media and Social Networks Marketing</li> </ol>	

Open Electives
<ol style="list-style-type: none"> <li>1. Building Material and Construction</li> <li>2. Architectural Graphics</li> <li>3. Computer Aided Design</li> <li>4. Building Services (Water Supply and Sanitation)</li> <li>5. Principles of Human Settlement</li> <li>6. Building Services (Illumination, Electrical Services and Acoustics)</li> <li>7. Quantity Survey &amp; Estimation</li> <li>8. Housing</li> <li>9. Disaster Resistance Architecture and Management</li> <li>10. Project Planning Technology</li> <li>11. Energy Efficient Buildings</li> </ol>