SAVITRIBAI PHULE PUNE UNIVERSITY

(FORMERLY UNIVERSITY OF PUNE)

MASTERS IN ARCHITECTURE

M.ARCH (DESIGN AND PROJECT MANAGEMENT)

BOARD OF STUDIES IN ARCHITECTURE

FACULTY OF SCIENCE AND TECHNOLOGY

To be implemented from

A Y 2022-23

MASTERS IN ARCHITECTURE

(DESIGN AND PROJECT MANAGEMENT)

PREAMBLE

Architectural projects are becoming more and more complex. The integration of design and project management processes along with the engineering in these building projects is an integral part of design and execution without which these projects would fail. **Careful and efficient management of projects ensure realization of architecture vision into reality.**

The course combines the skills, tools and techniques of design and project management as well as knowledge of integrating various engineering fields in building design, to meet the project requirements and efficiently execute the project.

Knowledge area of study include understanding business objectives, optimizing organizational resources, management and balancing the influence of constraints (scope, schedule, quality time, resources). Integration of building design with mechanical, electrical, plumbing, lighting, acoustics, fire protection, energy efficiency and structural integrity of buildings is also focused on in this course. The course also includes project planning, scheduling and management enhanced by soft labs that focus on use of IOT and software tools for project management. Laws and regulations pertaining to the construction sector are also a part of this course.

The construction sector has realized the importance of integrated design approach in delivering efficient buildings. The architect is required to take on a larger role where he conceptualizes the design with inputs from various consultants i.e., MEP, landscape, environment, energy etc. further acting as a coordinator between the design, site and other agencies involved in the construction industry.

This course aims to equip the architects to take on this role in contemporary times.

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

1. **KNOWLEDGE AND SKILLS -** To enable students to develop as a project manager having an integrated approach towards design, management, and realization of architecture project, right from the project feasibility, design stage to the execution stage. Focused understanding of the relation of projects, programs and portfolios and advanced study of architecture engineering subjects i.e., structure, mechanical, electrical, and plumbing services as well as tactical management of the project such that the building functions efficiently for its purpose. The students will be empowered with the understanding of the laws, rules and regulations and codes that govern the construction sector.

2. **RESEARCH -** To enable students to critically evaluate research and practices in the field to arrive at studied solutions within the constraints. To inculcate managerial thinking and critical analysis in the domain of design and project management as an integrated approach towards strategizing and execution of the building projects, for the students and faculty both.

3. **EMPLOYABILITY-** To enable students to become design managers in architecture offices, Project coordinators and project managers in construction sector. Students will be trained for BIM andCloud based tools which can help them manage projects.

4. **ETHICS & VALUES** - To enable students to develop as responsible professionals. To instill students with the ability to work in context specific domains in an interdisciplinary work culture respecting the values of the various disciplines. To provide students with the ability to integrate knowledge of design management and efficient project planning to create responsible projects that demand less resources and render building projects resilient and sustainable.

5. **THEORETICAL BASE** - Impart technical expertise on integrating design and project management processes, tools and techniques and further engineering knowledge, to achieve project success for complex building Projects.

PROGRAM OUTCOMES (PO's)

Upon successful completion of this program, students will be able to

1. **STRATEGIC DESIGN AND PLANNING**: Graduates will be equipped to formulate, design and manage high performance architectural projects by applying principles of engineering and management.

2. **RESEARCH SKILLS**: Graduates will be equipped to use appropriate research methods, interpret, and analyze data to derive conclusions.

3. **TECHNICAL KNOWLEDGE**: Graduates will be equipped to integrate managerial aspects to meet organizational and project objectives and aspects of engineering that meet specified needs of an architectural typology with consideration to efficiency, environmental sensitivity, and occupational safety.

4. **PRACTICAL KNOWLEDGE**: Graduates will be equipped to apply strategic principles to optimize the organizational economic value. Understanding of the tactical principles for planning, scheduling and monitoring will enable them to execute the building projects within the stipulated time, cost, and quality parameters. Acquire and apply new advancement as needed, using appropriate learning strategies

5. **SENSITIZATION AND RESPONSIBILITY:**
   Graduates will. be enabled to design environmentally responsible buildings that arefinancially viable.

6. **COMMUNICATION AND SKILLS**: Graduates will function effectively in a team whose members together create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives of an integrated design solution.

7. **SOCIAL RESPONSIBILITY:** Graduates will recognize ethical and professional responsibilities in architectural practice and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

MATRIX OF PROGRAM EDUCATIONAL OBJECTIVES AND PROGRAM OUTCOMES

PEO	PO1 **STRATEGIC DESIGN AND PLANNING**	PO2 **RESEARCH SKILLS**	PO3 **TECHNICAL KNOWLEDGE**	PO4 **PRACTICAL KNOWLEDGE**	PO5 **SENSITIZATION AND RESPONSIBILITY**	PO6 **COMMUNICATION SKILLS**	PO7 **SOCIAL RESPONSIBILITY**
PE01- **KNOWLEDGE AND SKILLS**	√	√	√		√		√
PEO2- **RESEARCH**		√	√			√	√
PEO3- **EMPLOYABILITY**	√		√	√	√	√	√
PEO4 **ETHICS & VALUES**		√			√		√
PEO5 **THEORETICAL BASE**	√		√	√			

Sr.No.	Program Outcomes	Subjects in curriculum
1	PO1-STRATEGIC DESIGN AND PLANNING	Project Management I – PMBOK framework, Project Budget Planning & Time Scheduling, Design & Engineering Integration studio for Performance of Large projects Management elective Project Financial Management & Risk Management Cloud based Design Management Software
2	PO2 - RESEARCH SKILLS	Research Methodologies & Quantitative theories & Operational Research
3	PO3 -TECHNICAL KNOWLEDGE	Construction Technology and structural systems Building Services, Functional Performance of buildings, Project Management II - PMBOK Framework., Building Engineering and performance, Quality management systems, Soft-lab- Simulations for building performance, Building engineering elective
4	PO4 - PRACTICAL KNOWLEDGE	Project Planning & Scheduling, Project Scheduling & office documentation system, Project Cost & Contract management Project Procurement, Design and Project Management Framework for large projects at site Practical Training, Elective III- industry based Project Scheduling & ERP system for Budgeting.
5	PO5 - SENSITIZATION AND RESPONSIBILITY	Contract management and Building Construction Laws, Project Formulation & Appraisal Quality Management & Health Safety & Environment (HSE) Management
6	PO6 - COMMUNICATION SKILLS	Project Management I- PMBOK framework, Management elective
7	PO7 - SOCIAL RESPONSIBILITY	Building Engineering and performance Soft-lab- Simulations for building performance

Sr.No.	Electives	Tentative Subjects of Electives
01	Elective I [Sem-1]:	Critical Appraisal of Building Typologies 1. Hotels 2. Hospitals 3. IT buildings 4. Large Residential Project
02	Elective II [Sem-2]:	Building Engineering based 1. Fire & Safety Infrastructure Maintenance & Management 2. Energy Audits and Monitoring 3. Building Management Systems 4. Building Services for High Rise Buildings 5. Critical Appraisal of Building Services for Hotels/ Hospitals.
03	Elective III [Sem-4]	Industry Based 1. Facility maintenance & management 2. Human Resource management for Building Projects 3. Real estate management 4. Project Planning for disaster management 5. Labour laws and compliance system in Construction.

Individual college may offer the students one or more topics, depending upon the availability of experts and resource material. The colleges will have the opportunity to focus on one or more of the topics as decided by the institute**.**

COURSE STRUCTURE

Semester I - M. ARCH (DESIGN AND PROJECT MANAGEMENT)

Course Code	Course Title	Course Type	Contact Periods (60 mins)	Teaching Scheme			Examination Scheme				
				Th/ Week	St/ Week	Credits	SS	SV	Theory		Marks
									In Sem	End Sem	
2019DPM101	Project Budget Planning & Time Scheduling studio	C1	10	2	8	10		400			400
2019DPM102	Elective I-	EL	3	2	1	3	100				100
2019DPM103	Project Management I- PMBOK framework	C2	4	2	2	4	200				200
2019DPM104	Advanced Building Construction Technology & Structural Systems	SP1	3	2	1	3			30	70	100
2019DPM105	Functional Performance of Building Services	SP2	3	2	1	3			30	70	100
2019DPM106	Softlab- Design Management & ERP.	L	2	1	1	2	100				100
	Total		**25**	**11**	**14**	**25**	**400**	**400**	**60**	**140**	**1000**

Semester II - M. ARCH (DESIGN AND PROJECT MANAGEMENT)

Course Code	Course Title	Course Type	Contact Periods (60 mins)	Teaching Scheme			Examination Scheme				
				Theory/ Week	Studio/ Week	Credits	SS	SV	Theory		Marks
									In Sem	End Sem	
2019DPM 201	Design & Engineering Integration studio for Performance	C1	10	2	8	10		400			400
2019DPM 202	Elective II	EL	3	2	1	3	100				100
2019DPM 203	Project Management II - PMBOK Framework.	C2	4	2	2	4	200				200
2019DPM 204	Project procurement management	SP1	3	2	1	3			30	70	100
2019DPM 205	Research I	SP2	3	2	1	3			30	70	100
2019DPM 206	Soft lab II - Building Simulation	L	2	1	1	2	100				100
	Total		**25**	**11**	**14**	**25**	**400**	**400**	**60**	**140**	**1000**

Semester III M. ARCH (DESIGN AND PROJECT MANAGEMENT)

Course Code	Course Title	Course Type	Contact Periods (60 mins)	Teaching Scheme			Examination Scheme				
				Theory/ Week	Studio/ Week	Credits	SS	SV	Theory		Marks
									In Sem	End Sem	
2019DPM 301	Project cost & contract Management Studio	C1	10	2	8	10		400			400
2019DPM 302	Research II	C2	3	2	1	3	100				100
2019DPM 303	Design and Project Management Framework and Practical Training **	C3	4	2	2	4		200			200
2019DPM 304	Project Financial Management & Risk Management	SP1	3	2	1	3			30	70	100
2019DPM 305	Quality Management & Health Safety & Environment (HSE) Management	SP2	3	2	1	3			30	70	100
2019DPM 306	Softlab III-Project Management & ERP	L	2	1	1	2	100				100
	Total		**25**	**11**	**14**	**25**	**400**	**400**	**60**	**140**	**1000**

** - This includes Practical Training (40 full working days) to be undertaken during intermediate time between II & III Semesters, details of which are mentioned in the detailed syllabus. The Oral Assessment of the same will be held at the end of Semester III. The subject is included as core subject and will have both sessional and viva assessment.

Semester IV M. ARCH (DESIGN AND PROJECT MANAGEMENT)

Course Code	Course Title	Course Type	Contact Periods (60 mins)	Teaching Scheme			Examination Scheme				
				Theory/ Week	Studio/ Week	Credits	SS	SV	Theory		Marks
									In Semester	End semester	
2019DPM 401	Project	C1	20	4	16	20		800			800
2019DPM 402	Elective III – Industry based	EL	5	1	4	5		200			200
	Total		**25**	**5**	**20**	**25**		**1000**			**1000**

*Elective III is to be done based on the industry experience. Incase student is not able to get guidance on live project based elective topic, colleges should offer any elective from the list of electives which the student has not undertaken in any previous semester.

DETAIL SYLLABUS

SEM I

SUBJECT TITLE: **Project Budget Planning & Time Scheduling Studio.**				
Subject Code : 2019DPM101				
Teaching Scheme		**Examination Scheme**	**Marks**	
Theory Periods per week	2	Sessional	300	
Studio Periods per week	8	Viva/Oral	100	
Total Contact Periods (60 min period)per week	**10**	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	**10**	**Total Marks**	**400**	

COURSE OBJECTIVES:

To disseminate about the application of Design and Project Management and to familiarise with the information technology-based tools, applications during the Project life cycle (i.e. inception phase to the Post-construction phase).

Emphasis on the planning processes at the both the designing and construction phase of a project. The concepts of project management are elaborated through inter-linked processes.

To introduce application software and their usage in different phases of designing and construction and rigorously impart training for using the project management software by on specific cases/projects. The course imparts basic understanding of computer networking and database management systems**.**

COURSE CONTENT:

Unit 1-

Introduction to Project Management; Familiarisation with Building Projects though studies of project drawing & documents, and extracting inferences for group projects on:

(a) Project brief (b)Area usage: FAR / Area Statement (c)Bye laws (d)Soil Investigation (e)Architectural appraisal, Configuration of spaces, plans, sections, elevations, levels, landscaping etc. (f)Structural appraisal: Foundation system, Structural system, Details on structural members including sizes and material specifications (g) MEP appraisal: Conceptual drawings, SLDs, and actual drawings showing location of services. Interaction of MEP with other aspects of project in terms of sequencing, layout etc.

Unit 2

Time Management; Development of Construction Logic; Work out alternatives of construction sequence logic considering project and site constraints, design requirement, services interaction, resource requirement etc.; Study of existing approach to construction logic; Analyse strengths and weaknesses; Preparation of Work Breakdown Structure (WBS)

Unit 3

Visualizing strategic breakdown of project into work packages; Identify approach of work breakdown for the project considering ease of co-ordination, cost savings etc.; Developing and presenting WBS of respective projects as a hierarchy of deliverables that collectively constitute the project; Presenting WBS in MS-Project with appropriate linkages monitoring and control, Delay management, Classification and causes of delays and managing delays

Unit 4

Project planning & scheduling; Identification of Activities, Milestones and Construction Sequencing considering: (a) Activities (b) Non work activities (c) Characteristics of repetitive activities and projects (d) Typical and non-typical activities (e) Repetitive and non-repetitive activities

Development of hierarchy of networks showing detailed activities, milestone time duration and labour/equipment resources of all activities in the projects, using MS project; Calculation of quantities, cost and productivity data; Determining activity durations through deterministic and probabilistic durations; Parametric Estimating; Analogous Estimating (Top Down Estimating); Expert Judgement; Three Point Estimates etc

Unit 5

Time Cost Analysis; Cost components of a construction project; Direct and indirect costs.

Cost-Time Relationships-Utility Curves, S-Curves; Time-Cost trade-off**.**. Earned Value Management; Developing Planned Value, Actual Cost, Earned Value and Variances; EVM application for project progress

Unit 6

Resource and Material Management; Resource Histograms and Resource levelling; Developing resource histograms for projects; Achieve uniform resource allocation; Application of Multiple Resource Allocation Procedure, PACK method, Branch and Bound Method; Developing a revised resource-based schedule; Application of MS Project.

SUBMISSION REQUIREMENT FOR SESSIONAL WORK:

Students will work in groups on live projects from the industry analyzing the KM's involved in project budget planning and time scheduling for a given project.

Study of individual topics of assignment from literature and field, present ideas, validate the same with objective discussion and articulate.

Each group shall have its own unique real life ongoing project for study. Groups are encouraged to have diverse projects so that peculiarities in specific projects are explored by entire class

OUTCOME:

To equip the students with the knowledge of the role of design and project management in the project life- cycle and how planning processes may affect the project's schedule, cost, and quality**.**

RECOMMENDED READINGS:

- PMBOK by PMI
- Prasanna Chandra- Projects: Planning, Analysis, Selection, Financing, Implementation and review
- P S Gahlot & B M Dhir. . Construction Planning & management. New Age International Limited.
- Charles Patrick, Pearson, (2012). Construction Project planning & Scheduling
- Kumar Neeraj Jha, Pearson, (2012). Construction Project Management Theory & practice
- Knutson, Schexnayder, Fiori, Mayo. Construction management Fundamentals. Tata McGraw.
- Chitkara. Construction Project Management Planning, Scheduling and Controlling. Tata McGraw

SUBJECT TITLE: **Elective I**				
Subject Code: 2019DPM102				
Teaching Scheme		**Examination Scheme**	**Marks**	
Theory Periods per week	2	Sessional	100	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	**3**	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	**3**	**Total Marks**	**100**	

COURSE OBJECTIVES:

To develop an attitude to critically appraise building projects for the design and construction details for functional performance specific to the typology of the project.

COURSE CONTENT:

Project Typology

1. Hotels
2. Hospitals
3. IT buildings
4. Large residential projects
5. Data Centres

SUBMISSION REQUIREMENT FOR SESSIONAL WORK:

Students will study and conduct critical appraisal of least one project of any ONE typology in terms of design, construction details and building services integration in a form of report. Appropriate sketches with notes shall be included in the report wherever necessary. The report needs to be presented to the class.

OUTCOME:

The students will be able to understand the relationship between architectural design decisions (construction and services), with respect to ease of operations and maintenance for that typology of building project.

RECOMMENDED READINGS:

All books/ Journals/ Magazines/ unpublished/published research/websites related to the topic selected by the individual student and institute and based on the subject

SUBJECT TITLE: **Project Management I - PMBOK Framework.**				
Subject Code 2019DPM**103**				
Teaching Scheme		**Examination Scheme**	**Marks**	
Theory Periods per week	2	Sessional	200	
Studio Periods per week	2	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	**4**	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	**4**	**Total Marks**	**200**	

COURSE OBJECTIVES:

Introducing the principles of PM applicable to all projects.

Examining the core concepts and applied techniques for cost-effective management of projects. Introduction to the importance of PM, organizational strategy, project selection and prioritization, as well as organizational capability within the context of projects. This would include structure, culture and roles, project life cycle and organization, and developing project-related product or service description and chartering a project.

COURSE CONTENT:

Unit 1: Foundations of Project Management

Approach to project management and understanding of all the essential concepts from both atheoretical and applied perspective drawing extensively from the following three knowledge modules(KMs):

(a) Project Management Principles (b) Project Phases and Processes (c) Project Planning and Integration

(d)Understanding of the personal and organizational modules, such as the Ethics and Professionalism, (e)Project Communications and Stakeholder Engagement, (f) Opportunity and Risk Management

Unit 2: Project Communications

Comprehensive project communications and stakeholder engagement knowledge and skills - .mastering theoretical and applied skills drawn from the following KMs:

(a) Plan, Distribute, and Manage Project Communications (b) Identifying and Engaging Stakeholders (c) Project Organization and Context (d) Understanding virtual project management and managing global projects.

Unit 3: Advanced Project Management

Introduction to advanced topics in project scheduling, risk and quality management, and cost control along with a comprehensive knowledge of scheduling and other PM tools.to include

(a) Project Resource Management (b) Project Scheduling (c) Project Control (d) Opportunity and Risk Management. The advanced project management module would include KMs of Estimating Costs, Plan and Control Quality, and PM Information Systems and Information Management and procurement and supply-chain.

Unit 4: Leadership in Teams
Preparing students for the professional work environment they will encounter upon graduation, and to prepare them as project leaders and managers. This unit draws extensively from the following KMs: (a) Project Team Building and Motivating (b) Project Leadership (c) Negotiating and Influencing
Unit 5: Organizational Behaviour and Projects
Detail relationship between the organizations that host the projects and the projects themselves. This unit draws from the following KMs:
(a) Project Organization and Context (b) Strategic Project Management (c) Ethics and Professionalism

SUBMISSION REQUIREMENT FOR SESSIONAL WORK:

- Students will work in groups on live projects from the industry.
- Study of individual topics of assignment from literature and field, present ideas, validate the same with objective discussion and articulate.

Each group shall have its own unique real life ongoing project for study. Groups are encouraged to have diverse projects so that peculiarities in specific projects are explored by entire class

OUTCOME:
A program of study involving basic knowledge modules of PM can define a student's career path more clearly and enhance his or her employability upon graduation.

RECOMMENDED READINGS:

- PMBOK by PMI
- Prasanna Chandra- Projects: Planning, Analysis, Selection, Financing, Implementation and review.
- S. Seetharaman Construction engineering and Management
- P S Gahlot & B M Dhir. . Construction Planning & management. New Age International Limited.
- Charles Patrick, Pearson, (2012). Construction Project planning & Scheduling
- Kumar Neeraj Jha, Pearson, (2012). Construction Project Management Theory & practice
- Knutson, Schexnayder, Fiori, Mayo. Construction management Fundamentals. Tata McGraw.
- Chitkara. Construction Project Management Planning, Scheduling and Controlling. Tata McGraw

SUBJECT TITLE: **Advanced Building Construction Technology & Structural Systems**				
Subject Code 2019DPM**104**				
Teaching Scheme		**Examination Scheme**	**Marks**	
Theory Periods per week	2	Sessional	Nil	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	**3**	In-semester Examination	30	
		End-semester Examination	70	
Total Credits	**3**	**Total Marks**	**100**	

COURSE OBJECTIVES:

Comprehensive coverage on all aspects of construction technologies related to building projects, the understanding of which should lead to selection of appropriate technology for various through planning design and managerial interventions in a life cycle perspective.

To introduce the structural system concepts and design processes methodology in relation to architectural and services systems peculiarities of building projects.

COURSE CONTENT:

Unit 1

Planning and design considerations of foundation and superstructure systems for Multi-storeyed, tall and super tall buildings. Construction of basements and water proofing techniques.

Seismological studies, Landslide vulnerability; Earthquake and wind resistant design and detailing of buildings including codal provisions; Seismic-resistant architecture design; Technologies for seismic risk reduction.

Unit 2

Concrete Technology, Special concrete (High performance concrete, self-compacting concrete, impervious concrete, architectural finishes and aesthetic concrete), Alternative aggregates, Pre-cast, pre-stressed concrete and composite constructions; pre-fabricated and off-site technologies (including pre-engineered construction, Lean Construction Technology.

Unit 3

Quality Control laboratory facilities and processes, experimental investigations; In-situ tests on concrete (including Non – Destructive Testing), Field laboratory tests, Formwork systems (including slip-form), temporary works and enabling works; Re-bar technologies and structural steel materials and jointing

Unit 4

Performance standards of building systems; Concrete versus steel technology suitability;

Life cycle analysis of technologies; Sustainable Construction Technologies; Waste-based / recycled materials and technologies.

Unit 5

Fabrication and erection of steel structures; Design and detailing of joints; Quality assurance in jointing, including welding and fabrication; Pre-engineered buildings;

Repair technologies and materials for strengthening and retrofitting for existing / distressed buildings, heritage buildings

Unit 6

Performance based design of structures; Analysis of special buildings (including tall and super tall); Co-ordination between structural systems and architectural and building services system.

Various structural systems for low-rise (including confined masonry), multi-storeyed, tall and super tall buildings and their planning and design considerations including cost economics;

SUBMISSION REQUIREMENT FOR SESSIONAL WORK:

Students will work in groups on live projects from the industry.

Study of individual topics of assignment from literature and field, present ideas, validate the same with objective discussion and articulate.

Each group shall have its own unique real life ongoing project for study. Groups are encouraged to have diverse projects so that peculiarities in specific projects are explored by entire class

OUTCOME:

The objective of the course is also to rigorously train and help the students in the selection of the appropriate structural systems and the broader understanding of the design process and structural detailing aspects which are essential for the design management and construction management responsibilities.

RECOMMENDED READINGS

- PMBOK by PMI
- Prasanna Chandra- Projects: Planning, Analysis, Selection, Financing, Implementation and review
- S.Seetharaman Construction engineering and Management
- P S Gahlot & B M Dhir. . Construction Planning & management. New Age International Limited.
- Charles Patrick, Pearson, (2012). Construction Project planning & Scheduling
- Kumar Neeraj Jha, Pearson, (2012). Construction Project Management Theory & practice
- Knutson, Schexnayder, Fiori, Mayo. Construction management Fundamentals. Tata McGraw.
- Chitkara. Construction Project Management Planning, Scheduling and Controlling. Tata McGraw

SUBJECT TITLE: **Functional Performance of Building Services**				
Subject Code : 2019DPM105				
Teaching Scheme		**Examination Scheme**	**Marks**	
Theory Periods per week	2	Sessional	Nil	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	**3**	In-semester Examination	30	
		End-semester Examination	70	
Total Credits	**3**	**Total Marks**	**100**	

COURSE OBJECTIVES:

To develop competence to determine the comprehensive performance of buildings with regards to its functional need satisfaction.

Students will be introduced to the theory of building services responsible for creating the indoor environment such as building envelope, HVAC systems, lighting systems, electrical systems, acoustical systems, and transportation systems.

To impart requisite knowledge for taking effective managerial decisions to ensure desirable performance conforming to good practices and national / international codes / standards.

COURSE CONTENT:

Unit 1

Building Envelope Systems; Form, orientation, fenestration design, material selection for thermal, visual, and acoustical performance. Overview of codes and standards applicable to envelope systems

Unit 2

Water and waste management services and systems; Water supply systems (sources, pumping, reservoirs, water treatment, tanks, pipe materials); Quality and quantity standards for water; Sewerage and Sewerage Treatment Plants; R.O. system for potable water; Storm water system; Rainwater harvesting; Plumbing system, fittings, and fixtures; Hydro-pneumatic systems; multi-stage pumping; Measures for effective water management; Net zero water approach.

Unit 3

HVAC system types and components; Heating and cooling load determination; District cooling; Low energy cooling systems e.g., radiant cooling, evaporative cooling, ground earth cooling; Planning for ventilation Cogeneration systems

Unit 4

Electrical services system and components; Main sub-stations and sub-station equipment (for large developments); Power distribution systems; Standby / captive power supply, metering; Renewable energy sources; Net zero approach

Unit 5

Vertical transportation system; Elevators; travellators; escalators; Access control CCTV system; Security and surveillance systems; Telecommunication and related information technology based facilities

Unit 6

Integrated building management system. Overview of codes and standards applicable to MEP services. Overview of Performance Rating Systems

SUBMISSION REQUIREMENT FOR SESSIONAL WORK:

Students will work on case studies to understand the design and integration of the services in building projects and present this in a form of a report.
Market Study of equipment and technologies for each unit.

OUTCOME:

The students will be able to understand the relationship between design of building services and their performance in terms of functional need satisfaction. They will be able to comprehend the integrated approach to design.

RECOMMENDED READINGS:

- Building Performance Analysis- Pieter de Wilde
- Building Services Design Management -Jackie Portman
- Building Services and Equipment: Volume 1,2, &3-F Hall
- Building Science: Concepts and Applications -Jens Pohl
- Building Services—S.M.Patil---(ISBN-978-81-7525-980-5), 1-C,102,Saamana Pariwar
- Building Maintenance Management, 2ed,---Chanter, Wiley India
- Maintenance of Buildings—A.C.Panchodhari—New Age International Publishers

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SUBJECT TITLE: **Soft lab I : Design Management & ERP system for Project Scheduling & Budgeting.**				
Subject Code 2019DPM**106**				
Teaching Scheme		**Examination Scheme**	**Marks**	
Theory Periods per week	1	Sessional	100	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	**2**	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	**2**	**Total Marks**	**100**	

COURSE OBJECTIVES:

To introduce application software and their usage in different phases of design coordination and documentation.
To introduce application software and their usage in different phases of Design management and construction and rigorously impart training for using the project management software by on specific cases/projects.
To impart basic understanding of computer networking and database management systems

COURSE CONTENT:

1. Project Scheduling Software and office documentation system.
2. Application software used in construction project management for scheduling (such as BIM, MS Project and Primavera)
3. Concept of computer networking, requirement, terminology and various networking configurations (LAN, WAN);
4. Database management systems; Emerging areas of construction specific information technologies; Concept of ERP systems; Basic internet and cloud based management technologies.

SUBMISSION REQUIREMENT FOR SESSIONAL WORK :
Generating report at different stages of construction using appropriate software taking live project.

OUTCOME:
Evaluate and select computer applications for successful design and project management throughout different phases of the project.

RECOMMENDED READINGS:

As suggested by faculty

DETAIL SYLLABUS

SEM – II

SUBJECT TITLE: **Design & Engineering Integration studio for Performance for complex projects.**				
Subject Code 2019DPM**201**				
Teaching Scheme		**Examination Scheme**	**Marks**	
Theory Periods per week	2	Sessional	300	
Studio Periods per week	8	Viva/Oral	100	
Total Contact Periods (60 min period) per week	**10**	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	**10**	**Total Marks**	**400**	

COURSE OBJECTIVES:

The objective of the unit is to introduce the concept of value engineering and design processes methodology in relation to architectural and services systems peculiarities of building projects which are essential for the design management and project management responsibilities. Planning and design emphasis in the studio would consider life cycle cost economics and sustainability issues by developing awareness of environmental issues in relation to building design and acquire abilities to integrate design and building engineering

COURSE CONTENT

Unit 1

The intent of the studio is to disseminate about the application of design management during the pre-construction phase of a project life cycle such as initiation, feasibility, and outline scheme design detailed phase. Project feasibility & detailed project reports and formats for the same.

To acquaint the students with overall idea about value management building design process & design review intent.

Unit 2

To acquaint the students with building design related aspects management of the pre -construction phase

The application of management processes such as Scope management, Cost management, Risk management, Communication management and Time management during the pre-construction phase.

Unit 3

The major techniques to be discussed -Value engineering, Quality Function Deployment, Cost benefit analysis, Brain Storming, Parametric Modelling, Risk Identification, Quantification and Response

Unit 4

To acquaint the students on energy efficiency in thermal & electrical utilities, conventional energy systems, energy sources, general aspect, waste heat recovery, energy storage, energy conservation in Buildings, building & energy, selection of energy efficient materials, energy, conservation & energy management (Thermal, Mechanical, Cogen heat, Electrical, Bio energies) and Energy codes

SUBMISSION REQUIREMENT FOR SESSIONAL WORK:
Study of individual topics of assignment from literature and field, present ideas, validate the same with objective discussion and articulate.

Each group shall have its own unique real-life on-going project for study. Groups are encouraged tohave diverse projects so that peculiarities in specific projects are explored by entire class

OUTCOME: Understand environmental issues in relation to building design and acquire abilities to integrate design and building engineering for high performance buildings.

RECOMMENDED READINGS:

- PMBOK by PMI
- Prasanna Chandra- Projects: Planning, Analysis, Selection, Financing, Implementation and review
- S.Seetharaman Construction engineering and Management
- P S Gahlot & B M Dhir. . Construction Planning & management. New Age International Limited.
- Charles Patrick, Pearson, (2012). Construction Project planning & Scheduling
- Kumar Neeraj Jha, Pearson, (2012). Construction Project Management Theory & practice
- Knutson, Schexnayder, Fiori, Mayo. Construction management Fundamentals. Tata McGraw.
- Chitkara. Construction Project Management Planning, Scheduling and Controlling. Tata McGraw

SUBJECT TITLE: **Elective II**				
Subject Code: 2019DPM202				
Teaching Scheme		**Examination Scheme**	**Marks**	
Theory Periods per week	2	Sessional	100	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	**3**	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	**3**	**Total Marks**	**100**	

COURSE OBJECTIVES:

To give an in-depth theoretical concept understanding of building engineering and to expose students to research, latest trend, innovations on the following topics

COURSE CONTENT:

1. Building Management Systems
2. Fire & Safety Infrastructure Maintenance & Management
3. Energy Audits and Monitoring
4. Building Services for High Rise Buildings

SUBMISSION REQUIREMENT FOR SESSIONAL WORK:

Study of individual topics from literature and field, present ideas, validate the same with objective discussion and articulate and submitted in a form of a report The report needs to be presented to the class.

OUTCOME:

The students will be able to conceptually understand theoretical aspects of the topic chosen.

RECOMMENDED READINGS:

All books/ Journals/ Magazines/ unpublished/published research/websites related to the topic selected by the individual student and institute and based on the subject.

SUBJECT TITLE: **Project Management II - PMBOK Framework**				
Subject Code 2019DPM**203**				
Teaching Scheme		**Examination Scheme**	**Marks**	
Theory Periods per week	2	Sessional	200	
Studio Periods per week	2	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	**4**	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	**4**	**Total Marks**	**200**	

COURSE OBJECTIVES:

To provide exposure to students about various aspects of planning, design, execution and maintainability of mechanical, electrical, plumbing and fire safety services so as to design functionally efficient building and effectively co-ordinate pre-construction and construction phase of projects.
In the context of large residential and institutional complexes, the objective is to cover the external infrastructural services, such as electrical, storm water drainage, sewerage etc., communication system and other civil infrastructure facilities.
This unit provides an integrated introduction to enterprise project and program management and project governance. Students would learn the fundamental aspects of modern PM, both managerial and technical. It also focuses on change management

COURSE CONTENT:

Unit 1- Project Governance
This unit draws from the following KMs:

(a) Governance in Projects (b) Project Scope Management (c) Ethics and Professionalism.

Unit 2 -Project Procurement and Supply Chains
This unit begins with an exploration of core principles of project procurement and expands to a consideration of how modern organizations expand their influence beyond simple contractual relationships. This unit draws from the following KMs:

(a) Supply Chain in Projects (b) Procurement and Contract Management (c) Project Handover, Closeout, and Reviews

Unit 3 - Project Stakeholder Engagement
The focus of this unit is the application of the customer interface, leadership to ensure customer satisfaction, and sustainability. It also deals with the business and commercial aspects of PM. This unit draws from the following KMs:
(a)Project Control (b) Identifying and Engaging Stakeholders (c) Managing Global Projects

Unit 4 -Special Topics in Project Management

This course draws from the following KMs:

(a)Agile Approaches to Project Management (b) Portfolio and Program Management Principles

(c) Finance and Cost Budgeting

Unit 5 Integrative Study

This course draws from the following set of KMs.

(a) Simulation (b) Ethics and Professional Responsibility (c) Advanced Cost and Schedule Estimation

SUBMISSION REQUIREMENT FOR SESSIONAL WORK:

Students will work in groups on live projects from the industry.

Study of individual topics of assignment from literature and field, present ideas, validate the same with objective discussion and articulate.

Each group shall have its own unique real life ongoing project for study. Groups are encouraged to have diverse projects so that peculiarities in specific projects are explored by entire class

OUTCOME:

This unit focuses on introducing emerging trends and reviews unique methodologies and approaches to PM, such as Agile Approaches to Project Management or Virtual Project Management. Students investigate tools to conduct simulation and modeling to better understand scheduling and risk... These courses can also integrate learning from the PM major with other non-PM courses. Courses may involve interdisciplinary partnerships among university departments and, even industry

RECOMMENDED READINGS:

- PMBOK by PMI
- Prasanna Chandra- Projects: Planning, Analysis, Selection, Financing, Implementation and review
- S.Seetharaman Construction engineering and Management
- P S Gahlot & B M Dhir. . Construction Planning & management. New Age International Limited.
- Charles Patrick, Pearson, (2012). Construction Project planning & Scheduling
- Kumar Neeraj Jha, Pearson, (2012). Construction Project Management Theory & practice
- Knutson, Schexnayder, Fiori, Mayo. Construction management Fundamentals. Tata McGraw.
- Chitkara. Construction Project Management Planning, Scheduling and Controlling. Tata McGraw

SUBJECT TITLE: **Project Procurement Management.**				
Subject Code 2019DPM **204**				
Teaching Scheme		**Examination Scheme**	**Marks**	
Theory Periods per week	2	Sessional	Nil	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	**3**	In-semester Examination	30	
		End-semester Examination	70	
Total Credits	**3**	**Total Marks**	**100**	

COURSE OBJECTIVES

T disseminate knowledge about Procurement Management Processes with emphasis on consulting services. The procurement could also include design stage services. During the "Bid and Award Phase" of the project life cycle in different project types in terms of organizational settings, contractual arrangements and building typologies.

In addition, the course covers the monitoring and control processes. It includes procurement of equipment supplies

COURSE CONTENT:

Unit 1

Project procurement management process; Study of procurement guidelines of international institutions (e.g. World Bank, ADB); Design & construction (EPC and other forms) of contracts; Preparation of contract documents (RFP, RFQ); Pre-qualification of contractors; Evaluation of technical and financial bid proposals; Negotiation and award; Overview of dispute resolution mechanisms (Alternate dispute resolution, DRBs; Arbitration procedures; issues related to contract administration, etc.).

Unit 2

Contracts for procurement of professional services; Selection of professionals for professional services (Design, Project Management services); Fee structures and contractual conditions; Joint ventures of professional teams (including equity in construction organizations in EPC / design build contracts); Norms for engagements of international Consultants; Performance guarantees; Bank guarantees and other fiscal aspects

Unit 3

Project delivery systems (including PPP / Swiss Challenge, DBB, DB, EPC)

Unit 4

Procurement procedures for various supplies, equipment, machineries; Warrantees and tax issues; Inspections, testing and release of payments; Fiscal aspects of supplies

Unit 5 Material Management; Scope, Objective and function of material management; Material classification; Supply Chain Management; Procurement strategies and purchase procedures; Inventory control and management

Unit 6

Responsibilities of project management organization; Procurement of Project Management services; Standard PMC consultancy agreement forms, fee structure; Code of professional practice; Issues of inter-disciplinary interaction and coordination and professional ethics

SUBMISSION REQUIREMENT FOR SESSIONAL WORK:

Students will work in groups on live projects from the industry.

Study of individual topics of assignment from literature and field, present ideas, validate the same with objective discussion and articulate.

Each group shall have its own unique real life ongoing project for study. Groups are encouraged to have diverse projects so that peculiarities in specific projects are explored by entire class

OUTCOME:

Enabling the students to define the job specification for a project management organisation and give guidance on the project manager's role in various life cycle phases of a project with an aim to study various professional and national / international professional practices and codes to relate to the Indian context of profession. The course also includes application of quality management system in various situations on projects, including project procurement

RECOMMENDED READINGS:

- PMBOK by PMI
- Prasanna Chandra- Projects: Planning, Analysis, Selection, Financing, Implementation and review
- S.Seetharaman Construction engineering and Management
- P S Gahlot & B M Dhir. . Construction Planning & management. New Age International Limited.
- Charles Patrick, Pearson, (2012). Construction Project planning & Scheduling
- Kumar Neeraj Jha, Pearson, (2012). Construction Project Management Theory & practice
- Knutson, Schexnayder, Fiori, Mayo. Construction management Fundamentals. Tata McGraw.
- Chitkara. Construction Project Management Planning, Scheduling and Controlling. Tata McGraw

SUBJECT TITLE: **Research I**				
Subject Code : **2019DPM205**				
Teaching Scheme		Examination Scheme	Marks	Duration
Theory Periods per week	2	Sessional	Nil	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	**3**	In-semester Examination	30	
		End-semester Examination	70	150 min
Total Credits	**3**	**Total Marks**	**100**	

COURSE OBJECTIVES:

The objective of the course is to impart knowledge about the various processes undertaken in research, through quantitative and qualitative methods and to create an appropriate capability for the students to conduct academic research,

COURSE CONTENT:

Unit 1:

Introduction to Research: Meaning of research, types of research, process of research,Sources of research problem, Criteria / Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem,

Unit 2:

Developing a Research Proposal: Format of research proposal:
Research area identification; Research aim and objective definition; Hypothesis of research topic;

Unit 3:

Literature sourcing and search; Literature study; Referencing journal papers Formulation of methodology; Quantitative and Qualitative research; Field study planning; **Unit 4:** Data Collection; Planning sample surveys, Sample size determination, Survey datacollection, Data types and structures, Population description, Ranking & Scoring; Field application and simulation models;

Unit 5:

Data Analysis and Results; Approach to analysis of survey data; Validity and Reliabilityanalysis; Analysis and presentation of research results;

Unit 6:

Inferences and Validation, and derivation of conclusions; Compilation and drawing inferences; Discussion of findings of research; Conclusion of study and formulation of recommendations.

SUBMISSION REQUIREMENT FOR SESSIONAL WORK:

Assignment will be in the form of notes / journal assignments covering all the topics mentioned above with suitable examples and supportive material.

Students will work on one project in details in the form of report.

OUTCOME:

Students will be imparted knowledge of research methodology and equipped with the knowledge and skills to articulate the findings of their research in the form of seminar and thesis reports as well as research papers

RECOMMENDED READINGS:

- Dr. C. R. Kothari, 'Research Methodology: Methods and Trends' New Age International Publishers
- Deepak Chawla and Neena Sondhi, 'Research Methodology: concepts and cases' Vikas Publishing House Pvt. Ltd. (ISBN 978-81-259-5205-3) Sekaran, 'Research Methods for Business' Wiley, India.

SUBJECT TITLE: **Softlab II: Building Simulation**				
Subject Code: 2019DPM206				
Teaching Scheme		**Examination Scheme**	**Marks**	
Theory Periods per week	1	Sessional	100	
Studio Periods per week	1	Viva/Oral	Nil	
Total Contact Periods (60 min period) per week	**2**	In-semester Examination	Nil	
		End-semester Examination	Nil	
Total Credits	**2**	**Total Marks**	**100**	

COURSE OBJECTIVES:

To introduce students to software used for building performance simulation and analysis of the outcomes for appropriate design decisions.

COURSE CONTENT:

1. Visual Performance software tools/applications
2. Thermal Performance software tools/applications
3. Fire evacuation simulation Software tools/applications

SUBMISSION REQUIREMENT FOR SESSIONAL WORK:

A report on various software/applications used for functional performance of building projects.
Performance evaluation report generated using software tool/application of any one project for any one performance,

OUTCOME:

The students will be able to understand the interface and logic of the software application, will be able to simulate basic level performance of the project as well as analyse the outcomes to guide design decisions.

RECOMMENDED READINGS:

As suggested by respective faculty