



SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**

▪ **NAAC & NBA Accredited** ▪ **AN AUTONOMOUS INSTITUTE** ▪ **ISO 9001:2015**

Approved by AICTE, New Delhi, Recognised by Govt. Of Maha., DTE Mumbai & Affiliated to
Dr.Babasaheb Ambedkar Technological University (BATU), Lonere.

- Address : At.Panmalewadi, Post.-Varye, Tal.& Dist.-Satara.-415 015 (Maharashtra)
- Phone : 02162 - 261122 , 200100
- e-mail : agcenggsatara@gmail.com
- Website : www.agce.edu.in
- Institute Code : Engg. DTE EN-6545
- BCA 6545, MCA 6545, B.Voc 6545

DEPARTMENT OF MECHANICAL ENGINEERING (HEAT POWER)

ABOUT THE DEPARTMENT

Mechanical engineering is the Core Department of the Arvind Gavali College of Engineering. The department has all UGC approved faculty members. The department has well-equipped laboratories.

With the growing demand for Mechanical Engineers in the Government and private sectors, the Department is making the best efforts to produce highly trained and capable engineers who can take up the challenges of the real world. Heat Power Engineering plays a crucial role in various industries, including power generation, automotive, aerospace, and renewable energy, making it a vital field for technological advancement and sustainable development. The quality of academic instructions, guidelines, and college activities are designed to produce competent and successful engineers. In the Department, the focus is on preparing professional engineers.

As far as the Department is concerned, academic standards and practical work are the two key parameters. To execute this parameter the department has taken the Initiatives to provide industrial work exposure by sending the students for training to make them fit for future professional challenges. For the extra curriculum activities, the Departmental Association (MESA) has been established by the students. This association conducts various technical and cultural events regularly.

“Nothing is impossible for Mechanical Engineers with Skill Oriented Knowledge.”

DEPARTMENT VISION

To develop professional technocrats and socially responsible engineers in the field of Mechanical engineering.

DEPARTMENT MISSION

M1	To provide quality education to enhance academic competency keeping pace with the industrial needs.
M2	To develop attitude and the professional skills for employability and research.
M3	To imbibe ethical values in graduates for the progressive social development.



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PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO 1	The graduates will be able to apply concepts from the fundamental engineering for solving problems in industry.
PEO 2	The graduates will be able to demonstrate the understanding of Mechanical engineering and allied areas to address complex real-life problems.
PEO 3	The graduates will be able to take responsibility to serve the society and to preserve the environment through ethical values.

PROGRAM OUTCOMES (PO)

PO 1	Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems.
PO 2	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.
PO 3	Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO 4	Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)
PO 5	Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO 6	The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO 7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)



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PO 8	Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO 9	Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO 10	Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO 11	Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO 1	Students will be able to acquire competencies in the usage of design, thermal, and manufacturing principals to develop product and process.
PSO 2	Students will be able to impart technological inputs and acquire managerial skills to become technocrats and entrepreneurs.

MAPPING OF PEO'S TO PO'S

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
PEO 1	3	3	3	2	3	2	2	2	2	2	2
PEO 2	2	2	2	3	2	1	1	2	1	1	1
PEO 3	1	1	1	2	1	3	3	2	1	2	1

MAPPING OF PEO's TO PSO's

	PSO 1	PSO2
PEO 1	3	2
PEO 2	2	2
PEO 3	2	3



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As per NEP Guidelines Proposed Scheme of Credit Distribution

Sr. No.	Year	FY		SY		Actual Credit
		I	II	III	IV	
1	Basic Science Course	--	--	--	--	--
2	Engineering Science Course	--	--	--	--	--
3	Program/Professional Core Courses	12	12	3	--	27
4	Program/Professional Elective Course	6	6	--	--	12
5	Multi - Disciplinary Minor	--	--	3	--	3
6	Open Elective	--	3	3	--	6
7	Vocational and Skill Enhancement Course	--	--	--	--	--
8	Ability Enhancement Course	--	--	--	--	--
9	Entrepreneurship /Economics/ Management Courses (Mgt./Economics/Mkt./Finance)	--	--	--	--	--
10	Indian Knowledge System	--	--	2	--	2
11	Value Education Course	--	--	--	--	--
12	Research Methodology (Project)	--	--	--	--	--
13	Common Egg. Project/Field Project (PBL/Seminar/Mini Project)	--	--	--	--	--
14	Project	--	--	10	20	30
15	Internship/OJT (PBL/Seminar/Mini Project/Virtual Internship/Physical)	--	--	--	--	--
16	Co-curricular Courses	--	--	--	--	--
	Total Credits	18	21	21	20	80

SEMESTER – I

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./ Week	Cr	Components	Max	Min for Passing	
1	PCC	25MHP1101	Thermodynamics and Combustion	3	0	0	3	3	CA1	15		45
									MSE	20		
									CA2	15		
									ESE	50		
2	PCC	25MHP1102	Advanced Fluid Dynamics	3	0	0	3	3	CA1	15		45
									MSE	20		
									CA2	15		
									ESE	50		
3	PCC	25MHP1103	Advanced Heat Transfer	3	0	0	3	3	CA1	15		45
									MSE	20		
									CA2	15		
									ESE	50		
4	PCC	25MHP1101L	Thermodynamics and Combustion Laboratory	0	0	2	2	1	CA1	25		45
									CA2	25		
									POE	50		
5	PCC	25MHP1102L	Advanced Fluid Dynamics Laboratory	0	0	2	2	1	CA1	25		20
									CA2	25		
									--	--		
6	PCC	25MHP1103L	Advanced Heat Transfer Laboratory	0	0	2	2	1	CA1	25		45
									CA2	25		
									POE	50		
7	PEC	25MHP1104	Professional Elective Course- I	3	0	0	3	3	CA1	15		45
									MSE	20		
									CA2	15		
									ESE	50		
8	PEC	25MHP1105	Professional Elective Course- II	3	0	0	3	3	CA1	15		45
									MSE	20		
									CA2	15		
									ESE	50		
			Total	15	0	6	21	18		750		
Total Contact Hours – 21 Total Credits - 18												



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Professional Elective Course List for F. Y. M. Tech (Heat Power) SEM – I:

Sr. No.	Track	Course Code	Course Name
PROFESSIONAL ELECTIVE COURSE- I			
1	Study and Design of Thermal Systems	25MHP1104A	Nuclear Engineering
2	Pumps and Turbines	25MHP1104B	Design of Thermal – Turbo Systems
3	Pumps and Turbines	25MHP1104C	Gas Turbines
PROFESSIONAL ELECTIVE COURSE- II			
1	Study and Design of Thermal Systems	25MHP1105A	Design of Hydro - Turbo Systems
2	Heating Ventilation and Air Conditioning	25MHP1105B	Air Conditioning System Design
3	Energy Engineering	25MHP1105C	Design of Solar and Wind System



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SEMESTER – II

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./ Week	Cr	Components	Max	Min for Passing	
1	PCC	25MHP1201	Steam Engineering	3	0	0	3	3	CA1	15		45
									MSE	20		
									CA2	15		
									ESE	50	20	
2	PCC	25MHP1202	Computational Techniques in Fluid Flow and Heat Transfer	3	0	0	3	3	CA1	15		45
									MSE	20		
									CA2	15		
									ESE	50	20	
3	PCC	25MHP1203	Internal Combustion Engine Design	3	0	0	3	3	CA1	15		45
									MSE	20		
									CA2	15		
									ESE	50	20	
4	PCC	25MHP1201L	Steam Engineering and I.C. Engine Laboratory	0	0	2	2	1	CA1	25		45
									CA2	25		
									POE	50	20	
5	PCC	25MHP1202L	CFD Laboratory	0	0	2	2	1	CA1	25		20
									CA2	25		
									--	--	--	
6	PCC	25MHP1204	Seminar	0	0	2	2	1	CA1	25		45
									CA2	25		
									OE	50	20	
7	PEC	25MHP1205	Professional Elective Course-III	3	0	0	3	3	CA1	15		45
									MSE	20		
									CA2	15		
									ESE	50	20	
8	PEC	25MHP1206	Professional Elective Course-IV	3	0	0	3	3	CA1	15		45
									MSE	20		
									CA2	15		
									ESE	50	20	
9	OEC	25MHP1207	Research Methodology	3	0	0	3	3	CA1	15		45
									MSE	20		
									CA2	15		
									ESE	50	20	
			Total	18	0	6	24	21		850		
Total Contact Hours – 24 Total Credits - 21												



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Professional Elective Course List for F. Y. M. Tech (Heat Power) SEM – II:

Sr. No.	Track	Course Code	Course Name
PROFESSIONAL ELECTIVE COURSE– III			
1	Study and Design of Thermal Systems	25MHP1205A	Design of Heat Exchanger
2	Refrigeration	25MHP1205B	Industrial Refrigeration
3	Food Preservation	25MHP1205C	Food Preservation and Cold Chain Management
4	Automotive and Power Systems	25MHP1205D	Alternative fuels for I.C. Engines
PROFESSIONAL ELECTIVE COURSE - IV			
1	Refrigeration	25MHP1206A	Cryogenics
2	Heating Ventilation and Air Conditioning	25MHP1206B	Industrial Air Conditioning
3	Energy Engineering	25MHP1206C	Energy Conservation and Management
4	Automotive and Power Systems	25MHP1206D	Battery thermal management system

SEMESTER – III

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./Week	Cr	Components	Max	Min for Passing	
1	PR	25MHP2301P	Dissertation Phase - I	0	0	20	20	10	CA1	25	20	45
									CA2	25		
									OE	50		
2	PCC	25MHP2302	Intellectual Property Rights	3	0	0	3	3	CA1	15	20	45
									MSE	20		
									CA2	15		
									ESE	50		
3	IKS	25MHP2303	Indian Knowledge System: Concepts and Applications in Engineering	2	0	0	2	2	CA1	25	20	20
									MSE	--		
									CA2	25		
									ESE	--		
4	AC	25MHP2304	Universal Human Values (UHV) & Professional Ethics	2	0	0	2	AU	CA1	25	20	20
									MSE	--		
									CA2	25		
									ESE	--		
5	OEC	25MHP2305	Open Elective Course	3	0	0	3	3	CA1	15	20	45
									MSE	20		
									CA2	15		
									ESE	50		
6	MDM	25MHP2306	Multi - Disciplinary Minor Course	3	0	0	3	3	CA1	15	20	45
									MSE	20		
									CA2	15		
									ESE	50		
			Total	13	0	20	33	21		500		
Total Contact Hours –33 Total Credits - 21												



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OPEN ELECTIVE COURSES

Sr. No.	Course Code	Course Name
1	25MHP2305A	Project Management
2	25MHP2305B	Mechatronics and Embedded System

MULTI - DISCIPLINARY MINOR COURSES

1	25MHP2306A	E-commerce Technologies
2	25MHP2306B	Entrepreneurship and Start-ups

SEMESTER – IV

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./ Week	Cr	Components		Max	Min for Passing
1	PR	25MHP2401P	Dissertation Phase - II	0	0	40	40	20	CA-1	25		45
									CA-2	25		
									OE	50	20	
			Total	0	0	40	40	20		100		
Total Contact Hours – 40 Total Credits - 20												

Title of the Course: Dissertation Phase - I Course Code: 25MHP2301P	L	T	P	Credit
	-	--	20	10

Course pre-requisite:

Basic knowledge of research methodology, subject domain fundamentals and technical writing skills.

Course Description:

This course focuses on the development of a dissertation project in the chosen specialization area. It involves problem identification, literature review and preliminary analysis. Students are required to prepare a detailed report and present their work, enhancing research, analytical and communication skills under the guidance of a supervisor.

Course Objectives:

1. To identify and define a research problem in the relevant domain.
2. To conduct an extensive literature review and analyze existing work.
3. To develop methodology and perform preliminary investigations.
4. To prepare a structured technical report on the research work.
5. To enhance presentation, communication and project management skills.

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify and formulate a research problem in the chosen domain.
CO2	Analyze literature and identify research gaps.
CO3	Develop methodology and carry out preliminary analysis or experimentation.
CO4	Prepare and present a technical report effectively.
CO5	Demonstrate independent learning, research ethics and project management skills.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	1	-	-	1	1	1	2	3	2
CO2	3	3	2	2	2	-	-	1	1	1	3	3	2
CO3	3	3	3	3	3	1	-	1	1	2	3	3	2
CO4	2	2	2	2	2	-	-	2	3	1	2	2	3
CO5	2	2	1	1	1	1	2	2	2	2	3	2	3

Assessment Scheme:

The components of Continuous Assessment (CA-1, CA-2) and Oral Examination (OE) have 25% and 50% weightage respectively.

Assessment Component	Marks
CA1	25
CA2	25
OE	50

CA1 and **CA2** are based on presentations given on work done at different stages (for example Project Stage I, Project Stage II, etc).

OE is based on 100% course content with 50% weightage for external oral examination at the end of semester.

Course Contents:

Project (stage-I and II) should be based on the area in which the candidate has undertaken the dissertation work as per the common instructions for all branches of M. Tech. The examination shall consist of the preparation of report consisting of a detailed problem statement and a literature review.

The preliminary results (if available) of the problem may also be discussed in the report. The work has to be presented in front of the examiners panel set by Head and PG coordinator/Faculty Advisor. The candidate has to be in regular contact with his/her guide and the topic of dissertation must be mutually decided by the guide and student.

Title of the Course: Intellectual Property Rights	L	T	P	Credit
Course Code: 25MHP2302	3	--	-	3

Course pre-requisite:

Product Design, Design Thinking

Course Description:

This course introduces the fundamentals of Intellectual Property Rights (IPR), including copyrights, trademarks, patents, and trade secrets. It covers legal frameworks, registration processes, infringement issues, and international treaties. The course also highlights management and commercialization of IP, along with recent developments, enabling students to understand protection and utilization of intellectual assets.

Course Objectives:

1. To introduce basic concepts and importance of Intellectual Property Rights.
2. To understand laws and procedures related to trademarks and trade secrets.
3. To impart knowledge of copyright laws and protection mechanisms.
4. To understand patent laws, filing procedures, and commercialization of IP.
5. To familiarize with recent developments and international aspects of IPR.

Course Outcomes: At the end of the course students will be able to:

CO1	Explain concepts, types, and importance of Intellectual Property Rights.
CO2	Understand and apply trademark, trade secret and geographical indication laws.
CO3	Analyze copyright laws, registration and infringement issues.
CO4	Apply knowledge of patent laws, filing procedures and IP management.
CO5	Evaluate recent developments and international frameworks in IPR.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1	-	-	2	1	1	1	1	1	1	2
CO2	2	3	2	1	1	2	2	1	1	1	2	1	2
CO3	2	3	1	2	1	2	2	1	1	1	2	1	2
CO4	2	3	2	1	2	2	2	1	1	2	2	1	3
CO5	2	3	2	2	1	2	2	1	2	2	2	1	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents:

Unit No.	Unit Title and Contents	Hours
1	Understanding and Overview of the IPR Regime: Introduction, types of intellectual property- Copyright, Trademarks, Patents, Trade secrets. Need for Intellectual property rights, Rationale for protection of IPR. Impact of IPR on development, health, agriculture, and genetic resources. IPR in India- Genesis and Development. IPR abroad. International Organizations, agencies, and treaties.	8
2	Trademarks and Trade secret: Rights of trademark-Kind of signs used as trademark types, Purpose and Function of a trademark, Trademark Protection, trademark registration, acquisition of trademark rights, protectable matters, selecting and evaluating trademark, trademark registration processes. Infringement of Trademark. Geographical Indication of Goods: Geographical Indications (GI) laws, Indian Geographical Indications (GI) act, Types of Geographical Indications (GI), Need for protection, legal aspects. Trade Secret: Trade Secret laws, determination of trade secret status, liabilities for misappropriation of trade secrets, protection for submission, trade secret litigation.	8
3	Copyrights: Rights and Protection covered by copyrights- Laws of copyrights: Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, obtaining copyright registration and process, international copyright law, Infringement of copyright under copyright act, the role, and liabilities of IPRs in India.	8

4	Patents: Kinds of inventions protected by patent, Patentable and Non patentable inventions, process and product patent, Legal requirements for patents- Granting of patent-Rights of a patent-exclusive right, Patent application process: Searching a patent- Drafting of a patent- Filing of a patent- Types of a patent application. Patent document: specifications and claims, Management of IP assets and IP portfolio, Commercial exploitation of IP- Assignment, licensing, infringement. Different laws of the international patent system: national, regional and international options. Industrial Design Protection.	8
5	New Development of Intellectual Property: New developments in trademark law, copyright law, patent law, trade secret law, Intellectual property audits. International overview on intellectual property, international trademark law, copyright law, international patent law and international trade secret law.	8

Textbooks:			
Sr. No.	Title	Author	Publisher
1.	“Intellectual Property Rights”	Deborah, E. Bouchoux	Cengage learning

Reference Books:			
Sr. No.	Title	Author	Publisher
1.	“Intellectual Property right: Unleashing the knowledge economy”	Prabuddha Ganguli	Tata McGraw Hill Publishing Company Ltd.

Title of the Course: Indian Knowledge System: Concepts and Applications in Engineering Course Code: 25MHP2303	L	T	P	Credit
	2	--	-	2

Course pre-requisite:

Basic awareness of Indian culture, history, and fundamental concepts of science and mathematics.

Course Description:

This course introduces the Indian Knowledge System (IKS), highlighting its contributions in Vedas, mathematics, astronomy, engineering, architecture, and linguistics. It explores ancient scientific and technological advancements along with their relevance to modern knowledge systems, enabling students to appreciate India's rich intellectual heritage.

Course Objectives:

1. To introduce the concept, history and significance of Indian Knowledge System.
2. To understand contributions of Indian mathematics and astronomy.
3. To explore traditional engineering and technological practices in India.
4. To understand ancient town planning, architecture, and knowledge frameworks.
5. To study linguistics and the role of Sanskrit in language processing.

Course Outcomes: At the end of the course, students should be able to:

CO1	Discuss need, history and features of IKS and various aspects of vedas, kalpa and jyotisa.
CO2	Understand the number system, indian mathematics and astronomy and their contribution.
CO3	Explain ancient metals and metal working practices and applications of engineering and technology.
CO4	Describe town planning and architecture of ancient india and ancient knowledge system.
CO5	Understand various features of linguistics and Sanskrit role in language processing.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1	-	-	2	2	1	1	-	2	1	2
CO2	3	2	1	1	1	2	-	1	1	-	2	2	2
CO3	2	2	2	1	1	2	-	1	1	-	2	2	2
CO4	2	2	2	1	-	3	1	1	1	-	2	1	2
CO5	2	2	1	1	2	1	-	1	2	-	3	1	2

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2) have 25% weightage.

Assessment Component	Marks
CA1	25
MSE	--
CA2	25
ESE	--

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

Course Contents:

Unit No.	Unit Title and Contents	Hours
1	Indian Knowledge System – An Introduction: What is IKS? Why do we need IKS? Organization of IKS 4. Historicity of IKS 5. Some salient aspects of IKS The Vedic Corpus: 1. Introduction to Vedas 2. A synopsis of the four Vedas, Subclassification of Vedas, Messages in Vedas, Introduction to Vedāṅgas, Prologue on Śikṣā and Vyākaraṇa, Basics of Nirukta and Chandas, Introduction to Kalpa and Jyotiṣa 9. Vedic Life: A Distinctive Features.	6
2	Number Systems and Units of Measurement: Number systems in India - Historical evidence, Salient aspects of Indian Mathematics, Bhūta-Saṃkhyā system 4. Kaṭapayādi system, Measurements for time, distance, and weight, Piṅgala and the Binary system Mathematics: Introduction to Indian Mathematics Unique aspects of Indian Mathematics 3. Indian Mathematicians and their Contributions, Algebra Geometry, Trigonometry, Binary mathematics and combinatorial problems in Chandaḥ Śāstra, Magic squares in India Astronomy: 1. Introduction to Indian astronomy, Indian contributions in astronomy, The celestial coordinate system, Elements of the Indian calendar, Notion of years and months, Pañcāṅga – The Indian calendar system , Astronomical Instruments (Yantras) 8. Jantar Mantar of Rājā Jai Singh Sawai.	6
3	Engineering and Technology: Metals and Metalworking: Wootz Steel: The rise and fall of a great Indian technology, The Indian S & T heritage, Mining and ore extraction, Metals and metalworking technology 5. Iron and steel in India, Lost wax casting of idols and artefacts, Apparatuses used for extraction of metallic components Engineering and Technology: Other applications: Irrigation systems and practices in South India, Literary sources for science and technology, Physical structures in India, Irrigation and water management, Dyes and painting technology, The art of making perfumes, Surgical techniques, Shipbuilding, Sixty-four art forms (64 Kalās), Status of Indigenous S & T.	6

4	Town Planning and Architecture: Perspective of Arthaśāstra on town planning, Vāstuśāstra – The science of architecture, Eight limbs of Vāstu, Town planning, Temples in India: marvelous stone architecture for eternity, Temple architecture in India, Iconography. Knowledge Framework and classifications: Indian scheme of knowledge, The knowledge triangle, Prameya – A vaiśeṣikan approach to physical reality, Dravyas – the constituents of the physical reality, Attributes – the properties of substances and Action – the driver of conjunction and disjunction, Sāmānya, viśeṣa, samavāya, Pramāṇa – the means of valid knowledge, Saṁśaya – ambiguities in existing knowledge, Framework for establishing valid knowledge, Deductive or inductive logic framework, Potential fallacies in the reasoning process, Siddhānta: established tenets in a field of study	6
5	Linguistics: Introduction to Linguistics, Aṣṭādhyāyī, Phonetics, Word generation, Computational aspects, Mnemonics, Recursive operations, Rule based operations, Sentence formation, Verbs and prefixes, Role of Sanskrit in natural language processing.	6

Textbooks:			
Sr. No.	Title	Author	Publisher
1.	“Introduction to Indian Knowledge System: Concepts and Applications”	Mahadevan, B., Bhat Vinayak Rajat Nagendra Pavana R.N. (2022)	PHI Learning Private Ltd. Delhi.
2.	“The Wonder that is Sanskrit”	Sampad and Vijay (2011)	Sri Aurobindo Society, Puducherry
3.	Mathematics in Ancient and Medieval India	Bag, A.K. (1979)	Chaukhamba Orientalia, New Delhi.
4.	History of Hindu Mathematics: Parts I and II	Datta, B. and Singh, A.N. (1962)	Asia Publishing House, Mumbai
5.	“On Astronomy in Ancient India”	Kak, S.C. (1987)	Indian Journal of History of Science, 22(3), pp. 205–221

Reference Books:			
Sr. No.	Title	Author	Publisher
1.	Indian Astronomy: A Source Book	Subbarayappa, B.V. and Sarma, K.V. (1985)	Nehru Centre, Mumbai
2.	History of Technology in India, Vol. I	Bag, A.K. (1997)	Indian National Science Academy, New Delhi
3.	Indian Architecture	Acarya, P.K. (1996)	Munshiram Manoharlal Publishers, New Delhi
4.	Public Administration in Ancient India	Banerjea, P. (1916)	Macmillan, London.
5.	“Indian Knowledge Systems Vol – I & II”	Kapoor Kapil, Singh Avadhesh (2021)	Indian Institute of Advanced Study, Shimla, H.P

Title of the Course: Universal Human Values (UHV) & Professional Ethics Course Code: 25MHP2304	L	T	P	Credit
	2	--	-	AU

Course pre-requisite:

Basic awareness of human values, ethics and social responsibilities.

Course Description:

This course focuses on value education and understanding harmony at individual, family, societal, and environmental levels. It emphasizes self-exploration, human relationships, ethical conduct and sustainable living. The course aims to develop socially responsible professionals with a holistic perspective towards life and profession.

Course Objectives:

1. To understand the need for and importance of value education and self-exploration.
2. To develop understanding of harmony within self and physical well-being.
3. To understand human relationships and societal harmony.
4. To explore harmony in nature and existence.
5. To apply ethical values in professional and social life.

Course Outcomes: After completion of the course, students should be able to:

CO1	Explain the importance of human values, self-exploration and happiness.
CO2	Understand harmony within self and maintain balance between mind and body.
CO3	Analyze human relationships and develop mutual trust and respect.
CO4	Understand harmony in nature and sustainable coexistence.
CO5	Apply ethical values in professional practices and societal development.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	2	1	-	-	2	3	1	1	-	2	1	2
CO2	1	2	1	-	-	2	3	1	1	-	2	1	2
CO3	1	2	2	-	-	3	3	2	2	-	2	1	3
CO4	1	2	2	-	-	3	2	1	1	-	2	1	2
CO5	1	2	2	1	-	3	3	2	2	1	3	1	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2) have 25% weightage.

Assessment Component	Marks
CA1	25
MSE	--
CA2	25
ESE	--

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

Course Contents:

Unit No.	Unit Title and Contents	Hours
1	Need, basic guidelines, contents and process for value education: Understanding the need, basic guidelines, content and process for Value Education , Self-Exploration-what is it? – its content and process; ‘Natural Acceptance’ and Experiential Validations the mechanism for self- exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding , Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario , Method to fulfil the above human aspirations: understanding & living in harmony at various levels.	6
2	Understanding harmony in human being- harmony in myself YSELF: The understanding human being as a co-existence of the sentient ‘T’ and the material ‘Body Understanding the needs of Self (‘T’) and ‘Body’ – Sukh and Suvidha • Understanding the Body as an instrument of ‘T’ (I being the doer, seer, and enjoyer), Understanding the characteristics and activities of ‘T’ and harmony in T, Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, Meaning of Prosperity in detail, Programs to ensure Sanyam & Swasthya.	6
3	Understanding harmony in family and society - harmony in human relationship: Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence.	6

	Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals. Visualizing a universal harmonious order in society, Undivided Society (Akhand Samaj)., Universal Order (Sarvabhaum Vyawastha) – from family to world family.	
4	Understanding harmony in the nature and in existence DERSTAINY: Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature –recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence	6
5	Implications of the above holistic understanding harmony on professional ethics: Natural acceptance of human values, The definitiveness of Ethical Human Conduct, The basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people friendly and ecofriendly production systems Technologies and management models, Case studies of typical holistic technologies, Management models and production systems, Strategy for the transition from the present state to Universal Human Order: a) At the level of the individual: as socially and ecologically responsible engineers, Technologists and Managers, b) At the level of society: as mutually enriching institutions and organizations.	6

Textbooks:

Sr. No.	Title	Author	Publisher
1.	A Foundation Course in Human Values and Professional Ethics	R. R. Gaur, R. Asthana, G. P. Bagaria	2nd Revised Edition, Excel Books, New Delhi, 2019, ISBN 978-93-87034-47-1

Reference Books:

Sr. No.	Title	Author	Publisher
1.	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics	R. R. Gaur, R. Asthana, G. P. Bagaria	2nd Revised Edition, Excel Books, New Delhi, 2019, ISBN 97893- 87034- 53-2

Title of the Course: Project Management Course Code: 25MHP2305A	L	T	P	Credit
	3	--	-	3

Course pre-requisite:

Basic knowledge of Engineering Mathematics, fundamentals of engineering,.

Course Description:

This course introduces the fundamental concepts and practices of Project Management in engineering. It covers project planning, work definition, time and cost estimation, and risk management. Students learn to use scheduling tools such as WBS, Gantt charts and CPM/PERT networks.

The course also focuses on project plan development, resource allocation, time–cost optimization and cash flow analysis. It further includes project implementation, monitoring and control, use of computer applications, contract and procurement management, and post-project evaluation, preparing students for effective project execution in real-world scenarios.

Course Objectives:

1. To introduce the fundamental concepts, characteristics, and organizational aspects of project management.
2. To develop the ability to define project work, estimate time and cost, prepare budgets, and analyze project risks.
3. To impart knowledge of project scheduling techniques and tools such as Work Breakdown Structure (WBS), Gantt charts, and network methods (CPM/PERT).
4. To enable students to develop comprehensive project plans, perform cash flow analysis, and optimize schedules using resource allocation, leveling, and time-cost trade-off techniques.
5. To provide understanding of project execution, monitoring and control mechanisms, contract and procurement management, and post-project evaluation.

Course Outcomes: After completion of the course, students should be able to:

CO1	Understand the fundamental concepts of project management, including characteristics, objectives, stages, planning process and project organization structure.
CO2	Apply techniques for defining project work, estimating time and cost, preparing budgets and analyzing project risks.
CO3	Develop project schedules using tools such as Work Breakdown Structure (WBS), Gantt charts and network techniques like CPM and PERT.
CO4	Analyze and prepare project plans including baseline development, cash flow analysis and optimize schedules using resource allocation, resource leveling and time-cost trade-off techniques.
CO5	Evaluate project execution and control mechanisms, including monitoring with PERT/Cost, application of computer tools, contract and procurement management and post-project analysis.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	-	-	1	1	2	1	1	2
CO2	3	3	2	1	1	1	-	1	1	3	1	2	3
CO3	3	3	2	1	3	-	-	1	2	3	1	2	3
CO4	3	3	3	2	3	1	-	2	2	3	2	2	3
CO5	2	3	2	2	3	2	2	2	3	3	2	1	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE.

Course Contents:

Unit No.	Unit Title and Contents	Hours
1	Introduction to Project management: Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization.	8
2	Work definition: Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Risk Management.	8
3	Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, CPM/PERT Networks.	8

4	Developing Project Plan (Baseline), Project cash flow analysis, Project scheduling with resource constraints: Resource Leveling and Resource Allocation. Time Cost Trade off: Crashing Heuristic.	8
5	Project Implementation: Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management. Post-Project Analysis.	8

Textbooks:

Sr. No.	Title	Author	Publisher
1.	Project Management: Engineering, Technology and Implementation	Shtub, Bard and Globerson	Prentice Hall, India

References:

Sr. No.	Title	Author	Publisher
1.	Project Management Handbook	Lock, Gower	

Title of the Course: Mechatronics and Embedded System	L	T	P	Credit
Course Code: 25MHP2305B	3	--	-	3

Course pre-requisite:

Basic knowledge of engineering fundamentals, electrical and mechanical systems, basic electronics and control systems.

Course Description:

This course introduces the fundamentals of mechatronics by integrating mechanical, electrical and control systems. It covers system modelling and analysis, sensors and actuators, signal conditioning, and microcontroller-based control. The course also focuses on automotive applications including safety systems such as ABS, airbags, and ADAS, enabling students to design and analyze modern intelligent systems.

Course Objectives:

1. To introduce concepts, elements, and applications of mechatronics systems.
2. To develop ability to model and analyze mechatronics systems.
3. To impart knowledge of sensors, actuators, and system components.
4. To understand signal conditioning and control systems including PLC and microcontrollers.
5. To apply mechatronics concepts in automotive and safety system design.

Course Outcomes: At the end of the course, students should be able to:

CO1	Explain Mechatronics system.
CO2	Analyze the Mechatronics based system.
CO3	Model, simulate and verify the mechatronics systems.
CO4	Use and apply available automotive sensors and actuators in various electronic control systems while designing automotive system design.
CO5	Apply knowledge of modern technologies in automotive design.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	1	-	-	1	1	-	1	2	1
CO2	3	3	2	2	2	1	-	1	1	-	1	3	2
CO3	3	3	2	3	3	-	-	1	1	-	2	3	2
CO4	3	3	3	2	3	1	-	2	2	1	2	3	3
CO5	3	3	3	2	3	2	1	2	2	1	2	3	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents:

Unit No.	Unit Title and Contents	Hours
1	Introduction: What is Mechatronics, Integrated Design Issues mechatronics, Mechatronics Design Process, Mechatronics Key elements, applications in mechatronics.	8
2	Modelling and Analysis of Mechatronics Systems: Block Diagram Modelling, Analogy approach, Impedance Diagrams, Electrical Systems, Mechanical systems and _ electromechanical systems. Mass-Spring-Oscillation and Damping system, Dynamic response of systems, Transfer function and frequency response. Labview, MATLAB, Scilab.	8
3	Sensors and Actuators: Performance terminology of sensors, Displacement, Position & Proximity Sensors, Displacement, Position sensors, Force, Fluid pressure, Liquid flow sensors, temperature, light sensors, Acceleration and Vibration measurement, Electrical and Mechanical Actuation Systems.	8
4	Signal Conditioning: Introduction to signal processing, Op-Amp as signal conditioner, Analogue to Digital Converter, Digital to Analogue Converter, Signal processing devices, relays, contactors and timers. Microcontrollers, PID controllers and PLCs	8

5	Active and passive safety systems: Body electronics including lighting control, Remote keyless entry, Immobilizers etc., Electronic instrument clusters and dashboard electronics, Antilock braking system, Electronic stability program, Air bags, Computer vision based ADAS	8
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Text Books:			
Sr. No.	Title	Author	Publisher
1.	"Mechatronics: Electronics in product and process"	Bradley, D. Dawson, N. C. Burd and A. J. Loader	Chapman and Hall, London
2.	Mechatronics system design	Devadas Shetty, Richrud A. Kolk	PWS publishing company

Reference Books:			
Sr. No.	Title	Author	Publisher
1.	Intelligent Mechatronic Systems: Modeling, Control and Diagnosis	R. Merzouki, K. Samantaray, P. M. Pathak, B. Ould Bouamama	Springer, London
2.	"Introduction to mechatronics and measurement systems"	David G. Alciatore, Michael B. Hstand	Mc Graw Hill Education

Title of the Course: E-commerce Technologies	L	T	P	Credit
Course Code: 25MHP2306A	3	--	-	3

Course pre-requisite:

Basic knowledge of engineering fundamentals, computers and internet fundamentals.

Course Description:

This course introduces the fundamentals of e-commerce, including its architecture, applications, and role in modern business. It covers internet technologies, website development, security issues, electronic payment systems, and EDI. The course also explores internet marketing strategies, online shopping and emerging trends in e-commerce, enabling students to understand and develop digital business solutions.

Course Objectives:

1. To introduce basic concepts, components and applications of e-commerce.
2. To understand internet technologies and website development for e-commerce.
3. To impart knowledge of security, privacy, and cyber threats in e-commerce.
4. To understand electronic data interchange (EDI) and electronic payment systems.
5. To analyze e-commerce strategies, internet marketing, and real-world applications.

Course Outcomes: After completion of the course, students should be able to:

CO1	Explain fundamental concepts, components and applications of e-commerce.
CO2	Understand internet technologies and develop basic e-commerce websites.
CO3	Analyze security, privacy issues and cyber threats in e-commerce systems.
CO4	Apply knowledge of EDI and electronic payment systems in business applications.
CO5	Evaluate e-commerce strategies, online marketing techniques and real-world case studies.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	1	-	-	1	1	-	1	1	2
CO2	3	3	2	1	3	-	-	1	2	-	2	1	3
CO3	3	3	1	2	2	2	2	1	1	-	2	1	3
CO4	3	3	2	1	2	1	1	1	1	2	2	1	3
CO5	2	3	3	2	2	2	1	2	2	3	2	1	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents:

Unit No.	Unit Title and Contents	Hours
1	Introduction to e-commerce, technical components and functions of e-commerce, Advantages and disadvantages of e-commerce, Scope and applications of e-commerce, E-commerce and e business	8
2	Evolution of internet, Domain names and internet organization, Types of networks, Role of internet in B2B application and building own website, Web promotion, Target email, Banner exchange and Shopping Bots, Secure transaction over internet	8
3	Privacy issues, Computer crime, Threats and attacks on computer systems, Software packages for privacy, Hacking and computer virus, Security algorithms, Authorization and authentication, digital signature, Firewall, Basic concepts of EDI	8
4	Applications of EDI, EDI model and Disadvantages of EDI model, Introduction to electronic payment systems, Payment types, Planning e-commerce initiatives, linking objectives to business strategies, managing costs, Strategies for developing e-commerce websites.	8
5	Pros and cons of online shopping, Case study- cons of online shopping, E-cycle of internet marketing, Internet marketing techniques, Personalization of e-commerce.	8

Textbooks:

Sr. No.	Title	Author	Publisher
1.	E-Commerce Concepts, Models, Strategies	C. S. V. Murthy	Himalaya Publishing House, 2011
2.	E- Commerce	Kamlesh K Bajaj and Debjani Nag	2005
3.	Electronic Commerce: The Strategic Perspective	Richard T. Watson, Pierre Berthon, Leyland F. Pitt, George M. Zinkhan	
4.	Electronic commerce	Gary P. Schneider	International Student Edition, 2011

Reference Books:			
Sr. No.	Title	Author	Publisher
1.	Applying E-commerce in business	Rana Tassabehji	2003
2.	Electronic Commerce – A Manager's Guide	Kalakota, Ravi and Whinston, Andrew B.	Pearson Education, Inc.
3.	Cryptography and Network security Principles and practice	William Stallings	Fifth edition

Title of the Course: Entrepreneurship and Start-ups	L	T	P	Credit
Course Code: 25MHP2306B	3	--	-	3

Course pre-requisite:

Basic knowledge of management concepts, communication skills and general awareness of business environment.

Course Description:

This course introduces the fundamentals of start-ups and entrepreneurship, including idea generation, design thinking, and market validation. It covers essential soft skills, business planning, legal aspects, marketing strategies, and financial management. The course also focuses on managing small businesses, enabling students to develop entrepreneurial and managerial capabilities.

Course Objectives:

1. To introduce concepts of start-ups, entrepreneurship and business ecosystems.
2. To develop skills for idea generation, design thinking and market validation.
3. To enhance soft skills required for managing start-ups.
4. To understand business planning, legal compliance, marketing and financial management.
5. To impart knowledge of managing and sustaining small businesses effectively.

Course Outcomes: After the completion of the course, students should be able to:

CO1	Explain concepts of start-ups, entrepreneurship and business ecosystem.
CO2	Apply design thinking and market research techniques for idea validation.
CO3	Demonstrate soft skills such as leadership, communication and problem-solving.
CO4	Develop business plans including marketing strategies, legal compliance and financial planning.
CO5	Analyze and manage small business operations for sustainability and growth.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1	-	-	1	-	1	1	2	1	1	2
CO2	2	3	2	1	1	1	-	1	1	2	2	1	3
CO3	1	2	1	-	-	-	1	3	3	1	2	1	3
CO4	2	3	3	1	1	1	1	2	2	3	2	1	3
CO5	2	3	2	2	1	2	1	2	2	3	2	1	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	15
MSE	20
CA2	15
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

MSE is based on 50% of course content.

ESE is based on 100% course content with 60-70% weightage for course content covered after MSE

Course Contents:

Unit No.	Unit Title and Contents	Hours
1	Understanding the meaning of Start-up Why Start-ups are growing immensely these days, Characteristics of Successful Entrepreneur, Theories & Types of Entrepreneurs, Understanding the Start-up Ecosystem.	8
2	Idea Generation: Introduction to Design Thinking, Idea Identification, Genuity of Idea, understanding what customers really want? Market Research: Validation of idea, testing your idea with real time user into the market, Selection a demographic area for implementing your idea, Building of Minimum Viable Product.	8
3	Soft Skills required to handle Start-up: Leadership, Negotiation skills, Time management, Problem solving, Communication.	8
4	Start-up Plan: Making Business Plan of your start-up, Understanding the legal compliances of your start-up, Building marketing strategies to get your product into the market (Traditional & Digital Marketing), Understanding Cash Flow Management, Raising funds for your business.	8
5	MANAGEMENT OF SMALL BUSINESS Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business Units- Effective Management of small Business.	8

Textbooks:			
Sr. No.	Title	Author	Publisher
1.	Entrepreneurial Development	Khanka S.S.	S. Chand Pub. Dec.2007
2.	Entrepreneurship	Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha	11th Edition, Mc Graw Hill pub.
3.	School to Start up	Rohit Sinha	Garuda Prakashan

Reference Books:			
Sr. No.	Title	Author	Publisher
1.	Overcome fear and launch your startup	Sudeshna Goswami Mandal	Notion Press
2.	Essentials of Entrepreneurship and Small Business Management	Norman Scarborough, Jeffrey Cornwall	Global Edition: Dec.2018

Title of the Course: Dissertation Phase - II Course Code: 25MHP2401P	L	T	P	Credit
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Course pre-requisite:

Basic knowledge of core subjects, research methodology and use of engineering tools/software.

Course Description:

This course focuses on dissertation work involving problem identification, literature review, methodology development and analysis of results. Students carry out research-oriented work using experimental or numerical techniques, prepare a detailed report and present their findings, contributing to problem-solving and innovation.

Course Objectives:

1. To identify and solve a research problem using engineering knowledge.
2. To develop methodology and use appropriate tools and techniques.
3. To perform analysis and interpret results.
4. To compare results with existing studies and validate outcomes.
5. To draw conclusions and present research findings effectively.

Course Outcomes: At the end of the course, students will be able to

CO1	Solve identified technical problems using acquired knowledge and skill.
CO2	Use latest equipment, instruments, software tools, infrastructure and learning resources available to solve the identified project problem. Procure resources, if required.
CO3	Interpret theoretical/experimental findings using available tools.
CO4	Compare the results obtained with results of similar studies.
CO5	Draw conclusions based on the results.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	1	-	1	1	1	2	3	2
CO2	3	3	2	3	3	-	-	1	1	2	2	3	2
CO3	3	3	2	3	3	1	-	1	1	1	2	3	2
CO4	2	3	2	2	2	1	-	1	1	1	2	2	2
CO5	2	3	2	2	2	1	1	1	2	1	3	2	3

Assessment Scheme:

The components of Continuous Assessment (CA-1, CA-2) and Oral Examination (OE) have 25% and 50% weightage respectively.

Assessment Component	Marks
CA1	25
CA2	25
OE	50

CA1 and **CA2** are based on presentations given on work done at different stages (for example Project Stage III, Project Stage IV, etc).

OE is based on 100% course content with 50% weightage for external oral examination at the end of semester.

Course Contents:

The Project Work will start in semester III and should preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solutions and must preferably bring out the individual contribution. The dissertation should be presented in standard format as provided by the department/guide.

The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion.

The report must bring out the conclusions of the work and future scope for the study. The work has to be presented before the panel of examiners consisting of an approved external examiner, internal examiner/guide as decided by the Head and PG coordinator/Faculty Advisor. The candidate has to be in regular contact with his guide throughout the project duration.