

**COMPETENCY BASED CURRICULUM  
FOR DIPLOMA  
IN  
ARCHITECTURE ASSISTANTSHIP**

**1<sup>st</sup> Year (1<sup>st</sup> & 2<sup>nd</sup> Semester)**

**FOR THE STATE OF HIMACHAL PRADESH**



**Implemented w.e.f. Session 2022-23**

**Prepared by: -**

**Composite Curriculum Development Centre  
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## **THREE YEAR DIPLOMA IN ARCHITECTURE ASSISTANTSHIP**

### **SALIENT FEATURES**

Program	Diploma in Architecture Assistantship
Duration	03 Years (Six Semesters)
Entry Qualification	As prescribed by HPTSB/COA/AICTE
Student Intake	As approved by H.P Takniki Shiksha Board.
Pattern	Semester System
Curriculum for	First year Architecture Assistantship

## GENERAL GUIDELINES FOR CURRICULUM IMPLEMENTATION

1. Weightage for the internal assessment in respect of theory subjects will be as follow:
  - a. House Test: 40%
  - b. Class Test: 20%
  - c. Home Assignment: 20%
  - d. Attendance: 20%
2. There will be two class tests in every semester and the average of the two tests will be taken into account.
3. The syllabus for the class tests will be as under:
  - a. Class Test-I: 30% of syllabus
  - b. Class Test-II: next 30% of syllabus
4. Class Test-I &II will be conducted as per Academic Calendar.
5. The 30%, 60% and 80% contents of the syllabus will be based on the number of hours allocated for the topics in the detailed curriculum of each subject.
6. The question paper for both the class tests will be of 30 marks each and of one-hour duration.
7. Improvement test can be conducted after every class test on the basis of some genuine reason to be judged by the Head of concerned Department.
8. There will be one house test as per Academic Calendar and syllabus coverage will be 80%.
9. The house test will be of total 60 marks and the duration of House Test should be two hours.
10. In case student fails to attend the house test due to genuine reasons, re-examination will be conducted with the approval of concerned Principal on the recommendation of concerned Head of Department.
11. There will be minimum two home assignments per subject per semester.
12. Weightage for the internal assessment in respect of Practical subject should be:
  - a. Practical Performance: 60%, Report Writing: 20% and Viva Voce: 20%
13. Weightage for Internal Assessment in respect of Drawing subjects will be as under:
  - a. House Test and Class Test =40%
    - a) Class performance/Drawings Sheets 40%
    - b) Attendance/punctuality =10%
    - c) Viva Voce =10%
14. For 13 a), b), c) marks should be given in each drawing sheet by concerned teacher during evaluation.

15. It is suggested that students may be taken for industrial visits for industrial exposure in second year and third year.

16. **Student Centered Activities:** A provision has been made for organizing Student Centered Activities for overall personality development of students. SCA will comprise co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, cultural activities and participation in programs like technical and cultural events etc.

Distribution of marks for SCA will be as follows:

- 20% marks shall be given for general behaviour.
- 20% marks for attendance.
- 60% Marks shall be given for the Sports/Cultural and Co-curricular activities /other activities after due consideration.

**Note:** These marks are to be sent to the H.P. Takniki Shiksha Board, Dharmashala at the end of semester along with internal assessment.

17. **INDUCTION PROGRAM:-**The students will have to undergo a mandatory induction program for one week as per Academic Calendar as per the suggestive list of activities mentioned in the AICTE Model Curriculum 2019.

**DERIVING CURRICULUM SUBJECT AREAS FROM DIPLOMA PROGRAM  
OUTCOMES**

<b>S.no</b>	<b>Program Outcomes</b>	<b>Curriculum/Subject Areas</b>	<b>Remarks</b>
1	Student will be able to understand the geometry and concept behind the design and construction of a building w.r.t its built environment making a student able to confidently express the learning's of different subjects.	<ul style="list-style-type: none"> <li>• ArchitectureDesign-I</li> <li>• Architecture</li> <li>• Drawing &amp;Graphics</li> <li>• Model Making</li> <li>• Communication Skills in English</li> <li>• Applied Sciences (Physics, Chemistry)</li> <li>• Sports &amp;Yoga</li> <li>• Communication Skills in English-Lab</li> <li>• WorkshopPractice-I</li> </ul>	Semester I
2	Student will be able to use/propose adequate construction material and technology to design a building with help of modern-day equipment and on-site exposure as per market.	<ul style="list-style-type: none"> <li>• ArchitectureDesign-II</li> <li>• Building Materials&amp; Construction-I</li> <li>• History of Architecture-I</li> <li>• Surveying</li> <li>• ArchitectureMathematics</li> <li>• Computer Application in Architecture-I</li> <li>• Environmental Science</li> </ul>	Semester II
3	Student will be able to design as per climate responsive methods and know the use of sustainable building materials with help of advanced technologies and onsite exposure making complete balance with History and tradition of Art and Architecture.	<ul style="list-style-type: none"> <li>• ArchitectureDesign-III</li> <li>• Building Materials&amp; Construction-II</li> <li>• BuildingServices</li> <li>• History Of Architecture-II</li> <li>• Climate responsive Architecture</li> <li>• Computer Application in Architecture-II</li> <li>• Essence of Indian Knowledge and Tradition</li> <li>• Workshop Practice-II</li> </ul>	Semester III
4	Student will know about the legal framework and structure system of building w.r.t latest building material as per trend in market with help of advanced use of software and on-site exposure to develop the design with real time experience of profession	<ul style="list-style-type: none"> <li>• ArchitectureDesign-IV</li> <li>• Building Materials&amp; Construction-III</li> <li>• Building ByeLaws &amp; Submission Drawings</li> <li>• StructureDesign-I</li> <li>• Professional Elective-I</li> <li>• Computer Application in Architecture-III</li> <li>• Workshop Practice-III</li> </ul>	Semester IV

	during internship and identifying the field of interest with numerous elective subjects	<ul style="list-style-type: none"> <li>• Summer Internship</li> </ul>	
5	Student will be able to conceptualize, design and develop the work with practical approach and will be able to prepare detailed working drawing, estimates with complete specifications using various modern software with developing sense of responsibility towards nation and profession.	<ul style="list-style-type: none"> <li>• ArchitectureDesign-V</li> <li>• Building Materials&amp; Construction-IN</li> <li>• StructuredDesign-IS</li> <li>• ProfessionalElective-II</li> <li>• Building Estimation</li> <li>• Computer Application in Architecture-IV</li> <li>• Major Project</li> <li>• Indian Constitution</li> <li>• Summer Internship</li> </ul>	Semester V
6	Student will be able to work in market with proficiency in all aspects of understanding and resolving the issues pertaining to Architectural field as well as entrepreneurship and professional practice.	<ul style="list-style-type: none"> <li>• Major Project</li> <li>• Entrepreneurship &amp; ProfessionalPractice</li> <li>• ContemporaryArchitecture</li> <li>• Computer Application in Architecture-V</li> <li>• Open Elective</li> </ul>	Semester VI

## STUDY AND EVALUATION SCHEME

### FIRST SEMESTER

Sr. No.	Course Code	Course Title	Study Scheme			Credit	Evaluation Scheme								Total marks
			Hrs./Week				Internal Assessment			External Assessment					
			Th	Pr	DCS***		Th / Dwg	Pr	Total	Th	Hr	Pr	Hrs	Total	
1	ARPC-1001	Architecture Design-I**	1	6		4	40	40	80	60	3	60 <sup>###</sup>	3	120	200
2	ARPC-1002	Architecture Drawing and Graphics	1	6	2	4	40		40	60	3			60	100
3	ARPC-1003	Model Making		6		3		40	40			60	3	60	100
4	HS-101	Communication Skills in English*	2		1	2	40		40	60	3			60	100
5	ARBS-1004	Applied Sciences (2 Hrs Physics & 1Hr Chemistry) #	3			3	40		40	60	3			60	100
6	HS-103	Sports & Yoga		2		1		40	40			60	3	60	100
7	ARES-1005	Workshop Practice-I		2		1		40	40			60	3	60	100
8	HS-105	Communication Skills in English Lab*		2		1		40	40			60	3	60	100
9	Students Centered Activity			2				25	25						25
<b>TOTAL</b>			<b>7</b>	<b>26</b>	<b>3</b>	<b>19</b>	<b>160</b>	<b>225</b>	385	<b>240</b>		<b>300</b>		540	<b>925</b>

**Note:**

\* Communication Skills in English, & Communication Skills in English Lab is common with engineering program and to be taught by Applied Sciences and Humanities department faculty.

\*\* Architecture Design-I to be taught in the design studio. For external practical, only viva voce will be conducted.

\*\*\* Doubt Clearing Session load will be distributed by the HOD among the faculty members as per their availability. Attendance of doubt clearing sessions will be taken by the respective faculty member.

# Applied Sciences to be taught by Applied Sciences and Humanities department faculty.

### Viva-Voce only.

AR- Architecture Program, PC-Program Core Courses, HS-Humanities & Social Sciences Courses, BS-Basic Science Courses, AU-Audit Courses & ES-Engineering Science Courses



**STUDY AND EVALUATION SCHEME**  
**SECOND SEMESTER**

Sr. No.	Course Code	Course Title	Study scheme			Credit	Evaluation scheme								Total Marks
			Hrs/Week				Internal Assessment			External Assessment					
			Th	Pr	Dcs***		Th / Dwg	Pr	Total	Th	Hr	Pr	Hrs	Total	
1	ARPC-2001	Architecture Design-II**	1	6		4	40	40	80	60	3	60 <sup>###</sup>	3	120	200
2	ARPC-2002	Building Materials & Construction-I**	1	4	2	3	40	40	80	60	3	60 <sup>###</sup>	3	120	200
3	ARPC-2003	History of Architecture -I	3			3	40		40	60	3			60	100
4	ARPC-2004	Surveying#	2	2		3	40	40	80	60	3	60	3	120	200
5	ARBS-2005	Architecture Mathematics*	3		2	3	40		40	60	3			60	100
6	ARPC-2006	Computer Application in Architecture – I****		4		2		40	40			60	3	60	100
7	AU-102	Environmental Science # #	2				40		40	60	3			60	100
8	Student Centered Activities			2				25	25						25
	Library			2											
<b>TOTAL</b>			<b>12</b>	<b>20</b>	<b>4</b>	<b>18</b>	<b>240</b>	<b>185</b>	<b>425</b>	<b>360</b>		<b>240</b>		<b>600</b>	<b>1025</b>

**NOTE:**

\*Architecture Mathematics to be taught by Applied Science and Humanities Department faculty.

\*\*Architecture Design-II and Building Material and Construction-I to be taught in the design studio. For external practical, only viva voce will be conducted.

#Surveying may be taught by Civil Engineering department faculty

# # Environmental Science is an audit course, common with engineering program

### Viva-Voce only.

\*\*\* Doubt Clearing Session load will be distributed by the HOD among the faculty members as per their availability. Attendance of doubt clearing sessions will be taken by the respective faculty member.

\*\*\*\* Computer Application in Architecture – I may be taught by Computer Engineering faculty.

AR- Architecture Program PC-Program Core Courses, HS-Humanities & Social Sciences Courses, BS-Basic Science Courses, AU-Audit Courses & ES-Engineering Science Courses

## **DETAILED CONTENTS OF FIRST YEAR**

## 1. ARCHITECTURE DESIGN-I (ARPC – 1001)

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Practical			
1	6	80 (40 Th + 40 Pr)	60	60	200	4	3

### COURSE OBJECTIVE:

- To introduce the architectural design language and design process.
- To understand the nature of built environment and its determinants.

UNIT	COURSE CONTENT
<b>I</b>	Introduction to the Concept of Design in everyday life, Objectives of design, Primary elements of design such as point- Line- Form- Space- Texture- Color etc. Detailed study of color theory and its applications through geometric compositions. Two Dimensional Compositions of simple geometric shapes (triangles, rectangles, circles etc.) Volumetric Study of Platonic Solids like Cube, Cuboids, Cylinder, Pyramid, Sphere etc. in simple positions. (Making compositions)
<b>II</b>	Principles of Design such as Scale- Balance- Proportion- Rhythm- Harmony, Contrast- etc. Application of the same through exercises in two- and three- dimensional compositions; using single and multiple types of elements. Anthropometric Studies: Average measurements of human body in different postures, its proportion and graphic representation, application in design of simple household and street furniture.
<b>III</b>	Space Study: Basic human functions and their implications for space requirements. Minimum and optimum areas for various functions such as living, dining, sleeping, cooking, study, storage, toilet etc. including furniture layout, circulation spaces.
<b>IV</b>	Time Problem: Design of single storey Residence.

### COURSE OUTCOME:

- (i) Upon completion of the course, the student shall have achieved a comprehensive understanding of technical drawing techniques and architectural presentation.
- (ii) The course shall prepare students to gain an understanding into the fundamental issues in architectural design and develop skills to create architectural solutions for simple problems.
- (iii) Students will be able to understand the concept of spatial planning.

## **BOOKS AND REFERENCES:**

1. "Design through Discovery", M.E. Bevin, Holt, Rinehart, and Winston.
2. "Drawing and Perceiving", Douglas Cooper, John Wiley & Sons.
3. "Principles of Design in Architecture", K.W. Smithies, Van Nostrand Reinhold.
4. "Architectural Drawing Masterclass", Tom Porter, Charles Scribner's.
5. "Time-saver Standards for Architectural Design Data: The Reference of "Architectural Fundamentals", Donald Watson, McGraw-Hill. 16
6. "Time Saver Standards for Building Types", John Hancock Callender, Joseph De Chiara, McGraw-Hill, New York.
7. "Architectural Graphic Standards", Charles George Ramsey, Harold Reeve Sleeper, Bruce Bassler John Wiley & Sons.
8. "Form Space & Order", 4 th Ed., Francis DK Ching, John Wiley & Sons, New Jerse
9. "Design in Architecture", Geoffrey Broadbent John Wiley and Sons, 1973.
10. "Rendering in Pen and Ink", Arthur L. Guphill and Susan E. Meyer, Watson-Guphill, 1997
11. "Neuferts", Architect's Data
12. "Architectural Graphics", Francis D. K. Ching, Wiley, 2009.

## **NOTE:**

- Detailed teaching program to be made and circulated to the students at the commencement of the semester.
- No. of sheets will be limited to cover all the contents as per the syllabus.
- Site Visits and Case studies should be conducted accordingly to give the students a practical exposure and learning experience.
- UNIT IV- Time problem will have the weightage for internal assessment and external practical only.

### **SUGGESTIVE DISTRIBUTION OF MARKS**

<b>Unit</b>	<b>Time Allotted (Hrs.)</b>	<b>Weightage</b>
<b>I</b>	<b>32</b>	<b>30%</b>
<b>II</b>	<b>42</b>	<b>40%</b>
<b>III</b>	<b>30</b>	<b>30%</b>
<b>IV</b>	<b>8</b>	<b>NIL</b>
<b>Total</b>	<b>112</b>	<b>100%</b>

## 2. ARCHITECTURE DRAWING & GRAPHICS (ARPC 1002)

Teaching Schedule			Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P	*Dcs		Theory	Practical			
1	6	2	40	60	0	100	4	3

### **COURSE OBJECTIVE:**

Drawing is the main language for any Architecture Student and it enables an Architect to convert his ideas in to reality on Ground. This subject is a core subject for Architecture students and for preparing perspective drawings, scale drawings, three dimensional views, furniture drawings and layouts this subject will act as a main guiding tool to the students. Therefore, this course aims at equipping the students with the skills of learning and preparing Architectural drawings or graphic presentation techniques. Teacher are expected to lay considerable stress on practical work so that students attain desired competencies for preparing good quality 2-D drawings and a basic idea of perspectives of interior and exterior of buildings in different media. Teachers are also expected to stress upon appropriate line work, properties, dimensioning, lettering, and printing, colour rendering techniques, shades/shadows and sciography.

<b>UNIT</b>	<b>COURSE CONTENT</b>
<b>I</b>	<p><b>INTRODUCTION TO ARCHITECTURAL GRAPHICS</b></p> <p>Various Drawing Instruments</p> <p>Standard Sizes of Drawing sheets</p> <p>Layout of drawing sheets-Title block</p> <p>Types of lines and their applications-Introduction to Dimensioning</p> <p>Elements of Dimensioning–Types of Dimensioning</p> <p>Unidirectional and Aligned system of dimensioning as per B.I.S.</p>

<p><b>II</b></p>	<p><b>PLANE GEOMETRY:</b></p> <p><b>Geometrical Construction</b></p> <p>Construction of polygons without angular measurements.</p> <p>Inscription of circle in polygons.</p> <p>Inscription of equal circles in regular polygons touching each other and midpoints of sides of polygon.</p> <p><b>Scales</b></p> <p>Representative fraction</p> <p>Types of Scales</p> <p>Plane Scale and Diagonal Scale</p> <p><b>Conic Section</b></p> <p>Terminology, Construction of Ellipse, Parabola &amp; Hyperbola by various methods</p>
<p><b>III</b></p>	<p><b>SOLID GEOMETRY</b></p> <p>Ortho Graphics Projections</p> <p>Theory of Projection, V.P. and H.P. Front and Top View First and Third Angle Projection of Solids</p> <p>Section of Solids</p> <p><b>Sciography</b></p> <p>Sciography of basic 3D shapes like cube, cuboid, sphere etc.</p>

<b>IV</b>	<p><b>ISOMETRIC PROJECTION &amp; PERSPECTIVE VIEW</b></p> <p>Terminology–Isometric Scale and Isometric Graph Box Method of Drawing Isometric Projections Co-ordinate/offset method of Drawing Isometric Projections. Four Centre method of Drawing Isometric Projections Simple problems of Isometric views of various forms such as cube, box etc. Difference between Isometric Projections &amp; Perspective Views Terminology used in Perspective view Simple problems on Two Point and One point perspective of interior and exterior of single storey building with flat roof.</p>
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### **COURSE OUTCOMES**

Upon successful completion of the course, the student will be able to

- (i) Understand Basic concepts of Architectural and Engineering drawings.
- (ii) Develop the basic conceptual sketches in 2D as well as 3D.

### **BOOKS AND REFERENCES**

1. Engineering drawing by N.D. Bhatt, Charotra Publishers
2. Engineering drawing by P.S. Gill, Kataria Publishers

### **NOTE:**

- Detailed teaching program to be made and circulated to the students at the commencement of the semester.
- No. of sheets will be limited to cover all the contents as per the syllabus.
- Use of models may be ensured to make students understand the drawing in a better and practical way. Various software may be used to explain the concepts of drawing.
- \*Doubt Clearing Session will be of 2 hours per week so that students can interact with the faculty members for clearing their doubts related to the corresponding subject and attendance will be compulsory for all students.



### **SUGGESTIVE DISTRIBUTION OF MARKS**

<b>Unit</b>	<b>Time Allotted (Hrs.)</b>	<b>Weightage</b>
<b>I</b>	<b>16</b>	<b>10%</b>
<b>II</b>	<b>26</b>	<b>20%</b>
<b>III</b>	<b>44</b>	<b>30%</b>
<b>IV</b>	<b>58</b>	<b>40%</b>
<b>Total</b>	<b>144</b>	<b>100%</b>

### 3. MODEL MAKING (ARPC – 1003)

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Practical			
-	6	40	-	60	100	3	3

#### COURSE OBJECTIVE:

Students are expected to assist in the preparation of architectural models of various kinds in their professional career. This skill can also be opted for self-employment. Architecture model as three- dimensional representations are made in different mediums. The student should be acquainted with all of these mediums.

UNIT	COURSE CONTENT
<b>I</b>	<ul style="list-style-type: none"> <li>• Draw developmental drawings to appropriate scale of different geometrical shapes/objects.</li> <li>• Block Model of any design project using anyone of the following medium&amp; also show Site presentation details like Ground surfaces, Human beings, vegetation, vehicles, water bodies, roads, street furniture etc.               <ul style="list-style-type: none"> <li>(i) Wood</li> <li>(ii) Thermocol</li> <li>(iii) PVC Sheets</li> <li>(iv) Photo mount board etc. on appropriate scale of different geometrical shapes/objects</li> </ul> </li> </ul>
<b>II</b>	Model of Details: <ul style="list-style-type: none"> <li>(i) Jali details</li> <li>(ii) Grill details</li> <li>(iii) Gate details</li> <li>(iv) Railing details</li> <li>(v) Block model of house</li> </ul>

<b>III</b>	<p>Detailed Models of any Architectural Design project building using any one of the followings:</p> <p>(i) Paper sheets of various kinds (Ivory sheet)</p> <p>(ii) Sun Board</p> <p>(iii) Acrylic sheets</p>
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### **COURSE OUTCOMES**

- (i) Students will be able to visualize and understand the 3D aspects of building design and its components via physical modeling.
- (ii) Students will be able to understand the proportion and scale used in architecture.
- (iii) Students will be able to attain the knowledge of different material to be used for preparing architectural model.

### **BOOKS AND REFERENCES**

1. Architectural Model Making by Nick Dunn (Published by Laurence King Publishing 2010).

### **NOTE:**

- Classes to be conducted in Model Making Lab.
- Detailed teaching program to be made and circulated to the students at the commencement of the semester.
- Model Making workshops should be conducted accordingly to give the students a practical exposure and learning experience.

### **SUGGESTIVE DISTRIBUTION OF MARKS**

Unit	Time Allotted (Hrs.)	Weightage
<b>I</b>	<b>30</b>	<b>35%</b>
<b>II</b>	<b>24</b>	<b>25%</b>
<b>III</b>	<b>42</b>	<b>40%</b>
<b>Total</b>	<b>96</b>	<b>100%</b>

#### 4. COMMUNICATION SKILLS IN ENGLISH (HS - 101)

Teaching Schedule			Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P	DCS		Theory	Practical			
2	0	1	40	60		100	2	3

#### COURSE OBJECTIVE:

Communication skills play an important role in career development. This course aims at introducing basic concepts of communication skills with an emphasis on developing personality of the students. Thus, the main objectives of this course are:

1. To develop confidence in speaking English with correct pronunciation.
2. To develop communication skills of the students i.e. listening, speaking, reading and writing skills.
3. To introduce the need for personality development- Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc.

UNIT	COURSE CONTENT
I	<p><b>Communication: Theory and Practice</b></p> <ol style="list-style-type: none"> <li>1. Basics of communication: Introduction, meaning and definition, process of communication etc.</li> <li>2. Types of communication: formal and informal, verbal, non- verbal and written Barriers to effective communication.</li> <li>3. 7 Cs for effective communication (considerate, concrete, concise, clear, complete, correct, courteous).</li> <li>4. Art of Effective communication, Choosing words <ul style="list-style-type: none"> <li>• Voice</li> <li>• Modulation</li> <li>• Clarity</li> <li>• Time</li> <li>• Simplification of words</li> </ul> </li> <li>5. Technical Communication.</li> </ol>

<b>II</b>	<p><b>Soft Skills for Professional Excellence</b></p> <ol style="list-style-type: none"> <li>1. Introduction: Soft Skills and Hard Skills.</li> <li>2. Importance of soft skills.</li> <li>3. Life skills: Self-awareness and Self-analysis, adaptability, resilience, emotional intelligence and empathy etc.</li> <li>4. Applying soft skills across cultures.</li> </ol>
<b>III</b>	<p><b>Reading Comprehension</b></p> <p>Comprehension, vocabulary enhancement and grammar exercises based on reading of the following texts:</p> <p><b>Section-1 Short Stories</b></p> <ol style="list-style-type: none"> <li>1. “The Gift of the Magi” by O. Henry</li> <li>2. “Uncle Podger Hangs a Picture” Jerome K. Jerome</li> </ol> <p><b>Section-2 Poetry</b></p> <ol style="list-style-type: none"> <li>1. Night of the Scorpion by Nissan Ezekiel,</li> <li>2. Stopping by Woods on a Snowy Evening by Robert Frost,</li> <li>3. Where the Mind is Without Fear by Rabindranath Tagore,</li> </ol>
<b>IV</b>	<p><b>Professional Writing</b></p> <ol style="list-style-type: none"> <li>1. The art of précis writing,</li> <li>2. Letters: business and personnel,</li> <li>3. Drafting e-mail, notices, minutes of a meeting etc.</li> </ol>
<b>V</b>	<p><b>Vocabulary and Grammar</b></p> <ol style="list-style-type: none"> <li>1. Glossary of administrative terms (English and Hindi)</li> <li>2. One-word substitution, Idioms and phrases etc.</li> <li>3. Parts of speech, active and passive voice, tenses etc., Punctuation.</li> </ol>

### **COURSE OUTCOMES:**

At the end of this course, the participants will:

1. Develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.
2. Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of oral communication.
3. Also develop skills of group presentation and communication in team.
4. Develop non-verbal communication such as proper use of body language and gestures.

### **BOOKS AND REFERENCES**

1. J.D.O'Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.
2. Lindley Murray. An English Grammar: Comprehending Principles and Rules. London: Wilson and Sons, 1908.
3. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Edition 2018)
4. Margaret M. Maison. Examine your English. Orient Longman: New Delhi, 1964.
5. M. Ashraf Rizvi. Effective Technical Communication. Mc-Graw Hill: Delhi, 2002.
6. John Nielson. Effective Communication Skills. Xlibris, 2008.
7. Oxford Dictionary
8. Roget's Thesaurus of English Words and Phrases
9. Collin's English Dictionary

### **SUGGESTIVE DISTRIBUTION OF MARKS**

<b>Unit</b>	<b>Time Allotted (Hrs.)</b>	<b>Weightage</b>
<b>I</b>	<b>11</b>	<b>20%</b>
<b>II</b>	<b>07</b>	<b>10%</b>
<b>III</b>	<b>13</b>	<b>30%</b>
<b>IV</b>	<b>08</b>	<b>20%</b>
<b>V</b>	<b>09</b>	<b>20%</b>
<b>Total</b>	<b>48</b>	<b>100%</b>

## 5. APPLIED SCIENCES (ARBS – 1004)

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Practical			
3 (2 Hrs. Physics, 1 Hr. Chemistry)	-	40 (24Phy+16 Chem.)	60	-	100	3	3

### COURSE OBJECTIVE:

Applied Sciences are very essential to develop scientific temper, continued learning skills and appreciation of physical and chemical changes of concern in the field of Architecture. This course covers elements of Applied Physics and Applied Chemistry and Applied Physics contains: units of measurements, force and motion, temperature and its measurement, Acoustics of buildings and fundamentals of light. Applied Chemistry part covers: metals, corrosion and its prevention, plastics, refractory and paints and varnishes.

Teachers, while imparting instructions, are expected to demonstrate various physical and chemical processes to clarify the concepts and Principles involved in the course.

### PART A- APPLIED PHYSICS

UNIT	COURSE CONTENT
<b>I</b>	<b>Units of measurement</b>  Physical quantities, Types of physical quantities, Fundamental and derived Physical quantities with their units. Dimensional formula and dimensional equations. Principal of homogeneity. Uses of dimensional analysis.
<b>II</b>	<b>Force and Motion</b>  Definition of force, Resolution of forces into two component form. Linear momentum, Impulse, Conservation of linear momentum. Four forces in nature (Gravitational, Electromagnetic, weak and strong forces).

<b>III</b>	<b>Temperature and its measurement</b> Definition of heat and temperature, Different scale of temperature, conversion of temperature in different scale (simple problems), Criteria for selection of a thermometer, Thermal expansion of solids, Linear, superficial and cubical expansions.
<b>IV</b>	<b>Acoustics of buildings</b> Conditions for pleasant effect of sound in big hall or auditorium, Echo, Reverberation, reverberation times and simple problems on reverberation time.
<b>V</b>	<b>Work, Power, Energy</b> Definition of work, power, energy and their units. Work energy theorem and simple numerical.

### PART B – APPLIED CHEMISTRY

<b>UNIT</b>	<b>COURSE CONTENT</b>
<b>I</b>	<b>Metals</b> Properties and uses of copper, Aluminum, iron and steel. Corrosion: Meaning of corrosion, Electrochemical theory of corrosion, prevention of corrosion by various methods.
<b>II</b>	<b>Polymers &amp; Adhesives</b> Polymer and Polymerization, Degree of Polymerization, Classification of polymers-on the basis of origin, synthesis, type of monomers and molecular forces. Natural rubber, Vulcanization of rubber and synthetic rubber. Plastics, Additives of plastics and applications of plastics. Adhesives and its brief classification.
<b>III</b>	<b>Paints &amp; Varnishes</b> Constituents of Paints, Characteristics of paints, Constituents and Characteristics of varnishes, Enamel and its constituents, Uses of paints, varnishes and enamels.

### COURSE OUTCOMES

By the end of the course, the students are expected to learn

- i. The basic concepts of force and its application in the field of Architecture.
- ii. The techniques of making sound proof buildings by studying the acoustical treatment of the buildings
- iii. The various types of materials available in the market in construction field and their uses and applications.



### BOOKS AND REFERENCES

1. Text book of Chemistry for class XI & XII ( Part- I & Part –II) ; NCERT Delhi 2017-18
2. Jain & Jain Engineering Chemistry, Dhanpat Rai and Sons New Delhi 2015.
3. Agnihotri, Rajesh, Chemistry for Engineering Wiley India PVT. LTD.
4. Text Book of Physics for class XI & XII ( Part- I & Part –II) ; NCERT Delhi.
5. Applied Physics Volume–I&II, TTTI Publications, Tata McGraw Hill Delhi.

### SUGGESTED DISTRIBUTION OF MARKS

UNIT	Time Allotted ( InHrs)	Marks Allotted (%)
<b>PART A – APPLIED PHYSICS</b>		
I	8	15%
II	6	12%
II	8	15%
IV	5	10%
V	5	8%
<b>PART B – APPLIED CHEMISTRY</b>		
I	5	12%
II	7	16%
III	4	12%
<b>TOTAL</b>	<b>48</b>	<b>100</b>

## 6. SPORTS AND YOGA (HS- 103)

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Practical			
-	2	40		60	100	1	3

### COURSE OBJECTIVE:

To make the students understand the importance of sound health and fitness principles as they relate to better health.

To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.

To create a safe, progressive, methodical and efficient activity-based plan to enhance improvement and minimize risk of injury.

To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

UNIT	COURSE CONTENT
<b>I</b>	<p><b>Introduction to Physical Education</b> Meaning &amp; definition of Physical Education Aims &amp; Objectives of Physical Education Changing trends in Physical Education <b>Olympic Movement</b></p> <p>Ancient &amp; Modern Olympics (Summer &amp; Winter) Olympic Symbols, Ideals, Objectives &amp; Values</p> <p>Awards and Honors in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)</p>

<p><b>II</b></p>	<p><b>Physical Fitness, Wellness &amp; Lifestyle</b> Meaning &amp; Importance of Physical Fitness &amp; Wellness Components of Physical fitness Components of Health related fitness Components of wellness Preventing Health Threats through Lifestyle Change Concept of Positive Lifestyle</p> <p><b>Fundamentals of Anatomy &amp; Physiology in Physical Education, Sports and Yoga</b> Define Anatomy, Physiology &amp; Its Importance Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuron-Muscular System etc.)</p>
<p><b>III</b></p>	<p><b>Kinesiology, Biomechanics &amp; Sports</b> Meaning &amp; Importance of Kinesiology &amp; Biomechanics in Physical Edu. &amp; Sports Newton's Law of Motion &amp; its application in sports. Friction and its effects in Sports. <b>Postures</b> Meaning and Concept of Postures. Causes of Bad Posture. Advantages &amp; disadvantages of weight training. Concept &amp; advantages of Correct Posture. Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordships, Kyphosis, Bow Legs and Scoliosis. Corrective Measures for Postural Deformities</p>

<p><b>IV</b></p>	<p><b>Yoga</b></p> <p>Meaning &amp; Importance of Yoga Elements of Yoga</p> <p>Introduction - Asanas, Pranayama, Meditation &amp; Yogic Kriyas</p> <p>Yoga for concentration &amp; related Asanas (Sukhasana; Tadasana; Padmasana &amp; Shashankasana )</p> <p>Relaxation Techniques for improving concentration - Yog-nidra</p> <p><b>Yoga &amp; Lifestyle</b></p> <p>Asanas as preventive measures.</p> <p>Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana,Sharasana.</p> <p>Obesity: Procedure, Benefits &amp; contraindications for Vajrasana, Hastasana, Trikonasana, ArdhMatsyendrasana.</p> <p>Back Pain: Tadasana, ArdhMatsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.</p> <p>Diabetes: Procedure, Benefits &amp; contraindications for Bhujangasana, aschimottasana, Pavan Muktasana, ArdhMatsyendrasana.</p> <p>Asthema: Procedure, Benefits &amp; contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.</p>
<p><b>V</b></p>	<p><b>Training and Planning in Sports</b></p> <p>Meaning of Training Warming up and limbering down</p> <p>Skill, Technique &amp; Style</p> <p>Meaning and Objectives of Planning.</p> <p>Tournament – Knock-Out, League/Round Robin &amp; Combination.</p> <p><b>Psychology &amp; Sports</b></p> <p>Definition &amp; Importance of Psychology in Physical Edu. &amp; Sports Define &amp; Differentiate Between Growth&amp; Development Adolescent Problems &amp; Their Management</p>

	<p>Emotion: Concept, Type &amp; Controlling of emotions Meaning, Concept &amp; Types of Aggressions in Sports. Psychological benefits of exercise.</p> <p>Anxiety &amp; Fear and its effects on Sports Performance.</p> <p>Motivation, its type &amp; techniques.</p> <p>Understanding Stress &amp; Coping Strategies.</p>
<p><b>VI</b></p>	<p><b>Doping</b></p> <p>Meaning and Concept of Doping Prohibited Substances &amp; Methods Side Effects of Prohibited Substances Sports</p> <p><b>Medicine</b></p> <p>First Aid – Definition, Aims &amp; Objectives.</p> <p>Sports injuries: Classification, Causes &amp; Prevention.</p> <p>Management of Injuries: Soft Tissue Injuries and Bone &amp; Joint Injuries</p> <p><b>Sports / Games</b></p> <p>Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.</p> <p>History of the Game/Sport.</p> <p>Latest General Rules of the Game/Sport. Specifications of Play Fields and Related Sports Equipment. Important Tournaments and Venues.Sports Personalities.</p> <p>Proper Sports Gear and its Importance.</p>

## **COURSE OUTCOMES**

On successful completion of the course the students will be able to:

- i. Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
- ii. Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
- iii. Learn breathing exercises and healthy fitness activities
- iv. Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
- v. Perform yoga movements in various combination and forms.
- vi. Assess current personal fitness levels.
- vii. Identify opportunities for participation in yoga and sports activities.
- viii. Develop understanding of health-related fitness components: cardio respiratory endurance, flexibility and body composition etc.
- ix. Improve personal fitness through participation in sports and yogic activities.
- x. Develop understanding of psychological problems associated with the age and lifestyle.
- xi. Demonstrate an understanding of sound nutritional practices as related to health and physical performance.
- xii. Assess yoga activities in terms of fitness value.
- xiii. Identify and apply injury prevention principles related to yoga and physical fitness activities.
- xiv. Understand and correctly apply biomechanical and physiological principles related to exercise and training.

## **BOOKS AND REFERENCES**

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light on Yoga By B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes)

## SUGGESTIVE DISTRIBUTION OF MARKS

<b>Unit</b>	<b>Time Allotted (Hrs.)</b>	<b>Weightage</b>
<b>I</b>	<b>4</b>	<b>10</b>
<b>II</b>	<b>4</b>	<b>10</b>
<b>III</b>	<b>6</b>	<b>20</b>
<b>IV</b>	<b>6</b>	<b>20</b>
<b>V</b>	<b>6</b>	<b>20</b>
<b>VI</b>	<b>6</b>	<b>20</b>
<b>Total</b>	<b>32</b>	<b>100%</b>

## 7. WORKSHOP PRACTICE – I (ARES – 1005)

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Practical			
-	2	40	-	60	100	1	3

### COURSE OBJECTIVE:

To acquaint students with the various construction materials available in market and their application in Architecture with a hands-on experience.

UNIT	COURSE CONTENT
<b>I</b>	<b>Masonry Shop</b> <ul style="list-style-type: none"> <li>• Exercise on handling of bricks, cement, sand and aggregate</li> <li>• Exercise on preparation of mortar.</li> <li>• Exercise on formation of Different types of masonry bonds</li> <li>• Exercise on pointing and finishing.</li> <li>• Knowledge of various tools used by mason etc.</li> </ul>
<b>II</b>	<b>Carpentry Shop</b> <ul style="list-style-type: none"> <li>• Introduction to various tools used by carpenter.</li> <li>• Terminology of various tools along with uses involving a small exercise</li> </ul>
<b>III</b>	<b>Welding</b> <ul style="list-style-type: none"> <li>• Introduction,</li> <li>• Welding materials</li> <li>• Types of welding</li> <li>• Scope of welding.</li> <li>• Exercises on welding</li> </ul>

### COURSE OUTCOMES

Upon successful completion of the course, the student will be able to

- i. Understand types of wood and its application in architecture.
- ii. Appreciate the importance of masonry works in their architectural design works.
- iii. Students will be able to understand the importance of finishing in building.
- iv. Students will be able to understand the basic tools and joints related to carpentry



**NOTE:**

- Detailed teaching program to be made and circulated to the students at the commencement of the semester.
- Field Visit may be arranged to make the students conversant with the basic techniques of Brick Masonry.
- Masonry shop to be taken in building construction laboratory (Civil Deptt.).
- Construction Yard to be used for exercise and demonstration in Masonry.

**SUGGESTIVE DISTRIBUTION OF MARKS**

<b>Unit</b>	<b>Time Allotted (Hrs.)</b>	<b>Weightage</b>
<b>I</b>	<b>10</b>	<b>30%</b>
<b>II</b>	<b>12</b>	<b>40%</b>
<b>III</b>	<b>10</b>	<b>30%</b>
<b>Total</b>	<b>32</b>	<b>100%</b>

## 8. COMMUNICATION SKILLS IN ENGLISH- LAB (HS-105)

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Practical			
-	2	40	-	60	100	01	3

### **COURSE OBJECTIVE:**

Communication skills play an important role in career development. This lab course aims at actively involving students in various activities to improve their communication skills with an emphasis on developing personality of the students. Thus, the objectives of this course are:

1. To develop listening skills for enhancing communication.
2. To develop speaking skills with a focus on correct pronunciation and fluency.
3. To introduce the need for Personality development- Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc. for that purpose group discussion, extempore and other activities should be conducted during lab classes.

UNIT	COURSE CONTENT
<b>I</b>	<b>Listening Skills</b> Listening Process and Practice: Introduction to recorded lectures, poems, interviews and speeches, listening tests.
<b>II</b>	<b>Introduction to Phonetics</b> <ol style="list-style-type: none"> <li>1. Sounds: consonant, vowel, diphthongs, etc. transcription of words (IPA), syllable division,</li> <li>2. Word stress, intonation, voice modulation etc.</li> </ol>
<b>III</b>	<b>Speaking Skills</b> Standard and formal speech: <ol style="list-style-type: none"> <li>1. Group discussion</li> <li>2. Oral presentations</li> <li>3. Public speaking, business presentations etc.</li> <li>4. Conversation practice</li> <li>5. Role playing</li> <li>6. Mock interviews etc.</li> </ol>

## **COURSE OUTCOMES**

At the end of this course, the participants will:

1. Develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.
2. Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of oral communication.
3. Also develop skills of group presentation and communication in team.
4. Develop non-verbal communication such as proper use of body language and gestures.

## **BOOKS AND REFERENCES:**

1. J.D.O'Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.
2. Lindley Murray. An English Grammar: Comprehending Principles and Rules. London: Wilson and Sons, 1908.
3. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Edition 2018)
4. Margaret M. Maison. Examine your English. Orient Longman: New Delhi, 1964.
5. M. Ashraf Rizvi. Effective Technical Communication. Mc-Graw Hill: Delhi, 2002.
6. John Nielson. Effective Communication Skills. Xlibris, 2008.
7. Oxford Dictionary
8. Roget's Thesaurus of English Words and Phrases
9. Collin's English Dictionary

## 1. ARCHITECTURE DESIGN-II (ARPC – 2001)

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Practical			
1	6	80 (40 Th + 40 Pr)	60	60	200	4	3

### COURSE OBJECTIVE:

To train the students in understanding the interdependence of form, function and structure in the process of Architectural design.

UNIT	COURSE CONTENT
<b>I</b>	Integration of form and function in the design of single use space with simple function like florist, kiosk, gift/souvenir shop, bus shelter, milk booth, Guard cabin, cycle stand, entrance gate, traffic police kiosk, ATM Centre etc.
<b>II</b>	Designing of space for small groups and minor activities with reference to site conditions and materials. The student should be guided to achieve necessary relationship between indoor and outdoor spaces and to understand the role of elements of structure in a built form such as, Post-Office, Crèche, Dispensary, library etc.
<b>III</b>	Study of a building/monument of an architectural importance in local area. Site visits, documentation through text, photography, Drawings.

### COURSE OUTCOME:

Upon completion of the course:

- i. Students shall be able to analyze and design single use space and its visualization in 3D space.
- ii. Students shall be made acquaintance with monuments of architectural importance.

### BOOKS AND REFERENCES:

1. "Building drawing with an integrated approach to Built Environment", M. G. Shah, C. M. Kale,
2. S. Y. Patki, Tata McGraw-Hill Education, 2002.

3. "Site Design Graphics", Micheal S. Kendall, Van Nostrand Reinhold, 1989.
4. "Architectural Graphics", 6<sup>th</sup> Ed., Francis D. K. Ching, John Wiley & Sons, 2015.
5. "Time-saver Standards for Architectural Design Data: The Reference of Architectural Fundamentals", Donald Watson, McGraw-Hill, 1997.
6. "Time Saver Standards for Building Types", John Hancock Callender, Joseph De Chiara, McGraw-Hill, New York, 1983.
7. "Architectural Graphic Standards", Charles George Ramsey, Harold Reeve Sleeper, John Wiley & Sons, 13-Jan-2011. 7. "Architectural Graphic Standards", Charles George Ramsey, Harold Reeve Sleeper, Bruce Bassler JohnWiley & Sons.

**NOTE:**

- Detailed teaching program to be made and circulated to the students at the commencement of the semester.
- No. of sheets will be limited to cover all the contents as per the syllabus.
- Site Visits and Case studies should be conducted accordingly to give the students a practical exposure and learning experience.
- UNIT III will have the weightage for internal assessment and external practical only.

**SUGGESTIVE DISTRIBUTION OF MARKS**

<b>Unit</b>	<b>Time Allotted (Hrs.)</b>	<b>Weightage</b>
<b>I</b>	<b>40</b>	<b>40%</b>
<b>II</b>	<b>48</b>	<b>60%</b>
<b>III</b>	<b>24</b>	<b>NIL</b>
<b>Total</b>	<b>112</b>	<b>100%</b>

## 2. BUILDING MATERIAL & CONSTRUCTION-I (ARPC – 2002)

Teaching Schedule			Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P	Dc s		Theory	Practical			
1	4	2	80 (40 Th + 40 Pr)	60	60	200	3	3

### COURSE OBJECTIVE:

To introduce the elementary building materials, their applications and construction methods. To familiarize the students with building components and their role.

To make student understand the application of brick and stone in masonry works.

UNIT	COURSE CONTENT
<b>I</b>	<b>Basic components of a “building”</b> - from foundation to roof Role of Construction in Architecture- Sketches of the same to be prepared.
<b>II</b>	<b>Basic building materials</b> - brick, stone, cement, sand, concrete: Application, properties and defects. Effects of sun, rain, wind and other climatic and environmental conditions on building materials and built environment. Introduction to paints and varnishes. Market studies such as manufacturing, types and application of the same. Introduction to popular brand names.
<b>III</b>	<b>Brick Masonry:</b> Detail drawings of various types of bonding in walls such as Stretcher bond-English bond-Single & Double Flemish bond etc. These bonds are to be explained with respect to varying wall thickness such as ½ brick, 1 brick, 1½ brick etc. and various types of junctions such as L junction- T junction- Cross junction etc. Brick Jellies, Brick Arches.
<b>IV</b>	<b>Stone masonry</b> Detail drawings of various types such as Rubble walling, Polygonal walling, Flint walling, Ashlars walling, Masonry joints, Stone arches etc.

### COURSE OUTCOME:

- i. Upon completion of the course, the student shall be familiar with basic components of a building.
- ii. The course shall prepare students to gain an understanding of the basic building material like brick, stone, cement etc. and would get an exposure of various bonds in bricks and stone masonry.

## **BOOKS AND REFERENCES**

1. Harry parker, Materials and Methods of Architectural Construction“, John Wiley & Sons.Canada,limited, 1958.
2. W B McKay, “Building Construction”, Orient Longman 21.
3. Robin Barry, „The Construction of buildings (Vol.I-V)“, Blackwell publishing, 2000.
4. Olin, Harold & Schmidt, „Building Construction – Principles, Material & Methods“, American Savings and Loan Institute Press, 1970.
5. Francis Ching, „Building Construction Illustrated“, John Wiley, 1991.

## **NOTE:**

1. Detailed teaching program to be made and circulated to the students at the commencement of the semester.
2. No. of sheets will be limited to cover all the contents as per the syllabus.
3. Site Visits to the ongoing construction projects related to the curriculum should be arranged.
4. Market survey of the paint and varnishes must be done in groups and from at least two different vendors.

## **SUGGESTIVE DISTRIBUTION OF MARKS**

<b>Unit</b>	<b>Time Allotted (Hrs.)</b>	<b>Weightage</b>
<b>I</b>	<b>20</b>	<b>15%</b>
<b>II</b>	<b>30</b>	<b>30%</b>
<b>III</b>	<b>40</b>	<b>35%</b>
<b>IV</b>	<b>22</b>	<b>20%</b>
<b>Total</b>	<b>112</b>	<b>100%</b>

### 3. HISTORY OF ARCHITECTURE-I (ARPC – 2003)

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Practical			
3	-	40	60	-	100	3	3

#### COURSE OBJECTIVE:

- To inculcate the appreciation of „History of Built Environment“ in the larger context of Time, Space, geophysical and social factors.
- To create awareness of the glorious architectural past and to interpret the future development based on that tradition, wisdom and technical knowledge.

UNIT	COURSE CONTENT
<b>I</b>	Factors influencing the architectural character of any place; Geographic, Climatic, Socio-cultural, Religious, Economic, etc. <b>Ancient Mesopotamia:</b> History, evolution and characteristics. <b>Ancient Egypt:</b> History, evolution and characteristics. Example: Mastabas and Pyramid of Giza <b>Indus Valley Civilization:</b> City Planning. Domestic Architecture. Building materials and construction techniques. Example: Great Bath, Mohenjo- daro, granary.
<b>II</b>	<b>Ancient Greece:</b> History, evolution and characteristics. Example: Classical Orders, Parthenon, Acropolis, Agora. <b>Ancient Rome:</b> History, evolution and characteristics. Example: Roman classical orders, Pantheon, Coliseum.
<b>III</b>	<b>Vedic Period:</b> Vedic Village, building materials and construction techniques. <b>Buddhist:</b> History, evolution and characteristics. Major typologies; Stupa, Chaitya Hall, Vihara.
<b>IV</b>	<b>Temple architecture:</b> Evolution of architectural style, major influences on the development of form and other architecturalelements. Detailed study of Nagara and Dravidian style temples. (at least 2 examples each)



## **COURSE OUTCOMES**

- i. Upon completion of the course, the student will be able to develop a keen appreciation of our heritage buildings leading to the understanding that architecture is the product of a particular culture, time and place.
- ii. Knowledge about the history of a culture, its building art and construction techniques helps an architecture student to develop designs that are rooted in the country.

## **BOOKS AND REFERENCES**

1. Percy Brown, „Indian Architecture: Buddhist and Hindu Periods“, D. B. Taraporevala,1965.
2. Satish Grover, „The Architecture of India: Buddhist and Hindu“, Vikas, 1980.
3. Christopher Tadgell , „The History of Architecture in India“, Phaidon, 1994.
4. Satish Chandra, „History of Architecture and Ancient Building Materials in India“, Tech BooksInternational, 2003.
5. James C. Harle , „The Art and Architecture of the Indian Subcontinent:“ Second Edition, YaleUniversity Press,1994.
6. Banister Fletcher, „Dan Cruickshank Sir, Banister Fletcher's a history of architecture: A Historyof Architecture“, Architectural Press, 1996.
7. Michael Raeburn, „Architecture of the Western World“, Rizzoli, 1982.
8. Ilay Cooper, „Barry Dawson, Traditional Buildings of India“, Thames and Hudson, 1998.
9. Ching, Francis, Vikramadithya Prakash, Mark M Jarzombek, „A Global History of Architecture“,John Wiley & Sons, 2011
10. History Of Architecture by G.K. Hiraskar.

## **NOTE:**

- Detailed teaching program to be made and circulated to the students at the commencement of the semester.
- Student shall be encouraged to take up exercises of free hand sketching of exemplar historical edifices.
- Analysis of architectural style/building typology must include functional, constructional and Architectural, ornamental aspects.
- Study Tour/Visit shall be arranged by the class teacher of any nearby important historical monument.

### **SUGGESTIVE DISTRIBUTION OF MARKS**

<b>Unit</b>	<b>Time Allotted (Hrs.)</b>	<b>Weightage</b>
<b>I</b>	<b>14</b>	<b>30%</b>
<b>II</b>	<b>10</b>	<b>20%</b>
<b>III</b>	<b>12</b>	<b>20%</b>
<b>IV</b>	<b>12</b>	<b>30%</b>
<b>Total</b>	<b>48</b>	<b>100%</b>

#### 4. SURVEYING (ARPC – 2004)

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Practical			
2	2	80 (40. Th.+40Pr)	60	60	200	3	3hrs. each for Th. & Pr.

#### **COURSE OBJECTIVE:**

Introduction of basic concepts of surveying, Photogrammetry, Remote sensing and Geographical Information System

UNIT	COURSE CONTENT
<b>I</b>	Introduction to surveying and its principles. Types of surveying, Map and Plan, its Scale and uses. Sources of errors in survey-linear measurement: accurate and approximate methods. Chain Surveying: Introduction, principles and operations, advantages and disadvantages
<b>II</b>	Plane Table surveying: Equipment and accessories, methods-2 point and 3 point, setting, advantages and disadvantages. Compass Surveying: introduction, uses, method, advantages and disadvantages.
<b>III</b>	Contouring: Characteristics, uses, methods, interpolation of contours. Leveling: Definitions, types, parts of dumpy level and its adjustments, types of leveling staff, reducing by rise and fall method and height of collimation method.
<b>IV</b>	Basic concepts of Photogrammetry, Automated Surveying – Introduction to use of Digital Surveying –Instruments such as distomat – total station, Electronic Theodolite, G.P.S. Remote sensing. Geographical Information systems and their applications

#### **COURSE OUTCOMES**

- Student will understand the importance of survey in mapping the topography with the help of latest equipment.

#### **BOOKS AND REFERENCES**

1. “Surveying- Vol.1”, Dr. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi; Sixteenth edition, 2005.
2. “Textbook of Surveying”, C. Venkatramaiah, Orient Blackswan; Second edition, 2011. “A Textbook of Advanced Surveying”, R. Agor, Khanna Publishers, 2002.

3. "Surveying and Levelling", S. C. Rangwala and P. S. Rangwala, Charotar Book Stall, 6th edition, 2011.
4. "Advanced Surveying", P. B. Shahani, 2nd edition; Oxford & IBH Publishers Co., 1992 "Surveying and Levelling" by C.L. Kocher (published by Dhanpatrai).
5. "Surveying and Levelling" by Kanetkar (published by New central book Agency)

**NOTE:**

- a. Detailed teaching program to be made and circulated to the students at the commencement of the semester.
- b. Student shall be encouraged to take up exercises of free hand sketching of exemplar historical edifices.
- c. Analysis of architectural style/building typology must include functional, constructional and Architectural, ornamental aspects.
- d. Study Tour/Visit shall be arranged by the class teacher of any nearby important historical monument.

**PRACTICAL EXERCISE**

**1. Chain Surveying**

- e. Ranging a line.
- f. Chaining a line and recording in the field book.
- g. Taking offsets- perpendicular and oblique (with a tape only).
- h. Setting out right angle with a tape.
  - Chaining of a line involving reciprocal ranging
  - Chaining a line involving obstacles to ranging
  - Chain Survey of a small area.

**2. Plane Tabling**

- a. To study plane table survey equipment.
- b. To set a plane table on a station point.
- c. Plotting a few points by radiation method.
- d. To orient the plane-table by:
  - Through Compass
  - Back-sighting
- e. Plotting a few points by intersection method.

### 3. Leveling

- a. Study of dumpy Level and leveling staff.
- b. Temporary adjustment of a dumpy level.
- c. Taking staff readings on different stations from the single setting and finding difference of level between them.
- d. Find the difference level between two distant points.

### 4. Contouring

- a. Preparing contour plan by radial line method by the use of Dumpy level/Auto Level.
- b. Preparing a contour plan by method of squares.
- c. Using a plain meter.

### 5. Hands-on Theodolite

- a. Handling and usage.

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)		Marks Allotted (%)
	Theory	Practical	
1	06	08	20
2	10	10	30
3	10	12	30
4	06	2	20
<b>Total</b>	<b>32</b>	<b>32</b>	<b>100</b>

## 5. ARCHITECTURE MATHEMATICS (ARBS – 2005)

Teaching Schedule			Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P	Dcs		Theory	Practical			
3	-	2	40	60	-	100	3	3

### COURSE OBJECTIVE:

This course is designed to give a comprehensive coverage at an introductory level to the subject of Trigonometry, Differential & Integral Calculus and Basic elements of algebra.

UNIT	COURSE CONTENT
<b>I</b>	<p><b>Matrices and Determinants</b></p> <p>Matrices, Algebra of matrices, Determinants, Value of determinants of 2<sup>nd</sup> &amp; 3<sup>rd</sup> order, Crammer's rule for solving two variables and three variables linear equations, Adjoint &amp; Inverse of a matrix, matrix inverse method to solve a system of linear equations in two and three variables.</p>
<b>II</b>	<p><b>Vector Algebra and Trigonometry</b></p> <p>Vector Algebra</p> <p>Definition, notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector products of 2 vectors.</p> <p>Trigonometry</p> <p>Concept of angles, measurement of angles in degrees, grades and radians and their conversions.</p> <p>T-Ratios of Allied angles (without proof). Graphs of Sin x, Cos x and Tan x.</p>
<b>III</b>	<p><b>Differential Calculus</b></p> <p>Important formulae of Differentiation, Rules for Differentiation, Differentiation of sum, product and quotient of functions.</p>

<b>IV</b>	<p><b>Integral Calculus</b></p> <p>Integration as inverse operation of differentiation.</p> <p>Simple integration by substitution, by parts and by partial fractions (for linear factors only).</p>
<b>V</b>	<p><b>Mensuration</b></p> <p>Surface area and volume of solid shapes (cube, cuboid, sphere, right circular cylinder, right circular cone).</p>

### **COURSE OUTCOMES**

By the end of the course, the students are expected to learn

- i. The students are expected to acquire necessary background in Trigonometry to appreciate the importance of the geometric study as well as for the calculation and the mathematical analysis.
- ii. The students are expected to acquire necessary background in Determinants and Matrices so as to appreciate the importance of the Determinants are the factors that scale different parameterizations so that they all produce same overall integrals, i.e. they are capable of encoding the inherent geometry of the original shape.
- iii. The students are able to solve the basic problems of Differentiation and Integration.

### **BOOKS AND REFERENCES**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018).
4. V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., Vi- First Year Curriculum Structure Common to All Branches 14 kas Publishing House.
5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi.
6. E-books/e-tools/ learning Mathematics software/websites etc.

## **SUGGESTED DISTRIBUTION OF MARKS**

<b>Unit</b>	<b>Time Allotted (In Hrs)</b>	<b>Marks Allotted (%)</b>
<b>I</b>	<b>16</b>	<b>20</b>
<b>II</b>	<b>16</b>	<b>20</b>
<b>III</b>	<b>16</b>	<b>20</b>
<b>IV</b>	<b>16</b>	<b>20</b>
<b>V</b>	<b>16</b>	<b>20</b>
<b>TOTAL</b>	<b>80</b>	<b>100</b>



## 6. COMPUTER APPLICATIONS IN ARCHITECTURE – I (ARPC – 2006)

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Practical			
-	4	40	-	60	100	2	3

### COURSE OBJECTIVE:

- The subject introduces the fundamentals of computer system for using various hardware and software components.
- This exposure will enable the students to enter their professions with confidence, and contribute to the productivity.

UNIT	COURSE CONTENT
<b>I</b>	Block diagram of a computer, components of computer system, CPU, Memory, Input devices; keyboard, Scanner, mouse etc.; Output devices; VDU, LCD, Printers etc.  Primary and Secondary Memory: RAM, ROM, magnetic disks – tracks and sectors, optical disk (CD, DVD & Blue Ray Disk.), USB/Flash Drive.
<b>II</b>	<b>Software Concepts</b>  System software, Application software, Virtualization software and Utility software, Introduction of Operating System, Installation of Window / Linux, Features of OPEN OFFICE/MS_OFFICE (MS word, Excel, PowerPoint) . Install and Uninstall a Software
<b>III</b>	<b>Basics of Networking –</b>  LAN, WAN, Wi-Fi technologies and sharing of printers and other resources, Concept of IP addresses, DNS, introduction of internet, applications of internet like: e-mail and browsing, concept of search engine and safe searching. Various browsers like Internet explorer/Microsoft Edge, Mozilla Firefox, use of cookies and History, WWW (World Wide Web), hyperlinks.
<b>IV</b>	<b>Computer functioning and Management</b>  Remove temporary files, prefetch. Introduction to Anti-virus and scanning the system.

## **COURSE OUTCOMES**

1. Upon successful completion of the course, the student will be able to increase computer proficiency.
2. Use of upcoming software in the field of related field will be easier in the future.

## **BOOKS AND REFERENCES**

- a. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi.
- b. Information Technology for Management by Henery Lucas, Tata McGraw Hills, NewDelhi.
- c. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi.
- d. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, NewDelhi.
- e. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt.Ltd., Jungpura, New Delhi.
- f. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd.,Jungpura, New Delhi.
- g. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
- h. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing HousePvt. Ltd., Jungpura, New Delhi.
- i. On Your Marks - Net...Set...Go... Surviving in an e-world by Anushka Wirasinha,Prentice Hall of India Pvt. Ltd., New Delhi.
- j. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar.

## **NOTE:**

- a. Detailed teaching program to be made and circulated to the students at the commencement of the semester.
- b. This subject may be taught by Faculty from Computer Engineering Deptt.
- c. A computer lab must be equipped with latest hardware and software.
- d. This subject may be taught by IT/CSE faculty.

## **LIST OF PRACTICAL EXERCISES**

1. Given a PC, name its various components and peripherals. List their functions
2. Installing various components of computer system and installing system software and application software

3. Installation of I/O devices, printers and installation of operating system viz. Windows/BOSS/LINUX
4. Features of Windows as an operating system
  - Start.
  - Shut down and restore.
  - Creating and operating on the icons.
  - Opening, closing and sizing the windows and working with windows interfacing elements (option buttons, checkbox, scroll etc.).
  - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file and folders.
  - Changing settings like, date, time, color (back ground and fore ground etc.).
  - Using short cuts.
  - Using on line help.
5. Word Processing (MS Office/Open Office)
  - a. File Management:
    - Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, giving password protection for a file
  - b. Page set up
    - Setting margins, tab setting, ruler, indenting
  - c. Editing a document:
    - Entering text, cut, copy, paste using tool- bars
  - d. Formatting a document:
    - Using different fonts, changing font size and colour, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods.
    - Aligning of text in a document, justification of document, inserting bullets and numbering.

- Formatting paragraph, inserting page breaks and column breaks, line spacing.
  - Use of headers, footers: Inserting footnote, end note, use of comments, auto text.
  - Inserting date, time, special symbols, importing graphic images, drawing tools.
- e. Tables and Borders:
- Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, and partition of cells, inserting and deleting a row in a table.
  - Print preview, zoom, page set up, printing options.
  - Using find, replace options.
- f. Using Tools like:
- Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels
  - Using shapes and drawing toolbar,
  - Working with more than one window.

## 6. Spread Sheet Processing (MS Office/Open Office)

- a. Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, save worksheet, switching between different spreadsheets
- b. Menu commands:
- Create, format charts, organize, manage data, solving problem by analyzing data. Programming with Excel Work Sheet, getting information while working
- c. Work books:
- Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations
  - Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet, conditional formatting.

d. Creating a chart:

- Working with chart types, changing data in chart, formatting a chart, use chart to analyze data.
- Using a list to organize data, sorting and filtering data in list.

e. Retrieve data with query:

- Create a pivot table, customizing a pivot table. Statistical analysis of data.

f. Exchange data with other application:

- Embedding objects, linking to other applications, import, export document.

7. Power Point Presentation (MS Office/Open Office)

a. Introduction to PowerPoint

- How to start PowerPoint
- Working environment: concept of toolbars, slide layout & templates.
- Opening a new/existing presentation
- Different views for viewing slides in a presentation: normal, slide sorter.

b. Addition, deletion and saving of slides

c. Insertion of multimedia elements

- Adding text boxes
- Adding/importing pictures
- Adding movies and sound
- Adding tables and charts etc.
- Adding organizational chart
- Editing objects
- Working with Clip Art

d. Formatting slides

- Using slide master
- Text formatting

- Changing slide layout
  - Changing slide color scheme
  - Changing background
  - Applying design template
- e. How to view the slide show?
- Viewing the presentation using slide navigator
  - Slide transition
  - Animation effects, timing, order etc.
8. Internet and its Applications
- a. Establishing an internet connection.
  - b. Browsing and down loading of information from internet.
  - c. Sending and receiving e-mail
    - Creating a message
    - Creating an address book
    - Attaching a file with e-mail message
    - Receiving a message
    - Deleting a message
  - d. Assigning IP Addresses to computers and use of domain names.
9. Functioning of Antivirus
- Installation and updation of an antivirus.
  - How to scan and remove the virus.
10. To remove temporary files

#### **SUGGESTED DISTRIBUTION OF MARKS**

UNITS	Practical No.	Time Allotted (Hrs.)	Marks Allotted (%)
<b>I</b>	<b>1, 2 and 3</b>	<b>16</b>	<b>20</b>
<b>II</b>	<b>4, 5, 6 and 7</b>	<b>24</b>	<b>40</b>
<b>III</b>	<b>8</b>	<b>12</b>	<b>20</b>
<b>IV</b>	<b>9 and 10</b>	<b>12</b>	<b>20</b>
	<b>Total</b>	<b>64</b>	<b>100</b>

## 7. ENVIRONMENTAL SCIENCE (AU-102)

Teaching Schedule		Marks of Sessional work	Marks of Examination		Total marks	Credits	Duration of Examination (h)
L	P		Theory	Practical			
2	-	40	60	-	100	0	3

### COURSE OBJECTIVE:

Technicians working in industries or elsewhere essentially require the knowledge of environmental science so as to enable them to work and produce most efficient, economical and eco-friendly finished products.

- Solve various engineering problems applying ecosystem to produce eco – friendly products.
- Use relevant air and noise control method to solve domestic and industrial problems.
- Use relevant water and soil control method to solve domestic and industrial problems.
- To recognize relevant energy sources required for domestic and industrial applications.
- Solve local solid and e-waste problems.

UNIT	COURSE CONTENT
<b>I</b>	<p><b>Ecosystem</b></p> <p>Structure of ecosystem, Biotic &amp; Abiotic components Food chain and food web Aquatic (Lentic and Lotic) and terrestrial ecosystem Carbon, Nitrogen, Sulphur, Phosphorus cycle.</p> <p>Global warming -Causes, effects, process, Green House Effect, Ozone depletion.</p>

<b>II</b>	<p><b>Air and, Noise Pollution</b></p> <p>Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler)</p> <p>Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator)</p> <p>Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler</p> <p>Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000</p>
<b>III</b>	<p><b>Water and Soil Pollution</b></p> <p>Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation</p> <p>Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis).</p> <p>Causes, Effects and Preventive measures of Soil Pollution: Causes- Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.</p>
<b>IV</b>	<p><b>Renewable sources of Energy</b></p> <p>Solar Energy: Basics of Solar energy. Flat plate collector (Liquid &amp; Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills.</p> <p>Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogasproduction mechanism. Utilization and storage of biogas.</p> <p>Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy.</p> <p>New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy.</p>



<b>V</b>	<p><b>Solid Waste Management, ISO 14000 &amp; Environmental Management</b></p> <p>Solid waste generation-</p> <p>Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste.</p> <p>Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.</p> <p>Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste, Air quality act 2004, air pollution control act 1981 and water pollution and control act 1996.</p> <p>Structure and role of Central and state pollution control board. Concept of Carbon Credit, Carbon Footprint.</p> <p>Environmental management in fabrication industry.</p> <p>ISO14000: Implementation in industries, Benefits</p>
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### **COURSE OUTCOMES**

At the end of the course student will be able to

- i. Understand the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco – friendly products.
- ii. Understand the suitable air, extent of noise pollution, and control measures and acts.
- iii. Understand the water and soil pollution, and control measures and acts.
- iv. Understand different renewable energy resources and efficient process of harvesting.
- v. Understand solid Waste Management, ISO 14000 & Environmental Management.

### **BOOKS AND REFERENCES**

1. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna Publishing House, New Delhi
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
3. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and.
4. Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099.
5. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
6. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing

- House, New Delhi
7. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
  8. Rao, M. N. Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New Delhi, 1988, ISBN: 0-07-451871-8.
  9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978, ISBN: 9780070354760.
  10. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
  11. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN: 978-81-7993-502-6
  12. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
  13. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

**Open-source software and website address:**

- 1) [www.eco-prayer.org](http://www.eco-prayer.org)
- 2) [www.teriin.org](http://www.teriin.org)
- 3) [www.cpcp.nic.in](http://www.cpcp.nic.in)
- 4) [www.cpcp.gov.in](http://www.cpcp.gov.in)
- 5) [www.indiaenvironmentportal.org.in](http://www.indiaenvironmentportal.org.in)
- 6) [www.whatis.techtarget.com](http://www.whatis.techtarget.com)
- 7) [www.sustainabledevelopment.un.org](http://www.sustainabledevelopment.un.org).
- 8) [www.conserve-energy-future.com](http://www.conserve-energy-future.com)

**NOTE**

Different methods of teaching and media to be used to attain classroom attention.

- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- 15-20% of the topics which are relatively simpler or descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
- Micro-projects may be given to group of students for hand-on experiences
- Encouraging students to visit to sites such as Railway station and research establishment round the institution.

**SUGGESTIVE DISTRIBUTION OF MARKS**

Unit	Time Allotted (Hrs.)	Weightage
I	6	20
II	6	20
III	6	20
IV	6	20
V	8	20
<b>Total</b>	<b>32</b>	<b>100%</b>

