

SAVITRIBAI PHULE PUNE UNIVERSITY

SYLLABUS FOR

**MASTER IN ARCHITECTURE
M. ARCH (COMPUTER APPLICATIONS)
(To be implemented w.e.f. A.Y. 2015-16)**

**BOARD OF STUDIES IN ARCHITECTURE
FACULTY OF ENGINEERING**

MASTER'S DEGREE IN ARCHITECTURE M. ARCH. (COMPUTER APPLICATIONS)

PREAMBLE

Digital design is an emerging area in Architecture and the M.Arch Computer Applications program is designed to prepare students to specialize in this area which has a high potential in future architectural career. Concepts from computation and contemporary sciences and their impact in the domain of architecture and urban design are investigated. This course encourages inquiries into methods and representations for design, the development of design tools, applications of digital technologies to design practice, the impacts of these technologies on the built environment and their social and cultural implications. Students enrolled in Computer Applications take subjects and do research in theory and applications of computation and computer technology including computer graphics, digital modeling and rendering, generative design, CAD/CAM and rapid prototyping technologies, remote collaborative design, and the design process and management systems. It will probe concepts such as behavioral, parametric and generative design, algorithmic logic and key ideas from quantum physics, biology and systems theory as a knowledge resource and means of production. A productive dialogue will be initiated with experts from other fields, including mathematics, computer science and engineering, under the larger collaborative platform of Computational design. Students are exposed to various new concepts like: Digital Tectonics , Digital Morphogenesis, Parametric design , Generative architecture , Per formative Design ,Parametric Urbanism , Hypertecture and Evolutionary prototyping. The program has a main digital design studio which runs through three semesters culminating in the thesis. Students undertake professional training during the course too.

Digital Design Studio :-

- Basic concept formulation, non-linear geometry and parametric thinking
- Sustainable design concepts and design based on data streaming
- Parametric Urbanism design projects using information mapping and research paper
- Research paper and Computer Applications project

Supporting Technical Subjects are :-

- Visualization and animation – advance 3D software and programming
- Advance building construction concepts through digital fabrication and automated design
- Building Information Modelling – simulation and analytical methods using software
- Management Information Systems – Management at all stages from design development to execution
- Geographic Information Systems – information Mapping and querying

Skill Development Classes are :- in software training, programming, colloquium, academic writing and research methods

OBJECTIVES :-

Architecture as a built reality maintains a close relationship to the mode and techniques of representation. The advent of digital software has released a unique potential that can lead to a significant rethinking, re-imaging and reconfiguration of the built environment. This course offers the opportunity to be at the forefront of interrogation in this field.

SCOPE AND OPPORTUNITIES :-

This course offers an opportunity to be at the forefront of the emergent practice of digital architecture. The graduates of this course can be absorbed in the mainstream Architecture or many related fields like Architectural Visualization, Building Management Systems, Software Development, etc.

SEMESTER WISE FOCUS :-

SEMESTER 1 :-

The focus of semester I will be towards developing skills and concepts in computational thinking and design. This will be done through a series of design projects in the studio as well as skill development in visualization the digital tools studio. The concept development in digital processes would be through the Digital theory classes. There will be two supportive subjects that will introduce computation through programming. There will be an elective (colloquium) that will allow students to enhance their reading, researching and presentation skills.

SEMESTER 2 :-

The focus of this semester II will be towards learning digital design processes and their application in Design studio in architectural projects. Another focus will be on sustainability through Automated design and construction. This will be done through the subjects Automated design and Digital fabrication. The electives offered will be in Robotics and Embedded systems to enhance learning.

SEMESTER 3 :-

The focus of this semester III will be in application of digital design processes in Urban design through the Parametric Urbanism studio. Various theoretical concepts in parametric urbanism would be introduced through digital theory II. Along with this elective would be offered in GIS and MIS for a better understanding of Information systems and management.

SEMESTER 4 :-

In semester III the students will be working on a project in digital architecture and a research paper. This work will help the students apply their assimilated learning through out the earlier semesters to an architectural project.

25% of the total teaching hours are reserved for reflecting the institute's philosophy and its reflection in the design studio.

RULES OF COURSE STRUCTURE FOR MASTER OF ARCHITECTURE, M.A.R.C.H. (COMPUTER APPLICATIONS)

PROVISION OF INFRASTRUCTURE

Course shall be conducted as per the guide lines laid down by the Council of Architecture, New Delhi, with respect to intake of students, class rooms, studios, laboratories, seminar rooms, library facilities, students' amenities and all the appurtenant requirements to carry out teaching activity effectively.

APPOINTMENT OF TEACHING AND SUPPORTING STAFF

The appointment of teaching staff shall be made as per the norms laid down by C.O.A., New Delhi and other statutory bodies as applicable.

RULE NO. 1 :- ELIGIBILITY CRITERIA

A student seeking admission to Master of Architecture Course must have secured minimum 50% marks in aggregate in a Bachelor of Architecture degree course or equivalent courses recognized by the apex body with /

without valid GATE score. The students with valid GATE score shall be given preference and the students without GATE score shall be considered subject to the vacancy.

RULE NO. 2 :- SCHEME OF ASSESSMENT:

A candidate, to be eligible for the Master's Degree in Architecture, will be required to appear for and pass examinations as under

1. First Year M. Arch : SEM I AND SEM II
2. Second Year M. Arch. : SEM III AND SEM IV

University will declare combined result of

- SEM I + SEM II at the end of First Year and
- SEM III + SEM IV at the end of Second Year

RULE NO. 3 :- GRANTING OF TERM

Academic year will consist of TWO SEMESTERS of 90 teaching days each. Sessional work/ assignments prepared by the students shall be continuously assessed by the Internal Teacher throughout the semester.

The candidate will be permitted to appear for the examinations at the end of each semester only if he/she keeps term at a college affiliated to the university and produces testimonials from the Principal for

1. 75% attendance in each head of passing of Theory and /or Sessional work as prescribed by the University.
2. Satisfactory completion of the Sessional Work prescribed for each subject and secured at least 50 % marks in the Internal Assessment for the same.
3. Good conduct.

RULE NO.4 :- EXAMINATIONS

At each examinations Theory Paper Sessional and Sessional and viva – voce based on Sessional Work, as prescribed in the syllabus for the Examination at the end of each semester, shall constitute separate heads of passing.

RULE NO. 5 :- SESSIONAL WORK ASSESSMENT:

In respect of Sessional work in First, Second, Third and Fourth semesters, target date shall be fixed for the completion of each assignment. All assignments shall be continuously assessed by the Internal Teacher during each semester.

- a) For the First, Second, and Third Semester examinations, Sessional and Viva assessment will be done by an External Examiner, who is external to the college i.e. teacher from college other than one, whose students are being examined.
- b) For Fourth Semester examination, external assessment shall be carried out by a professional not teaching in any of the Colleges under University of Pune.
- c) An examiner for any of the subjects of examination shall have a minimum of 5 years of teaching / professional experience in his/her specific field of study.

RULE NO. 6 :- PRE REQUISITES AND RULES OF A.T.K.T. FOR ADMISSION TO HIGHER CLASSES

This course has been considered as an integrated one and students will be allowed to take admission to second, third and fourth semesters irrespective of number of subjects in which they are failing.

RULE NO. 7 :- CRITERIA FOR PASSING

To pass the First and Second Year Examination, a candidate must obtain minimum 50 % marks in each paper, 50% in Sessional/Viva voce and 50% in aggregate.

RULE NO. 8 :- GRADING SYSTEM

Assessment and Grade Point Average

R-8.1 Marks / Grade / Grade Point

A grade is assigned based on the total marks obtained by a student in all the heads of examination of the course. These grades, their equivalent grade points are given in Table 3.

The guidelines for conversion of marks to grades are given below.

Grade	Grade Point	Percentage of	Remarks
O	10	90-100	Outstanding
A	9	80-89	Very Good
B	8	70-79	Good
C	7	60-69	Fair
D	6	50-59	Average
E	0	Below 50	Fail

R-8.2 Passing Grade

The grades **O, A, B, C, D**, are passing grades. A candidate acquiring any one of these grades in a course shall be declared as pass. And student shall earn the credits for a course only if the student gets passing grade in that course.

R-8.3 E Grade

The grade **E** shall be treated as a failure grade. The student with **E** grade will have to pass the concerned course by re-appearing for the examination. The student with **E** grade for any stage of the Project Work will have to carry out additional work/ improvement as suggested by the examiners and re-appear for the examination.

RULE NO. 9 :- PERFORMANCE INDICES:

R-9.1 SGPA

The performance of a student in a semester is indicated by a number called the Semester Grade Point Average (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses, seminars and projects registered by the student during the semester.

(i) Semester Grade Point Average (SGPA) =

$$SGPA = \frac{\sum_{i=1}^p C_i G_i}{\sum_{i=1}^p C_i}$$

$$SGPA = \frac{\sum \text{Grade Points Earned} \times \text{Credits for each course}}{\text{Total Credits}}$$

For Example: suppose in a given semester a student has registered for five courses having credits C1, C2, C3, C4, C5 and his / her grade points in those courses are G1, G2, G3, G4, G5 respectively. Then students

$$SGPA = \frac{C1G1 + C2G2 + C3G3 + C4G4 + C5G5}{C1 + C2 + C3 + C4 + C5}$$

SGPA is calculated up to two decimal places by rounding off.

R-9.2 CGPA

The CGPA is the weighted average of the grade points obtained in all the courses, seminars and projects registered by the student since student is admitted to the college. It is calculated in the same manner as the SGPA.

R-9.3 In case of a student clearing a failed course or improvement, the earlier grade would be replaced by the new grade in calculation of the SGPA and CGPA.

RULE NO. 10:- RESULT:-

R-10.1 Based on the performance of the student in the semester examinations, the University of Pune will declare the results and issue the Semester Grade sheets.

The University of Pune will issue a Degree Certificate and the final grade sheet of Semester I, II, III & IV, to the student, who is otherwise eligible for the award of Degree of Master of Architecture.

R-10.2 The class shall be awarded to a student on the CGPA calculated based on all the four semesters. The award of the class shall be as per Table 4.

Sr. No.	CGPA	Class of the Degree awarded
1	7.75 or More than 7.75	First Class with Distinction
2	6.75 or more but less than 7.75	First Class
3	6.25 or more but less than 6.75	Higher Second Class
4	5.5 or more but less than 6.25	Second Class

RULE NO. 11 :- EXEMPTIONS AND SUPPLEMENTARY EXAMINATION

In case a candidate fails and desires to appear again,

- a) He/she will be exempted from appearing in the head/s of passing in which he/she has passed.
- b) A candidate will have to appear for the examination of backlog subjects along with the examination of current semester.

RULE NO. 12 :- OTHER RULES:

University/ affiliated colleges may frame additional rules and regulations or modify these regulations if required, and once approved by the University, they would be binding on the students.

COURSE STRUCTURE MASTER IN ARCHITECTURE (COMPUTER APPLICATIONS)

[TO BE IMPLEMENTED W.E.F. ACADEMIC YEAR 2015 – 2016]

Credit Structure for M.ArchProgramme					
Course work	Semester I	Semester II	Semester III	Semester IV	Total
Core courses	16	16	16	-	48
Elective Courses	2	2	2	-	6
Lab Courses + Supportive courses	7	7	3	-	17
Seminar	-	-	-	5	5
Project work	-	-	4	20	24
Total	25	25	25	25	100

SEMESTER I MARCH (COMPUTER APPLICATIONS)														
Sub. Code	SUBJECT	Course	Hrs /wk	TEACHIG SCHEME			EXAMINATION SCHEME							CREDITS
				period/ wk	Lect./ Wk	Studio /Wk	Paper	Termw ork	SESSIONAL		Oral		Total	
									Int	Ext	Int	Ext		
CA 1	Digital Design Studio I	Core	9	12	2	10	-	-	150	150	25	25	350	9
CA 2	Digital Tools And Technicques I	Core	4	5	2	3	-	-	75	75	-	-	150	4
CA 3	Digital Design Theory I	Core	3	3	2	1	100	25	-	-	-	-	125	3
CA 4	Elective I	Elective	2	2	1	1	-	100	-	-	-	-	100	2
CA 11	Digital Fabrication	Lab/ Supporti ve	4	5	2	3	-	-	75	75	-	-	150	4
CA 9	Automated design	Core	3	3	2	1	100	25	-	-	-	-	125	3
TOTAL (SEMESTER I)			25	30	11	19	200	150	300	300	25	25	1000	25

SEMESTER II MARCH (COMPUTER APPLICATIONS)														
Sub. Code	SUBJECT	Course	Hrs /wk	TEACHIG SCHEME			EXAMINATION SCHEME							CREDITS
				period/ wk	Lect./ Wk	Studio /Wk	Paper	Term Work	SESSIONAL		Oral		Total	
									Int	Ext	Int	Ext		
CA 7	Digital Design Studio II	Core	9	12	2	10	-	-	150	150	25	25	350	9
CA 8	Digital Tools And Technicques II	Core	4	5	2	3	-	-	75	75	-	-	150	4
CA 15	Digital Design theory II	Core	3	3	2	1	100	25	-	-	-	-	125	3
CA 10	Elective II	Elective	2	2	1	1	-	100	-	-	-	-	100	2
CA 5	Computer Graphics	Lab/ Supporti ve	4	5	2	3	-	-	75	75	-	-	150	4
CA 12	Research I	Supporti ve	3	3	2	1	100	25	-	-	-	-	125	3
TOTAL (SEMESTER II)			25	30	11	19	200	150	300	300	25	25	1000	25

SEMESTER III MARCH (COMPUTER APPLICATIONS)														
Sub. Code	SUBJECT	Course	Hrs /wk	TEACHING SCHEME			EXAMINATION SCHEME							CREDITS
				period/wk	Lect./Wk	Studio /Wk	Paper	Term Work	SESSIONAL		Oral		Total	
									Int	Ext	Int	Ext		
CA 13	Digital Design Studio III	Core	9	12	2	10	-	-	150	150	25	25	350	9
CA 14	Digital Tools And Technicques III	Core	4	5	2	3	-	-	75	75	-	-	150	4
CA 6	Interaction Design	Supportive	3	3	2	1	100	25	-	-	-	-	125	3
CA 16	ElectiveIII	Elective	2	2	1	1	-	100	-	-	-	-	100	2
CA 17	Professional Practice (Training*)	Project Work	4	-	-	-	-	-	50	50	25	25	150	4
CA 18	Smart materials & advanced construction	Supportive	3	3	2	1	100	25	-	-	-	-	125	3
TOTAL (SEMESTER III)			25	25	9	16	200	150	275	275	50	50	1000	400

*This includes Professional Training (40 full working days) to be undertaken during intermediate time between II & III Semester, details of which are mentioned in the detailed syllabus. The Oral Assessment of the same will be held at the end of Semester III.

SEMESTER IV MARCH (COMPUTER APPLICATIONS)														
Sub. Code	SUBJECT	Course	Hrs /wk	TEACHING SCHEME			EXAMINATION SCHEME							CREDITS
				period/wk	Lect./Wk	Studio /Wk	Paper	TW	SESSIONAL		Oral		Total	
									Int	Ext	Int	Ext		
CA 19	DIGITAL DESIGN PROJECT	Project Work	20	22	5	17	-	-	300	300	100	100	800	20
CA 20	RESEARCH-II	Seminar	5	8	1	7	-	-	100	100	-	-	200	5
TOTAL (SEMESTER IV)			25	30	6	24	-	-	400	400	100	100	1000	25

Digital Design Studio I			
Subject Code – CA 01			
Teaching Scheme		Examination Scheme	
Hours / Week	9	Paper	Nil
Lectures/ week	2	Term work	Nil
Studio Periods/ week	10	Sessional (Internal)	150
Total Contact Periods/ week	12	Sessional (external)	150
		Oral (Internal) Nil	25
		Oral (External) Nil	25
Total Credits	9	Total Marks	350

OBJECTIVES :-

Objective of this studio is to introduce the integration of Visualization tools Architectural Design.

COURSE CONTENT :-

Students will take up two independent design projects during the course of this semester. The project shall be specifically designed and approved by the faculty, to fulfill the objectives. The scope of the project should be limited to a small project. The source of this may be an existing Architectural project, onto which the Visualization and parametric tools could be integrated and redefined in two separate projects. One project shall go on for no longer than 8 weeks.

- Unit I :- Introduction of the first project
- Unit II :- Using Visualization tools on the given project
- Unit III :- Presentation of the project
- Unit IV :- Introduction of the second project
- Unit V :- Parametric design project
- Unit VI :- Presentation of the project

SESSIONAL WORK / VIVA :-

Each student shall be judged on individual performance as well as his/her contribution to the group work.

RECOMMENDED READINGS :-

1. Gramazio Fabio, Matthias Kohler, Silvan Oesterle, Encoding Material, architectural Design Special Issue: The New Structuralism: Design, Engineering and Architectural
2. HyperArchitecture : Spaces in the Electronic Age (The Information Technology Revolution in Architecture) by Luigi Prestinenza Puglisi, L. Byatt (Translator)
3. Animate Form by Greg Lynn
4. Next Generation Architecture : Folds, Blobs, and Boxes by JOSEPH ROSA
5. Advanced Technologies : Building in the Computer Age (The Information Technology Revolution in Architecture) by Valerio Travi
6. Hyperbodies by Kas Oosterhuis
7. Digital Tectonics by Neil Leach (Editor), David Turnbull (Editor), Chris Williams (Editor)
8. Blobitecture: Waveform Architecture and Digital Design by John K. Waters
9. Next Generation Architecture : Folds, Blobs, and Boxes by JOSEPH ROSA

10. CAD Principles of Design, An Analytical Approach to the Computational Representation of Architectural Form by Peter Szalapaj

DIGITAL TOOLS AND TECHNICQUES– I			
Subject Code – CA 02			
Teaching Scheme		Examination Scheme	
Hours / Week	4	Paper	Nil
Lectures/ week	2	Term work	Nil
Studio Periods/ week	3	Sessional (Internal)	75
Total Contact Periods/ week	5	Sessional (external)	75
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	4	Total Marks	150

COURSE OBJECTIVE AND PREREQUISITES :-

The focus of this subject would be on various digital tools and their applications in Architectural projects. Opening up new horizons of technological advancements in the field of computational technology through the use of computer modeling, rendering, Parametric modeling, Simulation, analysis, BIM software etc. The focus would be on the exploration of space and place making through use of various computer modeling tools.

COURSE OUTLINE :-

Each of the below mentioned topics shall be introduced in lecture periods and is to be dealt with subsequently in the design studios in detail.

The focus of teaching in this subject shall be as following,

- Unit 1 - Architectural geometry:** Introduction to basic Architectural 2D & 3D geometry.
- Unit 2 - Visualization:** Introduction to Visualization tools in Architecture such as 3D software, Nurbs modeling, Parametric modeling, BIM.
- Unit 3 - Rendering:** Introduction to rendering techniques including Material mapping, Lighting, Perspective.
- Unit 4 - Presentation:** Introduction to presentation tools & techniques for print and digital medium.

SESSIONAL WORK :-

The assessment will be done on the progressive work in the studios and a final seminar presentation by the student for the various tools. Submission should be in form of a report and presentation of the progressive work done in the studios throughout the semester.

RECOMMENDED READINGS :-

1. Terzidis Kostas ,*Algorithmic Architecture*, Architectural Press , Oxford , 2006
2. Helmut Pottmann, Michael Hofer and Axel Kilian (eds), *Advances in Architectural Geometry*, Vienna, 2008

3. Helmut Pottmann, Michael Hofer and Axel Kilian (eds), *Advances in Architectural Geometry*, Vienna, 2008
4. Cecil Balmond, *Geometry, Algorithm, Pattern: The Serpentine Pavillion 2002*, *Digital Tectonics*, ed Neil Leach, London, Wiley-Academy, 2004. 132 Print
5. Alexander, C. (1964). Goodness of fit. In *Notes on the Synthesis* (pp. 15-28). Cambridge: Harvard University Press.

Digital Design Theory I			
Subject Code – CA 03			
Teaching Scheme		Examination Scheme	
Hours / Week	3	Paper	100
Lectures/ week	2	Term work	25
Studio Periods/ week	1	Sessional (Internal)	Nil
Total Contact Periods/ week	3	Sessional (external)	Nil
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	3	Total Marks	125

OBJECTIVES :-

The objective of this class is to develop an understanding and a theoretical underpinning for digital mediation in architecture.

COURSE CONTENT :-

- Unit I :- Introduction
- Unit II :- Concepts in Critical Theory
- Unit III :- Digital culture
- Unit IV :- Curvilinearity in architecture
- Unit V :- Architecture and science
- Unit VI :- Architecture and cybernetics

SESSIONAL WORK / VIVA :-

This being an individual project, each student shall be judged on preset individual performance. Through essays and presentations on readings in the class.

RECOMMENDED READINGS :-

1. Kotnik Toni, *Digital Architectural Design as Exploration of Computable Functions*, international journal of architectural computing issue 01, (2006) volume 08,(3)
2. G Lynn (ed) *Folding in architecture*, AD pp 8-15 Profile no. 102
3. Hensel, M. and Menges, A (2008): 'Morpho-Ecologies', London: Architectural Association.

4. Theories of the Digital in Architecture Edited by Rivka Oxman, Robert Oxman
Thinking Architecture by Peter Zumthor
5. Lina Bo Bardi, The Theory of Architectural Practice By Cathrine Veikos
6. Architecture's Appeal, How Theory Informs Architectural Praxis Edited by Marc J. Neveu, Negin Djavaherian
7. Architectural Theory Edited by Harry Francis Mallgrave
8. Architectural Theories of the Environment, Posthuman Territory Edited by Ariane Lourie Harrison
9. Rethinking Technology, A Reader in Architectural Theory Edited by William W. Braham, Jonathan A. Hale
10. The Production of Space by Henri Lefebvre
11. Intersections, Architectural Histories and Critical Theories Edited by Iain Borden, Jane Rendell
12. Architecture and Disjunction by Bernard Tschumi

ELECTIVE - I			
Subject Code – CA 04			
Teaching Scheme		Examination Scheme	
Hours / Week	2	Paper	Nil
Lectures/ week	1	Term work	100
Studio Periods/ week	1	Sessional (Internal)	Nil
Total Contact Periods/ week	2	Sessional (external)	Nil
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	2	Total Marks	100

COURSE OBJECTIVES AND PREREQUISITES :-

Colloquium

Emerging technologies e.g. digital media and computational design it is essential to gain the global perspective of the current research and developments. This format of the coursework helps to broadly understand the established and ongoing developments and research work in this domain.

Student should be able to do extensive research on the pioneers of this field and present with audio-visual aids. The presentation should be open house and followed by discussion, which will be guided by the faculty member/s.

Faculty shall guide the students for the topics, research methods and writing techniques.

COURSE OUTLINE :-

Unit I : Paraphrasing	Introduction to the colloquium format. Research on potential topics through books, magazines, internet and other sources
Unit II : Literature review	Selection of the topic and colloquium on the literature
Unit III : Analytical presentation	Colloquium presentation based on the selected topic with the understanding of analytical reading
Unit IV : Drawing inferences	Reading and analysis of the topic and drawing inferences based on the focus of the study.
Unit V : Writing	Writing papers/articles on the presented and discussed topics. Students should be able to write about own understanding and views.
Unit VI : Concluding	Student should be able to write own conclusions, generate research questions and study further based on those research questions. Students should be able to write with technical understanding of 'writing'

SESSIONAL WORK :-

The sessional work shall be assessed by the internal faculty member on the basis of A/V presentation and report/paper/article etc.

A/V presentation should be made by individual student.

The assessment shall be based on the following factors

- i. Student's understanding of the topic
- ii. Presentation techniques
- iii. Technical Writing

RECOMMENDED READINGS :-

1. Ruck, Nancy, C. 1989, Building Design and Human performance, Van Nostrand Rheingold
2. Hartkopf, Volk, [et al], (1993), Designing the office for the future: the Japanese approach to tomorrow's workplace, John Wiley & sons

DIGITAL FABRICATION			
Subject Code –CA 11			
Teaching Scheme		Examination Scheme	
Hours / Week	4	Paper	Nil
Lectures/ week	2	Term work	150
Studio Periods/ week	3	Sessional (Internal)	75
Total Contact Periods/ week	5	Sessional (external)	75
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	4	Total Marks	150

OBJECTIVES :-

This studio will explore fabrication process in architecture with non linear geometries and the material techniques which is useful to bring the software models into reality. It gives hands on experience of working with the machines.

COURSE CONTENT :-

Architectural and material techniques in architecturally innovative projects realize through digital design and constructive process. It has become possible because of the collaboration of software and machines. Introduction to various tools and different techniques of digital fabrication will be taught in this subject.

Introduction about digital fabrication , different methods of digital fabrication and their advantages, various fabrication machines .

Unit I : Introduction to various fabrication techniques like sectioning, tessellating, folding, its use.

Unit II : Introduction to various fabrication techniques like of contouring, forming, its use.

Unit III : introduction to various advanced technologies and latest trends like robotics etc.

SESSIONAL WORK :-

Students will be introduced to the types of digital fabrication and machines. The student will take individual project of architectural design and workout the joinery , select the material and technique to be used for individual model.

LEARNING OUTCOME :-

To expose student to the practical work of digital fabrication on machines.

RECOMMENDED READINGS :-

1. Digital Fabrications architectural and material techniques – by Lisa Iwamoto
2. Biosensor principles and Application – by Loic J.Blum, Pierre R.Coulet

AUTOMATED DESIGN BUILDING AUTOMATION			
Subject Code – CA 09			
Teaching Scheme		Examination Scheme	
Hours / Week	3	Paper	100
Lectures/ week	2	Term work	25
Studio Periods/ week	1	Sessional (Internal)	Nil
Total Contact Periods/ week	3	Sessional (external)	Nil
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	3	Total Marks	125

COURSE OBJECTIVES :-

Detail study of Building automation for various building typology

Study of the systems and their applicability in the following areas

- Unit I : Introduction Theory of automation design
- Unit II : Theory Theory of automation for energy efficiency
- Unit III : Project work Simulation for climate control
- Unit IV : Project work Simulation for light and noise control

SESSIONAL WORK :-

Student should be able to generate designs based on the building automation technique

RECOMMENDED READINGS :-

1. Home Automation and wiring – James Gerhart
2. L. Cremer and H. Muller (trns schults). Principles and applications of room acoustics (vol 1) applied science 1982
3. Fry et al. Noise control in building services. Pergammon Press 1988
4. Building Control Systems by Vaughn Bradshaw
5. Lighting Design + Applicatiob Published by IESNA (Illumination Engineering Society)
6. Applied Illumination Engineering by L.Lindsey. FIES
7. Ronald N.Helms and M.Clay Belcher, lighting for energy efficient
8. Dr.M.K.Murlidhara, luminous environments.Heat and Mass Transfer

DIGITAL DESIGN STUDIO II			
Subject Code – CA 07			
Teaching Scheme		Examination Scheme	
Hours / Week	9	Paper	Nil
Lectures/ week	2	Term work	Nil
Studio Periods/ week	10	Sessional (Internal)	150
Total Contact Periods/ week	12	Sessional (external)	150
		Oral (Internal) Nil	25
		Oral (External) Nil	25
Total Credits	9	Total Marks	350

OBJECTIVES :-

Objective of this studio is towards learning digital design processes and their application in Design studio in architectural projects. Another focus will be on sustainability through Automated design and construction.

COURSE CONTENT :-

Students will take up two independent design projects. One in a group of four, specifically designed to fulfill the requirement for integration of above-mentioned specializations. The scope of the project should be limited to a medium sized project. The source of this may be an existing Architectural project, onto which the automation tools could be integrated and redefined.

The second project shall be an individual one based on parametric design processes.

SESSIONAL WORK :-

This shall be a group-work, distributing specific duties to each of the member. Each student shall be judged on individual performance as well as his/her contribution to the group work.

RECOMMENDED READINGS :-

1. DBMS by Date
2. Fundamentals of Database Systems by Remez Elmasri, Shamkant B. Navathe
3. Building Control Systems by Vaughn Bradshaw
4. Modern Control Engineering by Katsuhilo Ogata, University of Minnesota
5. Berry John, 1995, Integrated design-building Services
6. Atkin, Brian, 1993, Intelligent Buildings: Applications of IT and building automation to high technology construction projects, Aldershot: Avebury Technical
7. M Anji Reddi, “ Remote sensing & Geographical Information Systems “,BS Publication, Second Edition.
8. George B. Korte, “ The GIS Book “, Onword Press (Thomson learning), 5th Edition.
9. Peter A. Burrough and McDonell, “Principles of Geographical Information Systems”, Oxford University Press, 1998.

DIGITAL TOOLS TECHNIQUES – II			
Subject Code – CA 08			
Teaching Scheme		Examination Scheme	
Hours / Week	4	Paper	Nil
Lectures/ week	2	Term work	Nil
Studio Periods/ week	3	Sessional (Internal)	75
Total Contact Periods/ week	5	Sessional (external)	75
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	4	Total Marks	150

COURSE OBJECTIVE AND PREREQUISITES :-

Introduction to various digital tools and their applications in Architectural projects. Opening up new horizons of technological advancements in the field of computational technology through the use of computer modeling, rendering, Parametric modeling, Simulation, analysis, BIM software etc. The focus would be on the exploration of space and place making through use of various computer modeling tools.

COURSE OUTLINE :-

Each of the below mentioned topics shall be introduced in lecture periods and is to be dealt with subsequently in the design studios in detail.

The focus of teaching in this subject shall be as following,

Unit 1 - Relational geometry: Introduction to Relational geometry and its applications in Architecture.

Unit 2 - Nurbs Modeling: Introduction to Nurbs modeling and its application in Architecture.

Unit 3 - Parametric modeling: Introduction to Parametric modeling & its application in Architecture.

SESSIONAL WORK :-

The assessment will be done on the progressive work in the studios and a final seminar presentation by the student for the various tools. Submission should be in form of a report and presentation of the progressive work done in the studios throughout the semester.

RECOMMENDED READINGS :-

1. Terzidis Kostas ,*Algorithmic Architecture*, Architectural Press , Oxford , 2006
2. Helmut Pottmann, Michael Hofer and Axel Kilian (eds), *Advances in Architectural Geometry*, Vienna, 2008
3. Architectural Representation Handbook: Traditional and Digital Techniques for Graphic Communication by Paul Laseau
4. Architectural Geometry by Helmut Pottmann

DIGITAL DESIGN THEORY II			
Subject Code – CA 15			
Teaching Scheme		Examination Scheme	
Hours / Week	3	Paper	100
Lectures/ week	2	Term work	25
Studio Periods/ week	1	Sessional (Internal)	Nil
Total Contact Periods/ week	3	Sessional (external)	Nil
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	3	Total Marks	125

OBJECTIVES :-

Specific theoretical issues dealing with form generation using the generative potential of software's unique ability to deploy geometric entities. Introduction of Shape grammars and its potential uses for the Architectural Design and analysis.

COURSE CONTENT :-

The focus of teaching shall be on:
 Digital Architecture design processes and diagrams
 Morphogenetic design processes, etc
 Shape grammar
 Other similar theoretical issues

SESSIONAL WORK :-

The sessional work shall be in form of the experiments with above mentioned topics and research papers based on those experiments.

RECOMMENDED READINGS :-

1. Hybrid Space : Generative Form and Digital Architecture by PETER ZELLNER
2. Developing Digital Architecture by Yu-Tung Liu (Editor), Yu Tung Liu
3. Defining Digital Architecture: 2001 FEIDAD Award by Yu Tung Liu (Editor)
4. Digital Architecture by M. Saleh Uddin
5. New Flatness : Surface Tension in Digital Architecture by Alicia Imperiale
6. Demonstrating Digital Architecture: 2004 Feidad Award by Yu-Tung Liu (Editor)
7. Digital Eisenman (The Information Technology Revolution in Architecture) by Luca Galofaro, Luca Galofaro (Translator)
8. Mathematics of Space by George Legendre
9. Patterns of Architecture: No 6 by Mark Garcia
10. The Autopoiesis of Architecture by Patrik Schumacher
11. Narrative Architecture by Nigel Coates
12. The Function of Ornament by Farshid Moussavi
13. MORPHOGENESIS OF FLUX STRUCTURE. by Mutsuro; Ito, Toyoo; Isozaki, Arata Sasaki
14. Programming Cultures: Architecture, Art and Science in the Age of Software Development (Architectural Design) by Mike Silver

15. Scripting Cultures: Architectural Design and Programming by Mark Burry
16. Computational Design Thinking: Computation, by Achim Menges
17. The Digital Turn in Architecture by Mario Carpo

ELECTIVE-II			
Subject Code – CA 10			
Teaching Scheme		Examination Scheme	
Hours / Week	2	Paper	Nil
Lectures/ week	1	Term work	100
Studio Periods/ week	1	Sessional (Internal)	Nil
Total Contact Periods/ week	2	Sessional (external)	Nil
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	2	Total Marks	100

COURSE OBJECTIVES AND PREREQUISITES :-

Robotics and Embedded systems

The course will facilitate understanding of various methods of automation into construction with respect to robotics.

The students shall be able to execute small scale components of design with the help of emerging technology of automation into construction.

This course shall facilitate the practical implementation of mass customisation.

Unit I : Embedded systems	Embedded systems for intelligent buildings
Unit II : Self assembly	Self-assembly systems
Unit III : Robotics: manufacturing	Introduction to robotics in manufacturing and assembly
Unit IV : Robotics: construction	Robotics in construction
Unit V : Mass Customisation	Concepts in mass customisation

SESSIONAL WORK :-

Student / group of students should be able to generate 3D models based on the technique of mass customisation/robotics/ automated construction.

RECOMMENDED READINGS :-

1. Histan B.H., Alciatore D.G., "Introduction to Mechatronics and Measurement Systems", ISBN 0-07-052910-8
2. Date P. P., "Introduction to Manufacturing Technology, Principles and Practices", , Jayco Publishers, Mumbai
3. G. Boothroyd , C. Poli, L. Murch, "Automatic Assembly", Marcel Dekker Inc. 1982.

COMPUTER GRAPHICS			
Subject Code – CA 05			
Teaching Scheme		Examination Scheme	
Hours / Week	4	Paper	Nil
Lectures/ week	2	Term work	Nil
Studio Periods/ week	3	Sessional (Internal)	75
Total Contact Periods/ week	5	Sessional (external)	75
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	4	Total Marks	150

OBJECTIVE :-

This course aims at giving emphasis on the fundamentals of Graphics, scripts & programming related to architectural geometry.

COURSE CONTENTS :-

- Unit I : Basic concepts: Introduction to computer graphics
• Line, circle and polygon generation:
- Unit II : Basics of Programming & scripting
- Unit III : Generation of 2D, 3D geometry
- Unit IV : All transformation rules for 2D, 3D geometry
- Unit V : Curves and fractals: Curve generation, Interpolation, Interpolating, B-splines, Bezier curves, Fractals, Fractal surfaces and lines
- Unit VI : Light, colour and shading: Diffused illumination, Point source illumination, Colour models RGB, HVS, CYM etc., Transparency, Reflection and shadows.

SESSIONAL WORK / TERM WORK :-

For this subject students will be assessed based on their small project which has scripts & its graphical output.

ASSESSMENT :-

Students will be enabled to deal with varying site-based natural and ecological systems with reference to urban design projects and the city at large.

RECOMMENDED READING :-

1. Procedural Elements for Computer Graphics: David F. Rogers, McGraw Hill International Editions
2. Computer Graphics- A programming approach: McGraw Hill International Editions
3. Computer Graphics, Principles and Practice: Foley, Vandam, Feiner, Hughes, Addison Wesley
4. Architectural Representation Handbook: Traditional and Digital Techniques for Graphic Communication by Paul Laseau
5. Demonstrating Digital Architecture: 2004 Feidad Award by Yu-Tung Liu (Editor)

RESEARCH I			
Subject Code – CA 17			
Teaching Scheme		Examination Scheme	
Hours / Week	3	Paper	100
Lectures/ week	2	Term work	25
Studio Periods/ week	1	Sessional (Internal)	Nil
Total Contact Periods/ week	3	Sessional (external)	Nil
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	3	Total Marks	125

OBJECTIVE :-

To develop an ability to research on any chosen topic, with systematic methodologies.

COURSE CONTENTS :-

- Unit I : Introduction to research methods and methodology
- Unit II : Types of research methods
- Unit III : Research design
- Unit IV : Literature review
- Unit V : Data documentation and analysis
- Unit VI : Components of the research paper
- Unit VII : Presentation of data and report
- Unit VIII : Theoretical research
- Unit IX : Applied research

The lectures will include presentations and discussions on the above mentioned topics.

SESSIONAL WORK / TERM WORK :-

For this subject students will be assessed based on their process/es of documentation, methods of analysis and the judicious understanding of the research methods along with the content and research design.

Minimum Assignment/s submissions towards Sessional Work shall include:

- a. A report on understanding of various research methods
- b. Comprehensive report of appropriate research design of their own paper on the chosen topic

ASSESSMENT :-

Students will be assessed based on their understanding of the subject.

RECOMMENDED READING :-

1. Research Methodology: Methods and Techniques by C. R. Kothari
2. Research Methodology: A Step-By-Step Guide for Beginners by Ranjit Kumar
3. Research Methodology: A Handbook by R. P. Misra
4. Research Methodology: Theory & Techniques by Jagadish R. Raiyani

Digital Design Studio III			
Subject Code – CA 13			
Teaching Scheme		Examination Scheme	
Hours / Week	9	Paper	Nil
Lectures/ week	2	Term work	Nil
Studio Periods/ week	10	Sessional (Internal)	150
Total Contact Periods/ week	12	Sessional (external)	150
		Oral (Internal) Nil	25
		Oral (External) Nil	25
Total Credits	9	Total Marks	350

OBJECTIVES :-

Introduction to various digital tools and their applications in Architectural projects. Opening up new horizons of technological advancements in the field of computational technology through the use of computer modeling, rendering, Parametric modeling, Simulation, analysis, BIM software etc. The focus would be on the exploration of space and place making through use of various computer modeling tools.

COURSE CONTENT :-

Each of the below mentioned topics shall be introduced in lecture periods and is to be dealt with subsequently in the design studios in detail.

The focus of teaching in this subject shall be as following,

Unit 1 - Simulation software: Introduction to various simulation software and its applications in Architecture.

Unit 2 - Analysis software: Introduction to various Analysis software and its applications in Architecture.

Unit 3 - Building information modeling: Introduction to Building Information modeling and its application in Architecture.

SESSIONAL WORK / VIVA :-

This shall be a group-work, distributing specific duties to each of the member. Each student shall be judged on individual performance as well as his/her contribution to the group work. For individual project the assessment shall be on individual work.

RECOMMENDED READINGS :-

1. HyperArchitecture : Spaces in the Electronic Age (The Information Technology Revolution in Architecture) by Luigi Prestinenza Puglisi, L. Byatt (Translator)
2. Next Generation Architecture : Folds, Blobs, and Boxes by JOSEPH ROSA
3. Advanced Technologies : Building in the Computer Age (The Information Technology Revolution in Architecture) by Valerio Travi
4. Hyperbodies by Kas Oosterhuis

5. Digital Tectonics by Neil Leach (Editor), David Turnbull (Editor), Chris Williams (Editor)
6. Blobitecture: Waveform Architecture and Digital Design by John K. Waters
7. Next Generation Architecture : Folds, Blobs, and Boxes by JOSEPH ROSA
8. Hybrid Space : Generative Form and Digital Architecture by PETER ZELLNER
9. Masterplanning the Adaptive City, Computational Urbanism in the Twenty-First Century Edited by Tom Verebes
10. Mass Customisation and Personalisation in Architecture and Construction Edited by Poorang A.E. Piroozfar, Frank T. Piller
11. Systemic Architecture, Operating Manual for the Self-Organizing City By Marco Poletto, Claudia Pasquero

DIGITAL TOOLS AND TECHNICQUES– III			
Subject Code – CA 14			
Teaching Scheme		Examination Scheme	
Hours / Week	4	Paper	Nil
Lectures/ week	2	Term work	Nil
Studio Periods/ week	3	Sessional (Internal)	75
Total Contact Periods/ week	5	Sessional (external)	75
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	4	Total Marks	150

COURSE OBJECTIVE AND PREREQUISITES :-

Introduction to various digital tools and their applications in Architectural projects. Opening up new horizons of technological advancements in the field of computational technology through the use of computer modeling, rendering, Parametric modeling, Simulation, analysis, BIM software etc. The focus would be on the exploration of space and place making through use of various computer modeling tools.

COURSE OUTLINE :-

Each of the below mentioned topics shall be introduced in lecture periods and is to be dealt with subsequently in the design studios in detail.

The focus of teaching in this subject shall be as following,

1. Simulation software
2. Analysis software
3. Building information modeling
- 4.

SESSIONAL WORK :-

The assessment will be done on the progressive work in the studios and a final seminar presentation by the student for the various tools. Submission should be in form of a report and presentation of the progressive work done in the studios throughout the semester.

RECOMMENDED READINGS :-

1. Terzidis Kostas ,*Algorithmic Architecture*, Architectural Press , Oxford , 2006
2. Helmut Pottmann, Michael Hofer and Axel Kilian (eds), *Advances in Architectural Geometry*, Vienna, 2008

INTERACTION DESIGN			
Subject Code – CA 06			
Teaching Scheme		Examination Scheme	
Hours / Week	3	Paper	100
Lectures/ week	2	Term work	25
Studio Periods/ week	1	Sessional (Internal)	Nil
Total Contact Periods/ week	3	Sessional (external)	Nil
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	3	Total Marks	125

Objective:

Issues dealing with Information Systems and Human Psychology, similarities and differences, Importance of human factor and paradigms of interaction.

Course contents:

Unit I : Introduction: The Human- I/P, O/P channels, Human memory, Thinking, Emotion, Individual differences (diversity), Human psychology.

Unit II : Theory & Principles of models and guidelines

o Principle 1: Recognize diversity

o Principle 2: 8 golden rules of id

o Principle 3: Prevent errors

□ Guidelines for data display, Guidelines for data entry, Study of HCI patterns

□ Models: Types of models, cognitive models, GOMS and keystroke level model, stages of action models, linguistic models, BNF and task action grammar, object action interface model

- Unit III : Design Process: The process of design, user focus, and aims of user entered design process, three pillars of design, participatory design, scenarios, navigation design, screen design, development methodology. s/w tools: design tools, and s/w engineering tools.
- Unit IV : Audio: Use of audio in computer applications, basic concepts, capture, digital representation of sound and processing music, speech, file formats for sound, streaming.
- Unit V : Text and Animation: Text in multimedia, hypertext, hypermedia, Principle of animation, 2D, 3D animation
- Unit VI : Introduction to tools & techniques of intelligent & embedded design, multimedia devices:

SESSIONAL WORK / TERM WORK :-

Students will be assessed based on assignments Interface designs for different gadgets.

ASSESSMENT :-

Students will be enabled to deal with varying site-based natural and ecological systems with reference to urban design projects and the city at large.

RECOMMENDED READING :-

1. "Human Computer Interaction", by Alan J. Dix, Janet Finlay, Russell Beale, Pearson Education, 3rd Edition 2004
2. "Designing the User Interface", by Ben Shneiderman, Pearson Education, 2001
3. "Human Computer factors: A study of users and Information Systems", by Andy Smith, McGraw Hill, 1997
4. "The essentials of Interaction Design", by Alan Cooper, John Wiley, 2003

ELECTIVE III			
Subject Code –CA 16			
Teaching Scheme		Examination Scheme	
Hours / Week	2	Paper	Nil
Lectures/ week	1	Term work	100
Studio Periods/ week	1	Sessional (Internal)	Nil
Total Contact Periods/ week	2	Sessional (external)	Nil
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	2	Total Marks	100

Elective like **Geographic Information System** and **Management Information System** will be taught in the course.

OBJECTIVES :-

Each student will choose a subject of their interest, aiming towards their final project. They will be given extensive knowledgebase in form of lectures and project-studies.

COURSE CONTENT :-

The main objective of this elective is obtaining the basic knowledge of Geographic Information System (GIS) and Remote Sensing fundamentals and Management Information System (MIS) and its relevance to Architectural design and development.

The main objective of this elective is obtaining the basic knowledge of and Management Information System (MIS) used to refer to the study to improve efficiency and effectiveness of decision making in different systems.

The lectures to be arranged by the faculty for the given subjects, which are chosen by the students, followed by the discussions and written work. Each student shall choose one subject as an elective, among the offered subjects.

SESSIONAL WORK :-

An individual project may be taken for individual studies. Various possible aspects to be accommodated and managed by the student. The scope of the project may be relatively small and pre-approved by the faculty member.

LEARNING OUTCOME :-

To expose student to integrate GIS and MIS as systems to be the part of Architectural design and development.

REFERENCES:

1. M Anji Reddi, “ Remote sensing & Geographical Information Systems “,BS Publication, Second Edition.
2. George B. Korte, “ The GIS Book “, Onword Press (Thomson learning), 5th Edition.
3. Peter A. Burrough and McDonell, “Principles of Geographical Information Systems “, Oxford University Press, 1998.

PROFESSIONAL PRACTICE (TRAINING*)			
Subject Code – CA 17			
Teaching Scheme		Examination Scheme	
Hours / Week	4	Paper	Nil
Lectures/ week		Term work	Nil
Studio Periods/ week		Sessional (Internal)	50
Total Contact Periods/ week		Sessional (external)	50
		Oral (Internal) Nil	25
		Oral (External) Nil	25
Total Credits	4	Total Marks	150

OBJECTIVE :-

Students should work in an architectural office. Objective is to understand practical aspects like office management, interaction with clients, project design and site management etc. The emphasis should be on use of computers in dealing with various aspects of the architectural profession.

SESSIONAL WORK / VIVA :-

Students should submit a report on practical training. Marking will be based on a report and viva presentation.

SMART MATERIALS & ADVANCED CONSTRUCTION			
Subject Code – CA 18			
Teaching Scheme		Examination Scheme	
Hours / Week	3	Paper	100
Lectures/ week	2	Term work	25
Studio Periods/ week	1	Sessional (Internal)	Nil
Total Contact Periods/ week	3	Sessional (external)	Nil
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	3	Total Marks	125

OBJECTIVE :-

This course aims at giving opportunity of learning more about different material families, their abilities to perceive climatic, acoustic and light conditions and the way they adapt to them; user detection and modification of the space in relation to users' bodies, their movements; their possibilities for capturing wind and solar energy; or even their ability to generate electrical and thermal energy. The course will also introduce students to materials that are untested but hold promise for future usage.

Finally, the course will challenge students to refine their understanding of responsible or sustainable design practice by looking at the evolution of those ideas within the field of architecture.

COURSE CONTENTS :-

Unit 1 :

Material properties: • Intrinsic Mechanical, physical, Thermal, Optical decorative
• Extrinsic Economic, Environmental, Societal, Cultural

Metals -- Light alloys, gels & foams, coatings, Adaptive / Responsive Surfaces
Polymers -- High-performance polymers, Biopolymers Ceramics, Nano materials, Smart materials

Unit 2 :

Natural -- Eco-efficient materials, Smart Biodegradable, shape-memory materials

Composites -- Advanced composites, Ceramics

Unit 3 : Complex process: extraction, refining, processing, manufacturing, construction, Inception, life cycle

Unit 4 : Complex system: materials components, assemblies, devices, building systems

SESSIONAL WORK / TERM WORK :-

The group works with digital content, information and fabrication for the generation of new techniques generating the production of non-rigid, responsive and multi-functional material and construction systems.

RECOMMENDED READING :-

1. Space Reader: Heterogeneous Space in Architecture, Hensel, M., Hight, C., Menges, A. (eds.): 2009, John Wiley and Sons, London. (ISBN 978-0470519424)
2. Intelligent Skins _ By Michael Wiggington
3. Material Connexion _ By George Beyleron
4. Architecture in the Digital Age: Design and Manufacturing by Branko Kolarevic

SEM IV

COMPUTER APPLICATIONS PROJECT			
Subject Code –CA 19			
Teaching Scheme		Examination Scheme	
Hours / Week	20	Paper	Nil
Lectures/ week	5	Term work	Nil
Studio Periods/ week	17	Sessional (Internal)	300
Total Contact Periods/ week	22	Sessional (external)	300
		Oral (Internal) Nil	100
		Oral (External) Nil	100
Total Credits	20	Total Marks	800

OBJECTIVES :-

Students work on the detailed design and presentation of an approved thesis subject that shall be in form of a real or virtual project based on a topic of individual preference. This project should be able to demonstrate a reasonable amount of interesting ideas and execution techniques.

COURSE CONTENT:-

The topic for this project shall be pre-approved by the guiding faculty member/members. The scope of this project shall be carefully considered. A student may take one internal and another external guide as subject expert. Dissertation will have a final product in the form of report (of words not less than 10,000 words) on the chosen subject, supported with images, drawings, etc. The students shall work in the studios on self-study guided by the faculty members.

SESSIONAL WORK :-

The final project shall be assessed based on the predefined criteria, such as ingenuity of ideas, their execution, presentation, level of complexity, etc. Viva may be taken based on the methodology and content of the final project. The sessional work as stipulated above will be assessed internally and externally with equal weight age as specified.

RESEARCH II			
Subject Code – CA 17			
Teaching Scheme		Examination Scheme	
Hours / Week	5	Paper	Nil
Lectures/ week	1	Term work	Nil
Studio Periods/ week	7	Sessional (Internal)	100
Total Contact Periods/ week	8	Sessional (external)	100
		Oral (Internal) Nil	Nil
		Oral (External) Nil	Nil
Total Credits	5	Total Marks	200

OBJECTIVE :-

To write a research paper on a chosen topic.

COURSE CONTENTS :-

- a. Writing of a research paper of on a chosen topic.

The studios are conducted for the students to write the paper with the faculty guidance.

SESSIONAL WORK / TERM WORK :-

For this subject students will be assessed based on their process/es of documentation, methods of analysis and the judicious understanding of the research methods, research design and the process of writing scholarly papers.

Minimum Assignment/s submissions towards Sessional Work shall include:

A research paper of about 2000 words, printed on A4 size paper.

ASSESSMENT :-

Students will be assessed on the technical aspects of paper writing and the contents of the paper.

RECOMMENDED READING :-

1. Research Methodology: Methods and Techniques by C. R. Kothari
2. Research Methodology: A Step-By-Step Guide for Beginners by Ranjit Kumar
3. Research Methodology: A Handbook by R. P. Misra
4. Research Methodology: Theory & Techniques by Jagadish R. Raiyani