

**AIR UNIVERSITY, ISLAMABAD**  
(Office of the Director Academics)

Chair Deptt Mechanical & Aerospace Engineering

**Curriculum Review of MS Mechanical Engineering**

1. Reference your letter No. IAA/AU/1186/MAE dated 16<sup>th</sup> September 2024 on the subject.
2. Approved Scheme of Studies of MS Mechanical Engineering is attached for your further necessary action. The revised Curriculum shall be applicable to all existing batches.

## Scheme of Studies for Masters of Science in Mechanical Engineering

MSME Program (Mechanics and Design)SEMESTER # 1

S1	Code	Subject	Pre-Requisite	Course Cr Hrs
1	ME XXX	Core-I	-	3-0-3
2	ME XXX	Core-II	-	3-0-3
3	ME XXX	Elective-I	-	3-0-3
4	ME 798	Research Methodology	-	1-0-1
		<b>Semester Credit Hours</b>		<b>10-0-10</b>
		<b>Cumulative Credit Hours</b>		<b>10-0-10</b>

SEMESTER # 2

S2	Code	Subject	Pre-Requisite	Course Cr Hrs
1	ME XXX	Core-III	-	3-0-3
2	ME XXX	Core-IV	-	3-0-3
3	ME XXX	Elective-II	-	3-0-3
		<b>Semester Credit Hours</b>		<b>9-0-9</b>
		<b>Cumulative Credit Hours</b>		<b>19-0-19</b>

**SEMESTER # 3**

S3	Code	Subject	Pre-Requisite	Course Cr Hrs
1	ME XXX	Elective-III	-	3-0-3
2	ME XXX	Elective-IV	-	3-0-3
3	ME 799	MS Thesis	-	6-0-6
<b>Semester Credit Hours</b>				<b>12-0-12</b>
<b>Cumulative Credit Hours</b>				<b>31-0-31</b>

**SEMESTER # 4**

S4	Code	Subject	Pre-Requisite	Course Cr Hrs
1	ME 799	MS Thesis	Continued from Previous	6-0-6
<b>Cumulative Credit Hours</b>				<b>31-0-31</b>

**Course Requirements:** At least four courses from the following.

<b>List of Core Courses (Mechanics and Design)</b>			
S. No.	Course Code	Course Title	Cr Hrs
1	ME 600	Theory of Elasticity	3-0-3
2	ME 701	Advanced Theory of Vibrations	3-0-3
3	ME 602	Finite Element Methods	3-0-3
4	ME 609	Product and Process Design	3-0-3
5	ME 723	Advanced Mechanics of Composites	3-0-3
6	ME 707	Advanced Materials in Engineering	3-0-3

**Note:** The sequence of the core and elective courses can be varied depending upon the faculty availability and PG students' course requirement

**Course Requirements:** One mathematics course and any three elective courses from the following list of elective/mathematics courses.

List of Elective Courses (Mechanics and Design)			
S. No.	Course Code	Course Title	Cr Hrs
1	ME 603	Fracture Mechanics	3-0-3
2	ME 779	Processing of Composites	3-0-3
3	ME 747	Theory of Plasticity	3-0-3
4	ME 814	Computational Fracture Mechanics	3-0-3
5	ME 605	MEMS Sensors & Actuators	3-0-3
6	ME 616	MEMS Devices and Applications	3-0-3
7	ME 610	Micro-Fabrication & Nano Technology	3-0-3
8	ME 613	Introduction to Microsystems and Microtechnology	3-0-3
9	ME 615	Introduction to Microelectromechanical Systems	3-0-3
10	ME 812	MEMS Materials and Processes	3-0-3
11	ME 818	Micro-System Design and Manufacturing	3-0-3
12	ME 718	Advanced CAD/CAM	3-0-3
13	ME 719	Computer Integrated Manufacturing	3-0-3
14	ME 817	Advanced Manufacturing	3-0-3
15	ME 617	Engineering Tribology	3-0-3
16	ME 612	Structural Dynamics	3-0-3
17	ME 722	Thin-Walled Structure	3-0-3
18	ME 663	Sustainable Materials in Engineering Design	3-0-3
19	ME 664	Material Selection for Sustainable Product Development	3-0-3
20	ME 762	Waste Management and Recycling of Engineering Materials	3-0-3
21	ME 808	Theory of Plates and Shell	3-0-3
22	ME 706	Computational Fatigue Mechanics	3-0-3
23	ME 704	Advanced Mechanics of Materials	3-0-3
24	ME 775	Advanced Measurements and Instrumentation	3-0-3
25	ME 727	Sustainability in Manufacturing	3-0-3
26	ME 661	Reliability and Quality Management	3-0-3
27	ME 662	Supply Chain Management in Engineering	3-0-3
28	ME 763	Corrosion Engineering	3-0-3
29	ME 772	Robotics and Parallel Mechanisms	3-0-3
30	ME 809	Systems Dynamics and Controls	3-0-3

Curriculum for MSME; Revised and Approved in July, 2024  
Applicable for All Running Batches Starting from Fall-24

31	ME 803	Mechanical Systems and Artificial Intelligence	3-0-3
32	ME 804	Applications of Machine Learning	3-0-3
33	ME 820	Advanced Finite Element Methods and Applications	3-0-3
34	ME 821	Polymer Engineering	3-0-3
35	ME 822	Advanced Polymer Engineering for Sustainable Applications	3-0-3
36	ME 823	Smart Materials	3-0-3
37	ME 824	Sustainable Polymer Composites for Structural Applications	3-0-3
38	ME 825	Optimization of Engineering Systems	3-0-3
39	ME 826	Continuum Mechanics	3-0-3
40	ME 827	Advanced Machine Design	3-0-3
41	ME 828	Microsystems Design and Technology	3-0-3
42	ME 815	BioMEMS and Microsystems	3-0-3
43	ME 816	Special Topics in Mechanics and Design	3-0-3
44	ME 829	Special Topics in Mechanical Engineering	3-0-3
Mathematics Courses			
45	MA 645	Advanced Numerical Techniques	3-0-3
46	MA 680	Applied Partial Differential Equations	3-0-3
47	MA 644	Advanced Engineering Mathematics	3-0-3
48	MA 660	Applied Differential Equations	3-0-3
49	MA 688	Applied Linear Algebra	3-0-3

**Notes:**

1. Post-graduate elective courses of Mechanical Engineering program of other streams and programs can also be taken as elective courses.
2. Post-graduate students can take up to two elective courses relevant to their research thesis/domain from any other department/faculty with prior permission from their Supervisor, GEC members, Chair DMAE and DG IAA.
3. Courses from the above-mentioned list (Core and Elective) can be taken as elective courses in PhD Mechanical Engineering Program for completion of course work requirements.

**MSME Program (Fluid and Thermal Engineering)**

**SEMESTER # 1**

<b>S1</b>	<b>Code</b>	<b>Subject</b>	<b>Pre-Requisite</b>	<b>Course Cr Hrs</b>
1	ME XXX	Core-I	-	3-0-3
2	ME XXX	Core-II	-	3-0-3
3	ME XXX	Elective-I	-	3-0-3
4	ME 798	Research Methodology	-	1-0-1
		<b>Semester Credit Hours</b>		<b>10-0-10</b>
		<b>Cumulative Credit Hours</b>		<b>10-0-10</b>

**SEMESTER # 2**

<b>S2</b>	<b>Code</b>	<b>Subject</b>	<b>Pre-Requisite</b>	<b>Course Cr Hrs</b>
1	ME XXX	Core-III	-	3-0-3
2	ME XXX	Core-IV	-	3-0-3
3	ME XXX	Elective-II	-	3-0-3
		<b>Semester Credit Hours</b>		<b>9-0-9</b>
		<b>Cumulative Credit Hours</b>		<b>19-0-19</b>

### SEMESTER # 3

S3	Code	Subject	Pre-Requisite	Course Cr Hrs
1	ME XXX	Elective-III	-	3-0-3
2	ME XXX	Elective-IV	-	3-0-3
3	ME 799	MS Thesis	-	6-0-6
<b>Semester Credit Hours</b>				<b>12-0-12</b>
<b>Cumulative Credit Hours</b>				<b>31-0-31</b>

### SEMESTER # 4

S4	Code	Subject	Pre-Requisite	Course Cr Hrs
1	ME 799	MS Thesis	Continued from Previous	6-0-6
<b>Cumulative Credit Hours</b>				<b>31-0-31</b>

**Course Requirements:** At least four courses from the following.

<b>List of Core Courses (Fluid and Thermal Engineering)</b>			
S. No.	Course Code	Course Title	Cr Hrs
1	ME 736	Advanced Incompressible Fluid Dynamics	3-0-3
2	ME 630	Computational Fluid Dynamics I	3-0-3
3	ME 738	Advanced Heat Transfer	3-0-3
4	ME 834	Advanced Compressible Fluid Dynamics	3-0-3
5	ME 632	Turbo Machinery	3-0-3
6	ME 745	Advanced Thermodynamics	3-0-3

**Note:** The sequence of the core and elective courses can be varied depending upon the faculty availability and PG students' course requirement.

Curriculum for MSME; Revised and Approved in July, 2024  
Applicable for All Running Batches Starting from Fall-24

**Course Requirements:** One mathematics course and any three elective courses from the following list of elective/mathematics courses.

List of Elective Courses (Fluid and Thermal Engineering)			
S. No.	Course Code	Course Title	Cr Hrs
1	ME 733	Computational Fluid Dynamics II	3-0-3
2	ME 835	Combustion Phenomena	3-0-3
3	ME 859	Turbulent Fluid Flow	3-0-3
4	ME 746	Gas Turbine Theory and Performance	3-0-3
5	ME 641	Conduction Heat Transfer	3-0-3
6	ME 642	Convection Heat Transfer	3-0-3
7	ME 643	Radiation Heat Transfer	3-0-3
8	ME 754	Transport Process in Energy Systems	3-0-3
9	ME 844	Advanced Transport Phenomenon	3-0-3
10	ME 748	Design of Renewable Energy Systems	3-0-3
11	ME 854	Advanced Fluid Mechanics III	3-0-3
12	ME 751	Advanced Aerodynamics	3-0-3
13	ME 753	Non-linear Heat Transfer	3-0-3
14	ME 838	Special Topics in Fluid and Thermal Engineering	3-0-3
15	ME 829	Special Topics in Mechanical Engineering	3-0-3
Mathematics Courses			
16	MA 680	Applied Partial Differential Equations	3-0-3
17	MA 644	Advanced Engineering Mathematics	3-0-3
18	MA 645	Advanced Numerical Techniques	3-0-3
19	MA 660	Applied Differential Equations	3-0-3
20	MA 688	Applied Linear Algebra	3-0-3

**Notes:**

1. Post-graduate elective courses of Mechanical Engineering program of other streams can also be taken as elective courses.
2. Post-graduate students can take up to two elective courses relevant to their research thesis/domain from any other department/faculty with prior permission from their supervisor in consultation with GEC members, Chair DMAE and DG IAA.
3. Courses from the above-mentioned list (Core and Elective) can be taken as elective courses in PhD Mechanical Engineering Program for completion of course work requirements.

### Course Codes Streams in MS Mechanical Engineering

Stream Center Digit	Code Range	Stream
0, 1, 2, 6 & 7	ME 600-629 ME 700-729 ME 800-829 ME 660-679 ME 760-779 ME 860-879	Design Engineering
3, 4, 5 & 8	ME 630-659 ME 730-759 ME 830-859 ME 680-689 ME 780-781 ME 880-889	Fluid Power Engineering

## Scheme of Studies for PhD in Mechanical Engineering

SEMESTER # 1

S1	Code	Subject	Pre-Requisite	Course Cr Hrs
1	ME XXX	Elective-I	-	3-0-3
2	ME XXX	Elective-II	-	3-0-3
3	ME XXX	Elective-III	-	3-0-3
4	ME 798	Research Methodology*	-	1-0-1
		<b>Semester Credit Hours</b>		<b>10-0-10</b>
		<b>Cumulative Credit Hours</b>		<b>10-0-10</b>

SEMESTER # 2

S2	Code	Subject	Pre-Requisite	Course Cr Hrs
1	ME XXX	Elective-IV	-	3-0-3
2	ME XXX	Elective-V	-	3-0-3
3	ME XXX	Elective-VI	-	3-0-3
		<b>Semester Credit Hours</b>		<b>9-0-9</b>
		<b>Cumulative Credit Hours</b>		<b>19-0-19</b>

\* Course is compulsory for student(s) who haven't taken it in their Master's Degree.

**SEMESTER # 3**

<b>S4</b>	<b>Code</b>	<b>Subject</b>	<b>Pre-Requisite</b>	<b>Course Cr Hrs</b>
1	ME 899	PhD Thesis/Dissertation	Continued from Previous	30-0-30
<b>Cumulative Credit Hours</b>				<b>49-0-49</b>

**Notes:** The detailed list of courses stream wise is given with MS Mechanical Engineering and MS Aerospace Engineering Curriculum. Courses from the list (Core and Elective) of any stream can be taken as elective courses in PhD Mechanical Engineering Program for completion of PhD course work requirements. However, at least 50% of the courses should be of 800 level.

Curriculum for PhD Aerospace Engineering; Revised and Approved in July 2024  
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