Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
Shri Chhatrapati Shivaji Maharaj College of Engineering, Nepti, Ahmednagar
Survey No. 162 & 163, Nepti, Nagar - Kalyan Road, Ahmednagar - 414005. Maharashtra
Phone No :- 0241 -2568383 Unipune - ID CEGA019270 Fax No: - 0241 -2568384
Email: ajmvps123@gmail.com, scsmcoe.anr@gmail.com, Website: www.scoea.org

Approved by AICTE New Delhi, Govt. of Maharashtra & Affiliated To Savitribai Phule Pune University.

2.6.2. ***Attainment of Programme outcomes and course outcomes are evaluated by the institution.***

Index- 2.6.2

AhmednagarJilha Maratha Vidya Prasarak Samaj's
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Program Specific Outcomes (PSOs)

PSO-1 : Mechanical Engineers will be able to apply concepts for design/test/implement/analyze systems in the areas related to Mechanical Engineering for Industry and Society.

PSO-2 : The Mechanical Engineering graduate will be able to work in manufacturing sector, Services sector , research area and industries in the totality sphere of operation and maintenance .

Program Outcomes (POs)

Engineering Graduates will be able to :

PO-1 : Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. [Engineering knowledge]

PO-2 : Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. [Problem analysis]

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PO-3 : Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. [Design/development of solutions]

PO-4 : Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions. [Conduct investigations of complex problems]

PO-5 : Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. [Modern tool usage]

PO-6 : Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. [The engineer and society]

PO-7 : Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. [Environment and sustainability]

Shivaji Maharaj College of Engineering Mechanical Dept. Nepti, Nagar

PO-8 : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. [Ethics]

PO-9 : Function effectively as an individual and as a member or a leader in diverse teams and in multidisciplinary settings. [Individual and team work]

PO-10 : Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. [Communication]

PO-11 : Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. [Project management and finance]

PO-12 : Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. [Life-long learning]

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Scope of the Subject in Present Scenario

Importance

The subject of manufacturing processes is of significant importance in the field of engineering and technology, as it encompasses various methods and techniques used to transform raw materials into finished products. Here are the scope and importance of the manufacturing process subject:

- Materials Processing: Manufacturing processes cover a wide range of materials, including metals, polymers, ceramics, composites, and more. This subject encompasses methods for shaping, joining, and finishing these materials.
- Diverse Techniques: Manufacturing processes include traditional techniques like casting, forging, and machining, as well as modern methods like additive manufacturing (3D printing), laser cutting, and CNC machining.
- Product Variety: The scope extends from small, intricate components to large structures and assemblies. It covers the manufacturing of everyday consumer products, automotive parts, aerospace components, electronic devices, medical devices, and more.
- Interdisciplinary Field: Manufacturing processes involve knowledge from various disciplines, including materials science, mechanical engineering, electrical engineering, and industrial engineering.

Importance of Manufacturing Process:

- Economic Significance: Manufacturing is a major contributor to a country's economy. Efficient manufacturing processes are crucial for reducing production costs and improving competitiveness.
- Product Quality: The choice of manufacturing processes and methods directly affects the quality of the final product. Precision and consistency are key for ensuring products meet quality standards.

- Innovation and Product Development: Manufacturing processes enable the development of new products and innovations. Advancements in processes like additive manufacturing have opened up new possibilities in design and production.
- Customization: The subject allows for the customization of products to meet specific requirements, which is essential in industries like aerospace and healthcare.
- Resource Efficiency: Efficient manufacturing processes contribute to resource conservation by minimizing material waste and energy consumption. This is important for sustainable manufacturing.
- Supply Chain Management: Understanding manufacturing processes is crucial for supply chain management, as it helps in optimizing production schedules, reducing lead times, and ensuring just-in-time production.
- Quality Control and Assurance: Manufacturers must adhere to strict quality control standards to produce safe and reliable products. Knowledge of manufacturing processes is essential for implementing quality assurance measures.
- Safety: Understanding manufacturing processes helps in identifying and mitigating safety hazards in industrial environments, promoting workplace safety and accident prevention.
- Global Trade and Competitiveness: Efficient manufacturing processes contribute to a nation's competitiveness in the global marketplace. Countries with advanced manufacturing capabilities have a significant advantage in international trade.
- Innovation in Materials: Manufacturing processes are closely linked to materials development. The ability to create and manipulate new materials is vital for various industries, including aerospace, automotive, and electronics.
- Product Lifecycle Management: Manufacturers need to consider the entire lifecycle of a product, from design and production to maintenance and disposal. Knowledge of manufacturing processes is crucial for optimizing each stage of this lifecycle.
- Job Creation: Manufacturing provides employment opportunities across various skill levels, from assembly line workers to engineers and researchers.

In summary, the subject of manufacturing processes is highly significant in engineering and technology. It impacts the economy, product quality, innovation, and sustainability, making it an essential component of industrial development and competitiveness. It also plays a crucial role in addressing current global challenges related to resource conservation and sustainability.

Applications

The subject of manufacturing processes is applied across a wide range of industries and fields to transform raw materials into finished products. Here are some specific applications of the manufacturing process subject:

- Automotive Industry: Manufacturing processes are used to produce vehicle components such as engine parts, chassis components, body panels, and interior components. Techniques like machining, welding, and injection molding are extensively employed.
- Aerospace Industry: The aerospace sector relies on manufacturing processes to produce high-strength, lightweight components for aircraft and spacecraft. Advanced techniques such as precision machining and composite material fabrication are common.
- Electronics Manufacturing: The production of electronic devices involves processes like printed circuit board (PCB) fabrication, surface mount technology (SMT) assembly, and semiconductor manufacturing.
- Consumer Goods: Manufacturing processes are used to create a wide array of consumer products, including appliances, consumer electronics, toys, and furniture. Injection molding, casting, and assembly processes are commonly used.
- Medical Device Manufacturing: The production of medical devices, including implants, surgical instruments, and diagnostic equipment, requires strict adherence to quality standards. Manufacturing processes in this sector include precision machining and sterilization techniques.

- Pharmaceuticals: The pharmaceutical industry uses manufacturing processes to produce pharmaceuticals, tablets, capsules, and other drug forms. These processes include blending, granulation, tablet pressing, and sterilization.
- Food and Beverage Production: Manufacturing processes are essential in food and beverage industries for processing, packaging, and preserving food products. Techniques include canning, pasteurization, and extrusion.
- Textile Industry: Manufacturing processes are employed to create various textile products, including fabrics, clothing, and home furnishings. Processes such as spinning, weaving, dyeing, and finishing are used.
- Construction and Building Materials: The construction industry relies on manufacturing processes to produce materials like concrete, steel, and precast components. These materials are used in building construction and infrastructure development.
- Packaging Industry: The production of packaging materials, such as plastic containers, glass bottles, and cartons, involves manufacturing processes like blow molding, injection molding, and extrusion.
- Metalworking: Manufacturing processes are extensively applied in the metalworking industry to produce parts and structures. Techniques include machining, forging, casting, and welding.
- Renewable Energy: The manufacturing of components for renewable energy technologies, such as wind turbine blades and solar panels, involves specialized manufacturing processes to ensure efficiency and durability.
- 3D Printing and Additive Manufacturing: Additive manufacturing, often referred to as 3D printing, is a rapidly growing area of manufacturing that enables the production of complex and customized parts and prototypes.
- Defence and Military Applications: The defense sector uses manufacturing processes to produce advanced materials, weaponry, and equipment, with a strong emphasis on precision and quality control.

- Art and Jewelry: Fine jewelry and artistic metalwork often require specialized manufacturing processes for creating intricate and unique pieces.
- Sustainable Manufacturing: There is a growing emphasis on sustainable manufacturing, where processes are designed to minimize waste, energy consumption, and environmental impact.
- Custom Manufacturing: Some industries require custom manufacturing processes to create one-of-a-kind products, prototypes, or limited production runs.
- Robotics and Automation: The development and production of robots and automation systems use manufacturing processes to create the components that enable advanced automation.

The application of manufacturing processes is widespread, touching nearly every aspect of modern life. It is essential for the production of goods, economic development, job creation, and technological advancement across various industries.

Aim of the Subject

The aim of the subject of manufacturing processes is to provide individuals with a comprehensive understanding of various techniques and methods used to transform raw materials into finished products. The subject of manufacturing processes is of significant importance in the field of engineering and technology, as it encompasses various methods and techniques used to transform raw materials into finished products. The aim of the manufacturing process subject is to equip individuals with the knowledge, skills, and principles necessary to efficiently and effectively produce high-quality products while considering factors like safety, sustainability, and economic competitiveness. It is a fundamental subject for anyone involved in the field of manufacturing and plays a crucial role in advancing technology and industry.

Course Objectives:

1. Describe various sand and permanent mould casting methods, procedure and mould design aspects.
2. Understand basics of metal forming process, equipment and tooling.
3. Understand sheet metal forming operation and die design procedure.
4. Classify, describe and configure the principles of various welding techniques.
5. Understand plastic processing techniques.
6. To know about composites, its fabrication processes.

Course Outcomes:

On completion of the course, student will be able to,

1. SELECT appropriate mulding, core making and melting practice and estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process.
2. UNDERSTAND mechanism of metal forming techniques and

CALCULATE load required for flat rolling

3. DEMONSTRATE press working operations and APPLY the basic principles to DESIGN dies and tools for forming and shearing operations
4. CLASSIFY and EXPLAIN different welding process and EVALUATE welding characteristics
5. DIFFERENTIATE thermoplastics and thermosetting and EXPLAIN polymer processing techniques
6. UNDERSTAND the principle of manufacturing of fiber reinforce composites and metal matrix composites.

Academic Year : 2023-24	
SUBJECT : Manufacturing Process (2202050)	
SEMESTER : II	**CLASS:** S. E.
STAFF : Mr. Mohnesh D. Mandhre	

Course Objectives	
1	Describe various sand and permanent mould casting methods, procedure and mould design aspects.
2	Understand basics of metal forming process, equipment and tooling.
3	Understand sheet metal forming operation and die design procedure.
4	Classify, describe and configure the principles of various welding techniques.
5	Understand plastic processing techniques.
6	To know about composites, its fabrication processes.

Course Outcomes : **Students will be able to**	
CO1	SELECT appropriate mulding, core making and melting practice and estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process.
CO2	UNDERSTAND mechanism of metal forming techniques and CALCULATE load required for flat rolling
CO3	DEMONSTRATE press working operations and APPLY the basic principles to DESIGN dies and tools for forming and shearing operations
CO4	CLASSIFY and EXPLAIN different welding process and EVALUATE welding characteristics
CO5	DIFFERENTIATE thermoplastics and thermosetting and EXPLAIN polymer processing techniques
CO6	UNDERSTAND the principle of manufacturing of fiber reinforce composites and metal matrix composites.

Academic Year : 2023-24			
Subject Name (Code): Manufacturing Process (202050) (C205)			
YEAR : S.E.	**Mechanical**	**SEMESTER :** II	**Subject Incharge:** Mr. Mohnesh D.Mandhre

Course Outcomes

CO No.	Course Outcome Statements
C205.1	Describe various sand and permanent mould casting methods, procedure and mould design aspects.
C205.2	Understand basics of metal forming process, equipment and tooling.
C205.3	Understand sheet metal forming operation and die design procedure.
C205.4	Classify, describe and configure the principles of various welding techniques.
C205.5	Understand plastic processing techniques.
C205.6	To know about composites, its fabrication processes.

Course Outcomes Attainment Level Matrix

For < 50

% Students	Target Average Marks (%)	Attainment Level
0	45	0
50	45	1
60	45	2
70	45	3

Course Outcome Assesment	By External Tools	By Internal Tools
	90%	10%

COURSE OUTCOME ATTAINMENT TOOLS & LEVELS

	Assessment Tools	Course Outcome					
		C205.1	C205.2	C205.3	C205.4	C205.5	C205.6
	(External)						
1	Theory (Th)	2.00	2.00	2.00	2.00	2.00	2.00
	(Internal)						
1	Assignment	3.00	3.00	3.00	3.00	3.00	3.00

FINAL COURSE OUTCOME ATTAINMENT SUMMARY

	C205.1	C205.2	C205.3	C205.4	C205.5	C205.6
External Attainment Level (Average of All External Tools)	2.00	2.00	2.00	2.00	2.00	2.00
Internal Attainment Level	3.00	3.00	3.00	3.00	3.00	3.00
Attainment Levels	2.10	2.10	2.10	2.10	2.10	2.10

COURSE OUTCOME ATTAINMENT RESULT

Course Attainment Level	2.10

Prof. M. D. Mandhre
Subject Incharge

HOD
Mechanical Department
Shri Chhatrapati Shivaji Maharaj College of Engineering, Nepti, Ahmednagar

Chhatrapati Shivaji Maharaj College of Engineering Mechanical Dept.

CO-PO-PSO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	2										1	
CO2		2												2
CO3	2			1										
CO4	2												1	
CO5	1													1
CO6	1												1	

1: Low 2: Moderate 3: High

Justification of CO-PO-PSO Mapping:

Mapping		Justification
CO	**POs**	
CO1	PO2	**Low as the students will understand casting process.**
	PO3	**Moderate as the student will be able to understand mechanism of metal forming process**
	PSO1	**Low as the students can design riser and understand location of riser.**
CO2	PO2	**Moderate as the students will understand concept of mechanism of metal forming techniques.**
	PSO2	**Moderate as the students will be able to calculate load required for flat rolling.**
CO3	PO1	**Moderate as the students will be able to demonstrate press working operation and design dies and tools for forming and shearing operations.**
	PO4	**Low as the students can analyze various property of material using destructive and nondestructive testing method.**
CO4	PO1	**Moderate as the students will be able to apply different welding process and welding characteristics.**
	PSO1	**Low as the students will understand welding process.**

Shri Chhatrapati Shivaji Maharaj College of Engineering Mechanical Dept. Nepti,A.Nagar

Mapping		Justification
CO	**POs**	
CO5	PO1	**Low as the students should differentiate thermoplastics and thermosetting plastics.**
	PSO2	**Low as the student will be able express polymer process techniques.**
CO6	PO1	**Low as student understand principle of manufacturing of composite material.**
	PSO1	**Low as the students will be able to process of manufacturing process of composite material**

Subject Teacher **Domain Coordinator** **H.O.D.**

Shri Chhatrapati Shivaji Maharaj College of Engineering Mechanical Dept. Nepti,A.Nagar

HOD
Mechanical Department
Shri Chhatrapati Shivaji Maharaj College of Engineering, Nepti, Ahmednagar

Course Outcome Assessment of Manufacturing Process (S.E.)

TOTAL STUDENTS	57

Sr. No	Name of Student	Assessment tool	Externa Theory (TH)	Internal Assesment (Assignment)					
				C205.1	C205.2	C205.3	C205.4	C205.5	C205.6
		Marks Out of	100	10	10	10	10	10	10
		Exam Seat Number							
1	AWARE TEJAS RAVINDRA	S191010801	25	9	10	9	9	10	9
2	BANDAL SWANAND SAMBHAJI	S191010802	41	8	9	10	8	7	5
3	BARDE PRATHAMESH ANIL	S191010803	48	8	9	9	9	8	8
4	BHAWAR TUSHAR BALASAHEB	S191010804	42	10	9	10	10	7	7
5	BHOGADE PRATIK SANTOSH	S191010805	47	8	8	9	10	9	9
6	BHOSALE PREMRAJ PURUSHOTTAM	S191010806	38	8	10	8	9	9	9
7	BITLA VARUN GIRISH	S191010807	45	9	8	9	9	8	9
8	BOJJA PRASHANT DILIP	S191010808	AB	8	9	10	9	9	8
9	CHAUDHARI CHAITANYA DATTATRAYA	S191010809	21	8	8	10	8	10	8
10	CHAVAN AKSHATA SUBHASH	S191010810	AB	9	8	9	8	10	8
11	DHAGE VAISHNAV SUNIL	S191010811	40	8	7	9	8	7	8
12	DHAVAN SWARAJ ANIL	S191010812	48	10	9	9	8	7	8
13	DODAKE NIKHIL LAHU	S191010813	52	8	8	8	8	10	6
14	DONGARE TUSHAR BALU	S191010814	42	9	10	8	9	8	9
15	DUDHADE VISHAL RAVINDRA	S191010815	51	9	9	8	7	9	7
16	EDKE NARESH PRAVIN	S191010816	44	10	8	7	6	9	7
17	GAIKWAD RAVIRAJ SAMBHAJI	S191010817	38	9	10	10	6	8	7
18	GARGUND APARNA SATISH	S191010818	56	10	8	8	7	6	6
19	GAURAV SANTOSH BHALKE	S191010819	54	9	7	9	10	10	7
20	GHULE VAISHNAVI LAXMAN	S191010820	49	10	6	9	6	10	10
21	GIRE SHITAL SHRIKANT	S191010821	52	8	5	10	8	9	6
22	GOSAVI MAYURESH VIJAYKUMAR	S191010822	37	10	6	9	7	8	8
23	GUNJAL TEJAS DNYANESHWAR	S191010823	67	10	10	10	10	10	7
24	GUNJAL VAIBHAV VIJAY	S191010824	51	8	9	9	8	5	7
25	GUNJAL VIJAY SITARAM	S191010825	44	8	10	10	10	8	6
26	HARISHCHANDRE NAYAN JANARDHAN	S191010826	57	7	9	8	10	9	8
27	IROLE MAYURI DHANANJAY	S191010827	62	9	10	10	8	8	8
28	KANDEKAR GAURAV ANIL	S191010828	54	8	10	10	8	10	7
29	KANDEKAR KRUSHNA SUDHAKAR	S191010829	35	9	9	8	7	9	9
30	KARDILE RADHIKA RAJESH	S191010830	66	9	8	6	6	10	7
31	KHETMALAS JAYESH SATISH	S191010831	51	8	9	10	6	9	7
32	KHETMALAS OMKAR ASHOK	S191010832	52	7	7	9	8	8	8
33	KIMBAHUNE ANJALI SANTOSH	S191010833	AB	9	6	10	9	9	7
34	KOMPELLI RAHUL ANIL	S191010834	41	9	8	9	10	8	7
35	KOTKAR ABHIJEET RAOSAHEB	S191010835	59	8	7	10	6	10	9
36	KSHIRSAGAR SUYASH ASHOK	S191010836	52	8	10	10	8	6	10
37	KULAT PRATIK SHARAD	S191010837	50	9	9	9	6	7	6
38	LONDHE SANKET NANDU	S191010838	47	9	7	8	7	9	7
39	MARKAD RUTUJA MAHADEV	S191010839	63	9	10	9	9	10	9
40	MEHETRE NUTAN CHAKRADHAR	S191010840	71	9	8	7	8	6	7
41	MHASKE AMRUTA RAJU	S191010841	69	8	8	7	9	10	7
42	MOHITE HARSHAL SANYOSH	S191010842	45	7	9	9	8	8	10
43	MUNGASE TEJAS SANDIP	S191010843	58	7	8	9	10	7	7
44	PATOLE TUSHAR DADASAHEB	S191010844	53	6	7	9	8	8	6
45	PAWAR AKASH MADHUKAR	S191010845	52	8	10	9	8	7	8
46	PAWAR AKSHAY BHANUDAS	S191010846	41	9	9	8	9	10	7
47	PRAJWAL PRAKASH DHADGE	S191010847	51	10	7	7	8	8	8
48	PUND RUSHABH MOHAN	S191010848	32	6	10	7	9	9	9
49	RAUT SUMIT KIRAN	S191010849	37	7	8	9	10	10	9
50	SALUNKE DATTATRAY BABANRAO	S191010850	48	7	8	6	9	9	9
51	SALVE AMIT NITIN	S191010851	56	8	9	9	8	8	10
52	SASE NAYAN VILAS	S191010852	39	7	8	6	10	10	7
53	SHELAKE SATYAM VISHNU	S191010853	42	8	8	9	8	8	7
54	SHINDE DHANASHREE DNYANESHWAR	S191010854	40	8	7	9	8	9	7
55	SHRADDHA DNYANDEV MORE	S191010855	29	7	10	8	10	9	6
56	THANGE AKSHADA SHIVAJI	S191010856	64	9	9	9	7	10	9
57	UDAWANT PRATHAMESH SANJAY	S191010857	25	8	7	8	8	10	8
58	WAGH DIPAK REVANNATH	S191010858	32	9	10	10	8	9	8
59	WAGH SHUBHANGI BHAUSAHEB	S191010859	45	9	8	8	8	6	9
60	WAYKAR PRADIP TRIMBAK	S191010860	40	9	8	8	9	9	9
61	ZAREKAR DIPAK SAKHARAM	S191010861	44	10	10	9	10	8	9

		I
		Theory (TH)
No of Studetns scoring above 45		38
% of Studetns scoring above 45		66.67
Levels Attained		2.00

Internal Assesment						
C205.1	C205.2	C205.3	C205.4	C205.5	C205.6
60	60	60	60	60	60
105.26	105.26	105.26	105.26	105.26	105.26
3.00	3.00	3.00	3.00	3.00	3.00

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			Internal Assesment (Assignment Question wise)																			
			C205.1			C205.2			C205.3			C205.4			C205.5			C205.6				
			Q.1	Q.2	Total	Q.1	Q.2	Total	Q.1	Q.2	Total	Q.1	Q.2	Total	Q.1	Q.2	Total	Q.1	Q.2	Total		
Sr. No	Name of Student	Exam Seat	5	5	10	5	5	10	5	5	10	5	5	10	5	5	10	5	5	10		
1	AWARE TEJAS RAVINDRA	S191010801	5	4	9	5	5	10	5	4	9	4	5	9	5	5	10	4	5	9		
2	BANDAL SWANAND SAMBHAJI	S191010802	5	3	8	4	5	9	5	5	10	4	4	8	5	2	7	4	1	5		
3	BARDE PRATHAMESH ANIL	S191010803	5	3	8	4	5	9	5	4	9	4	5	9	5	3	8	5	3	8		
4	BHAWAR TUSHAR BALASAHEB	S191010804	5	5	10	4	5	9	5	5	10	5	5	10	3	4	7	4	3	7		
5	BHOGADE PRATIK SANTOSH	S191010805	4	4	8	3	5	8	4	5	9	5	5	10	5	4	9	5	4	9		
6	BHOSALE PREMRAJ PURUSHOTTAM	S191010806	5	3	8	5	5	10	4	4	8	5	4	9	4	5	9	5	4	9		
7	BITLA VARUN GIRISH	S191010807	4	5	9	3	5	8	4	5	9	5	4	9	4	4	8	5	4	9		
8	BOJJA PRASHANT DILIP	S191010808	4	4	8	4	5	9	5	5	10	5	4	9	4	5	9	5	3	8		
9	CHAUDHARI CHAITANYA DATTATRAYA	S191010809	5	3	8	3	5	8	5	5	10	5	3	8	5	5	10	5	3	8		
10	CHAVAN AKSHATA SUBHASH	S191010810	4	5	9	4	4	8	5	4	9	5	3	8	5	5	10	4	4	8		
11	DHAGE VAISHNAV SUNIL	S191010811	4	4	8	5	2	7	5	4	9	4	4	8	2	5	7	4	4	8		
12	DHAVAN SWARAJ ANIL	S191010812	5	5	10	4	5	9	5	4	9	4	4	8	2	5	7	4	4	8		
13	DODAKE NIKHIL LAHU	S191010813	5	3	8	3	5	8	5	3	8	4	4	8	5	5	10	5	1	6		
14	DONGARE TUSHAR BALU	S191010814	5	4	9	5	5	10	5	3	8	4	5	9	3	5	8	4	5	9		
15	DUDHADE VISHAL RAVINDRA	S191010815	5	4	9	4	5	9	4	4	8	4	3	7	4	5	9	5	2	7		
16	EDKE NARESH PRAVIN	S191010816	5	5	10	3	5	8	5	2	7	4	2	6	5	4	9	4	3	7		
17	GAIKWAD RAVIRAJ SAMBHAJI	S191010817	5	4	9	5	5	10	5	5	10	4	2	6	5	3	8	5	2	7		
18	GARGUND APARNA SATISH	S191010818	5	5	10	3	5	8	5	3	8	5	2	7	3	3	6	4	2	6		
19	GAURAV SANTOSH BHALKE	S191010819	4	5	9	4	3	7	5	4	9	5	5	10	5	5	10	5	2	7		
20	GHULE VAISHNAVI LAXMAN	S191010820	5	5	10	4	2	6	5	4	9	4	2	6	5	5	10	5	5	10		
21	GIRE SHITAL SHRIKANT	S191010821	4	4	8	2	3	5	5	5	10	5	3	8	4	5	9	4	2	6		
22	GOSAVI MAYURESH VIJAYKUMAR	S191010822	5	5	10	2	4	6	5	4	9	4	3	7	3	5	8	5	3	8		
23	GUNJAL TEJAS DNYANESHWAR	S191010823	5	5	10	5	5	10	5	5	10	5	5	10	5	5	10	4	3	7		
24	GUNJAL VAIBHAV VIJAY	S191010824	5	3	8	4	5	9	4	5	9	4	4	8	3	2	5	5	2	7		
25	GUNJAL VIJAY SITARAM	S191010825	4	4	8	5	5	10	5	5	10	5	5	10	5	3	8	4	2	6		
26	HARISHCHANDRE NAYAN JANARDHAN	S191010826	4	3	7	4	5	9	4	4	8	5	5	10	5	4	9	5	3	8		
27	IROLE MAYURI DHANANJAY	S191010827	4	5	9	5	5	10	5	5	10	5	3	8	4	4	8	5	3	8		
28	KANDEKAR GAURAV ANIL	S191010828	5	3	8	5	5	10	5	5	10	4	4	8	5	5	10	5	2	7		
29	KANDEKAR KRUSHNA SUDHAKAR	S191010829	4	5	9	4	5	9	5	3	8	4	3	7	5	4	9	5	4	9		
30	KARDILE RADHIKA RAJESH	S191010830	5	4	9	5	3	8	3	3	6	3	3	6	5	5	10	5	2	7		
31	KHETMALAS JAYESH SATISH	S191010831	5	3	8	4	5	9	5	5	10	4	2	6	5	4	9	5	2	7		
32	KHETMALAS OMKAR ASHOK	S191010832	3	4	7	5	2	7	4	5	9	5	3	8	3	5	8	5	3	8		
33	KIMBAHUNE ANJALI SANTOSH	S191010833	5	4	9	4	2	6	5	5	10	4	5	9	5	4	9	5	2	7		
34	KOMPELLI RAHUL ANIL	S191010834	5	4	9	3	5	8	4	5	9	5	5	10	3	5	8	5	2	7		
35	KOTKAR ABHIJEET RAOSAHEB	S191010835	4	4	8	3	4	7	5	5	10	4	2	6	5	5	10	5	4	9		
36	KSHIRSAGAR SUYASH ASHOK	S191010836	5	3	8	5	5	10	5	5	10	3	5	8	3	3	6	5	5	10		
37	KULAT PRATIK SHARAD	S191010837	5	4	9	4	5	9	4	5	9	3	3	6	5	2	7	4	2	6		
38	LONDHE SANKET NANDU	S191010838	5	4	9	3	4	7	5	3	8	2	5	7	5	4	9	5	2	7		
39	MARKAD RUTUJA MAHADEV	S191010839	5	4	9	5	5	10	4	5	9	5	4	9	5	5	10	5	4	9		
40	MEHETRE NUTAN CHAKRADHAR	S191010840	4	5	9	4	4	8	5	2	7	3	5	8	4	2	6	5	2	7		
41	MHASKE AMRUTA RAJU	S191010841	4	4	8	3	5	8	3	4	7	5	4	9	5	5	10	5	2	7		
42	MOHITE HARSHAL SANYOSH	S191010842	4	3	7	5	4	9	5	4	9	3	5	8	3	5	8	5	5	10		
43	MUNGASE TEJAS SANDIP	S191010843	4	3	7	5	3	8	5	4	9	5	5	10	5	2	7	5	2	7		
44	PATOLE TUSHAR DADASAHEB	S191010844	4	2	6	4	3	7	5	4	9	4	4	8	3	5	8	5	1	6		
45	PAWAR AKASH MADHUKAR	S191010845	4	4	8	5	5	10	4	5	9	3	5	8	5	2	7	5	3	8		
46	PAWAR AKSHAY BHANUDAS	S191010846	5	4	9	5	4	9	4	4	8	5	4	9	5	5	10	4	3	7		
47	PRAJWAL PRAKASH DHADGE	S191010847	5	5	10	4	3	7	4	3	7	5	3	8	4	4	8	4	4	8		
48	PUND RUSHABH MOHAN	S191010848	4	2	6	5	5	10	4	3	7	4	5	9	4	5	9	5	4	9		
49	RAUT SUMIT KIRAN	S191010849	3	4	7	4	4	8	4	5	9	5	5	10	5	5	10	5	4	9		
50	SALUNKE DATTATRAY BABANRAO	S191010850	3	4	7	5	3	8	3	3	6	4	5	9	5	4	9	5	4	9		
51	SALVE AMIT NITIN	S191010851	5	3	8	4	5	9	4	5	9	3	5	8	3	5	8	5	5	10		
52	SASE NAYAN VILAS	S191010852	4	3	7	4	4	8	4	2	6	5	5	10	5	5	10	5	2	7		
53	SHELAKE SATYAM VISHNU	S191010853	4	4	8	3	5	8	5	4	9	4	4	8	3	5	8	5	2	7		
54	SHINDE DHANASHREE DNYANESHWAR	S191010854	5	3	8	3	4	7	5	4	9	3	5	8	4	5	9	4	3	7		
55	SHRADDHA DNYANDEV MORE	S191010855	4	3	7	5	5	10	3	5	8	5	5	10	4	5	9	4	2	6		
56	THANGE AKSHADA SHIVAJI	S191010856	5	4	9	4	5	9	5	4	9	3	4	7	5	5	10	4	5	9		
57	UDAWANT PRATHAMESH SANJAY	S191010857	4	4	8	3	4	7	3	5	8	3	5	8	5	5	10	4	4	8		
58	WAGH DIPAK REVANNATH	S191010858	4	5	9	5	5	10	5	5	10	3	5	8	5	4	9	5	3	8		
59	WAGH SHUBHANGI BHAUSAHEB	S191010859	4	5	9	4	4	8	4	4	8	3	5	8	3	3	6	5	4	9		
60	WAYKAR PRADIP TRIMBAK	S191010860	5	4	9	3	5	8	3	5	8	5	4	9	4	5	9	5	4	9		
61	ZAREKAR DIPAK SAKHARAM	S191010861	5	5	10	5	5	10	5	4	9	5	5	10	4	4	8	4	5	9		

Scope of the Subject in Present Scenario

Importance

Turbomachinery, in mechanical engineering, describes machines that transfer energy between a rotor and a fluid, including both turbines and compressors. While a turbine transfers energy from a fluid to a rotor, a compressor transfers energy from a rotor to a fluid.

Turbomachines is a subject which can provide excellent knowledge of Design of equipment based on the aspect of flow characteristics. It deals with various machines that involve fluid flow. As far the Industrial aspect is concerned, it is 'must-learn' subject if you are going to work in Gas Turbine Industry, Hydraulic Power plants, Centrifugal Pump manufacturing industries and all industries that involve fluid flow. It is not required if you are interested to work in Conventional Manufacturing Industry. Any device that extracts energy from or imparts energy to a continuously moving stream of fluid can be called a turbomachine. Elaborating, a turbomachine is a power or head generating machine which employs the dynamic action of a rotating element, the rotor; the action of the rotor changes the energy level of the continuously flowing fluid through the machine. Turbines, compressors and fans are all members of this family of machines

Applications

Power Generation:-

Hydro electric- Hydro-electric turbomachinery uses potential energy stored in water to flow over an open impeller to turn a generator which creates electricity

Steam turbines- Steam turbines used in power generation come in many different variations. The overall principle is high pressure steam is forced over blades attached to a shaft, which turns a generator. As the steam travels through the turbine, it passes through smaller blades causing the shaft to spin faster, creating more electricity.

Gas turbines- Gas turbines work much like steam turbines. Air is forced in through a series of blades that turn a shaft. Then fuel is mixed with the air and causes a combustion reaction, increasing the power. This then causes the shaft to spin faster, creating more electricity.

Windmills- Also known as a wind turbine, windmills are increasing in popularity for their ability to efficiently use the wind to generate electricity. Although they come in many shapes and sizes, the most common one is the large three-blade. The blades work on the same principle as an airplane wing. As wind passes over the blades, it creates an area of low and high pressure, causing the blade to move, spinning a shaft and creating electricity. It is most like a steam turbine, but works with an infinite supply of wind.

Marine

Steam turbine- Steam turbines in marine applications are very similar to those in power generation. The few differences between them are size and power output. Steam turbines on ships are much smaller because they don't need to power a whole town. They aren't very common because of their high initial cost, high specific fuel consumption, and expensive machinery that goes with it.

Gas turbines- Gas turbines in marine applications are becoming more popular due to their smaller size, increased efficiency, and ability to burn cleaner fuels. They run just like gas turbines for power generation, but are also much smaller and do require more machinery for propulsion. They are most popular in naval ships as they can be at a dead stop to full power in minutes (Kayadelen, 2013), and are much smaller for a given amount of power.

Water jet- Essentially a waterjet drive is like an aircraft turbojet with the difference that the operating fluid is water instead of air. Water jets are best suited to fast vessels and are thus used often by the military. Water jet propulsion has many advantages over other forms of marine propulsion, such as stern drives, outboard motors, shafted propellers and surface drives.

Auto

Turbochargers- Turbochargers are one of the most popular turbomachines. They are used mainly for adding power to engines by adding more air. It combines both forms of

turbomachines. Exhaust gases from the engine spin a bladed wheel, much like a turbine. That wheel then spins another bladed wheel, sucking and compressing outside air into the engine.

Superchargers- Superchargers are used for engine-power enhancement as well, but only work off the principle of compression. They use the mechanical power from the engine to spin a screw or vane, some way to suck in and compress the air into the engine.

General

Pumps- Pumps are another very popular turbomachine. Although there are very many different types of pumps, they all do the same thing. Pumps are used to move fluids around using some sort of mechanical power, from electric motors to full size diesel engines. Pumps have thousands of uses, and are the true basis to turbomachinery.

Air compressors- Air compressors are another very popular turbomachine. They work on the principle of compression by sucking in and compressing air into a holding tank. Air compressors are one of the most basic turbomachines.

Fans- Fans are the most general type of turbomachines.

Aerospace

Gas turbines- Aerospace gas turbines, more commonly known as jet engines, are the most common gas turbines.

Turbopumps- Rocket engines require very high propellant pressures and mass flow rates, meaning their pumps require a lot of power. One of the most common solutions to this issue is to use a turbopump that extracts energy from an energetic fluid flow. The source of this energetic fluid flow could be one or a combination of many things, including the decomposition of hydrogen peroxide, the combustion of a portion of the propellants, or even the heating of cryogenic propellants run through coolant jackets in the combustion chamber's walls.

Aim of the Subject

Turbomachines is a subject which can provide excellent knowledge of Design of equipment based on the aspect of flow characteristics. It deals with various machines that involve fluid flow. As far the Industrial aspect is concerned, it is 'must-learn' subject if you are going to work in Gas Turbine Industry, Hydraulic Power plants, Centrifugal Pump manufacturing industries and all industries that involve fluid flow. It is not required if you are interested to work in Conventional Manufacturing Industry.

Course Objectives:

- To provide the knowledge of basic principles, governing equations and applications of Turbomachines.
- To provide the students with opportunities to apply basic thermos-fluid dynamics flow equations to Turbomachines.
- To explain construction and working principles of Turbomachines.
- To evaluate the performance characteristics of Turbomachines.

Course Outcomes:

On completion of the course, student will be able to,

1) VALIDATE impulse moment principle using flat, inclined and curved surfaces and INVESTIGATE performance characteristics of hydraulic turbines.
2) DETERMINE performance parameters of impulse and reaction steam turbine along with discussion of nozzles, governing mechanism & losses.
3) MEASURE performance parameters of single & multistage centrifugal pumps along with discussion of cavitation and selection.
4) EXPLAIN performance parameters of centrifugal compressor along with discussion of theoretical aspects of axial compressor.

AHMEDNAGAR JILHA MARATHA VIDYA PRASARAK SAMAJ'S

Shri Chhatrapati Shivaji Maharaj College of Engineering, Nepti.

Department of Mechanical Engineering

Academic Year : 2023-24	
SUBJECT : Turbomachinery	
SEMESTER : I	**CLASS:** B. E.
STAFF : Mr. Mohnesh D. Mandhre	

Course Objectives	
1	To provide the knowledge of basic principles, governing equations and applications of Turbomachines.
2	To provide the students with opportunities to apply basic thermos-fluid dynamics flow equations to Turbomachines.
3	To explain construction and working principles of Turbomachines.
4	To evaluate the performance characteristics of Turbomachines.

Course Outcomes : **Students will be able to**	
CO1	VALIDATE impulse moment principle using flat, inclined and curved surfaces and INVESTIGATE performance characteristics of hydraulic turbines.
CO2	DETERMINE performance parameters of impulse and reaction steam turbine along with discussion of nozzles, governing mechanism & losses.
CO3	MEASURE performance parameters of single & multistage centrifugal pumps along with discussion of cavitation and selection.
CO4	EXPLAIN performance parameters of centrifugal compressor along with discussion of theoretical aspects of axial compressor.

CO-PO-PSO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2				2							2		
CO2	2	2												
CO3	2											2		
CO4	2	2	3									3		

1: Low 2: Moderate 3: High

Shri Chhatrapati Shivaji Maharaj College of Engineering, Nepti. Mechanical Dept.

Justification of CO-PO-PSO Mapping:

Mapping		Justification
CO	**POs**	
CO1	PO1	**Moderate as the students will understand the impulse momentum principle and performance of turbine**
	PO5	**Moderate as the students will know the application of turbine**
	PO12	**Moderate as the students can explore the obtained knowledge of turbine and working of turbine**
CO2	PO1	**Moderate as the students will be able to explain turbine working and nozzle performance.**
	PO2	**Moderate as the students will be able to find losses of turbine.**
CO3	PO1	**Moderate as the students will understand the concept of Multistage centrifugal pump.**
	PO12	**Moderate as the students can explore the obtained knowledge cavitation, surging**
CO4	PO1	**Moderate as the students will be able to apply the engineering fundamental knowledge to identify type of Turbine, Compressor, pump.**
	PO2	**Moderate as the students can analyze various process selection of component.**
	PO3	**Strongly as the students will be able to explain working of compressor and pump.**
	PO12	**Strongly as the students can lifelong engage themselves in the field Turbomachinery.**

Subject Teacher **Domain Coordinator** **H.O.D.**

Shri Chhatrapati Shivaji Maharaj College of Engineering Mechanical Dept. Nepti A'nagar

Academic Year : 2023-24			
Subject Name (Code): Turbomachinery (2402043) (C409)			
YEAR : B.E.	**Mechanical**	**SEMESTER :** I	**Subject Incharge:** Mr. Mohnesh D.Mandhre

Course Outcomes

CO No.	Course Outcome Statements
C409.1	VALIDATE impulse moment principle using flat, inclined and curved surfaces and INVESTIGATE performance characteristics of hydraulic turbines.
C409.2	DETERMINE performance parameters of impulse and reaction steam turbine along with discussion of nozzles, governing mechanism & losses.
C409.3	MEASURE performance parameters of single & multistage centrifugal pumps along with discussion of cavitation and selection.
C409.4	EXPLAIN performance parameters of centrifugal compressor along with discussion of theoretical aspects of axial compressor.

Course Outcomes Attainment Level Matrix

	% Students	Target Average Marks (%)	Attainment Level
For < 50	0	45	0
	50	45	1
	60	45	2
	70	45	3

Course Outcome Assesment	By External Tools	By Internal Tools
	90%	10%

COURSE OUTCOME ATTAINMENT TOOLS & LEVELS

	Assessment Tools	Course Outcome					
		C409.1	C409.2	C409.3	C409.4	C409.5	C409.6
	(External)						
1	Theory (Th)	2.00	2.00	2.00	2.00	2.00	2.00
	(Internal)						
1	Assignment	3.00	3.00	3.00	3.00	3.00	3.00

FINAL COURSE OUTCOME ATTAINMENT SUMMARY

	C409.1	C409.2	C409.3	C409.4	C409.5	C409.6
External Attainment Level (Average of All External Tools)	2.00	2.00	2.00	2.00	2.00	2.00
Internal Attainment Level	3.00	3.00	3.00	3.00	3.00	3.00
Attainment Levels	2.10	2.10	2.10	2.10	2.10	2.10

COURSE OUTCOME ATTAINMENT RESULT

Course Attainment Level	2.10

Subject Incharge
Prof. M. D. Mandhre

Shri Chhatrapati Shivaji Maharaj College of Engineering * Mechanical Dept. * Nepti, A'nagar

HOD
Mechanical Department
Shri Chhatrapati Shivaji Maharaj College of Engineering, Nepti, Ahmednagar

Course Outcome Assessment of Turbomachinery (B.E.)

TOTAL STUDENTS	28

Sr. No	Name of Student	Assessment tool	Externa
			Theory (TH)
		Marks Out of	50
		Exam Seat Number	
1	BHALEKAR GANESH SADASHIV	B191010801	AB
2	BHALSING SHREYASH APPASAHEB	B191010802	20
3	EKKALDEVI RUTUJA NARAYAN	B191010803	26
4	GAGARE KARTIK JALINDAR	B191010804	21
5	GANGARDE PRAFFUL VIJAY	B191010805	26
6	GARULE SOMNATH RAMDAS	B191010806	20
7	GHUBE CHANCHAL SANJIV	B191010807	29
8	GITE NIKHIL DEEPAK	B191010808	33
9	HARISHCHANDRE OMKAR ARJUN	B191010809	29
10	JADHAV JAYDEEP FAKKAD	B191010810	20
11	KADUS SHUBHAM BHAUSAHEB	B191010811	26
12	KALE AMOL SAMPAT	B191010812	24
13	KARALE VISHAL BALASAHEB	B191010813	24
14	KARLE GANESH BHAUSAHEB	B191010814	21
15	KASHID OM DEEPAK	B191010815	20
16	KATORE VAISHNAV VINAYAK	B191010816	19
17	KSHIRSAGAR RUSHIKESH RAJU	B191010817	22
18	LIMBHORE PRATIKSHA SUDAM	B191010818	23
19	MHASKE VIRAJ PRAVIN	B191010819	20
20	MODHAVE ASHWINI AMBADAS	B191010820	34
21	PARKALE TUSHAR BHAUSAHEB	B191010821	26
22	SALVE VISHAL SHARAD	B191010822	30
23	SARODE AJAY ASHOK	B191010823	21
24	SHELKE SANKET SANJAY	B191010824	27
25	SHIRSATHE KUNAL RAJENDRA	B191010825	21
26	SHRIMANDILKAR PRADNYA PRAKASH	B191010826	24
27	THORAT RAMDAS PRAKASH	B191010827	25
28	THORAT VIMAL BHAUSAHEB	B191010828	25
29	TOKSHIYA RAUNAK ABHIJIT	B191010829	27

Internal Assesment (Assignment)					
C309.1	C309.2	C309.3	C309.4	C309.5	C309.6
10	10	10	10	10	10
8	6	8	9	10	9
9	9	8	10	10	10
9	8	9	8	9	10
10	8	8	9	10	9
10	9	8	9	8	8
8	9	8	10	10	8
8	9	8	10	10	9
9	8	7	10	9	8
9	10	9	9	10	7
10	9	8	9	10	7
9	9	9	10	10	7
10	8	10	10	10	9
9	10	10	10	9	9
9	9	10	10	10	9
8	8	9	9	10	8
10	8	10	9	9	10
9	7	8	8	10	9
10	7	8	10	10	9
9	8	9	9	10	8
10	8	10	9	10	8
10	9	10	8	9	9
10	9	9	9	10	8
7	8	8	8	10	7
10	9	9	9	10	7
8	8	9	10	10	7
10	8	9	9	10	9
9	9	9	9	9	9
10	6	8	6	8	9
9	9	9	9	10	7

		1
		Theory (TH)
No of Studetns scoring above 45		17
% of Studetns scoring above 45		60.71
Levels Attained		2.00

Internal Assesment					
C309.1	C309.2	C309.3	C309.4	C309.5	C309.6
29	29	29	29	29	29
103.57	103.57	103.57	103.57	103.57	103.57
3.00	3.00	3.00	3.00	3.00	3.00

			Internal Assesment (Assignment Question wise)																		
			C409.1			C409.2			C409.3			C409.4			C409.5			C409.6			
			Q.1	Q.2	Total	Q.4	Q.1	Total	Q.2	Q.3	Total	Q.1	Q.2	Total	Q.1	Q.2	Total	Q.1	Q.2	Total	
Sr. No	Name of Student	Exam Seat	5	5	10	5	5	10	5	5	10	5	5	10	5	5	10	5	5	10	
1	BHALEKAR GANESH SADASHIV	B191010801	4	4	8	3	3	6	4	4	8	5	4	9	5	5	10	5	4	9	
2	BHALSING SHREYASH APPASAHEB	B191010802	4	5	9	5	4	9	5	3	8	5	5	10	5	5	10	5	5	10	
3	EKKALDEVI RUTUJA NARAYAN	B191010803	5	4	9	5	3	8	5	4	9	4	4	8	4	5	9	5	5	10	
4	GAGARE KARTIK JALINDAR	B191010804	5	5	10	5	3	8	5	3	8	5	4	9	5	5	10	5	4	9	
5	GANGARDE PRAFFUL VIJAY	B191010805	5	5	10	5	4	9	5	3	8	5	4	9	3	5	8	5	3	8	
6	GARULE SOMNATH RAMDAS	B191010806	4	4	8	4	5	9	4	4	8	5	5	10	5	5	10	5	3	8	
7	GHUBE CHANCHAL SANJIV	B191010807	4	4	8	5	4	9	4	4	8	5	5	10	5	5	10	5	4	9	
8	GITE NIKHIL DEEPAK	B191010808	5	4	9	5	3	8	3	4	7	5	5	10	5	4	9	4	4	8	
9	HARISHCHANDRE OMKAR ARJUN	B191010809	4	5	9	5	5	10	5	4	9	4	5	9	5	5	10	3	4	7	
10	JADHAV JAYDEEP FAKKAD	B191010810	5	5	10	5	4	9	5	3	8	4	5	9	5	5	10	3	4	7	
11	KADUS SHUBHAM BHAUSAHEB	B191010811	4	5	9	4	5	9	4	5	9	5	5	10	5	5	10	4	3	7	
12	KALE AMOL SAMPAT	B191010812	5	5	10	4	4	8	5	5	10	5	5	10	5	5	10	4	5	9	
13	KARALE VISHAL BALASAHEB	B191010813	4	5	9	5	5	10	5	5	10	5	5	10	4	5	9	4	5	9	
14	KARLE GANESH BHAUSAHEB	B191010814	5	4	9	5	4	9	5	5	10	5	5	10	5	5	10	4	5	9	
15	KASHID OM DEEPAK	B191010815	4	4	8	5	3	8	5	4	9	4	5	9	5	5	10	3	5	8	
16	KATORE VAISHNAV VINAYAK	B191010816	5	5	10	4	4	8	5	5	10	4	5	9	5	4	9	5	5	10	
17	KSHIRSAGAR RUSHIKESH RAJU	B191010817	5	4	9	4	3	7	4	4	8	5	3	8	5	5	10	5	4	9	
18	LIMBHORE PRATIKSHA SUDAM	B191010818	5	5	10	4	3	7	4	4	8	5	5	10	5	5	10	5	4	9	
19	MHASKE VIRAJ PRAVIN	B191010819	5	4	9	4	4	8	5	4	9	5	4	9	5	5	10	5	3	8	
20	MODHAVE ASHWINI AMBADAS	B191010820	5	5	10	4	4	8	5	5	10	5	4	9	5	5	10	5	3	8	
21	PARKALE TUSHAR BHAUSAHEB	B191010821	5	5	10	5	4	9	5	5	10	5	3	8	5	4	9	5	4	9	
22	SALVE VISHAL SHARAD	B191010822	5	5	10	5	4	9	5	4	9	5	4	9	5	5	10	4	4	8	
23	SARODE AJAY ASHOK	B191010823	3	4	7	5	3	8	4	4	8	4	4	8	5	5	10	3	4	7	
24	SHELKE SANKET SANJAY	B191010824	5	5	10	5	4	9	5	4	9	5	4	9	5	5	10	3	4	7	
25	SHIRSATHE KUNAL RAJENDRA	B191010825	4	4	8	5	3	8	5	4	9	5	5	10	5	5	10	4	3	7	
26	SHRIMANDILKAR PRADNYA PRAKASH	B191010826	5	5	10	5	3	8	5	4	9	5	4	9	5	5	10	4	5	9	
27	THORAT RAMDAS PRAKASH	B191010827	5	4	9	5	4	9	5	4	9	5	4	9	5	4	9	4	5	9	
28	THORAT VIMAL BHAUSAHEB	B191010828	5	5	10	3	3	6	5	3	8	3	3	6	4	4	8	4	5	9	
29	TOKSHIYA RAUNAK ABHIJIT	B191010829	5	4	9	5	4	9	4	5	9	5	4	9	5	5	10	3	4	7	