

DEPARTMENT OF MECHANICAL ENGINEERING

At Mechanical Engineering department, an excellent educational experience is designed to sharpen the students' talents and skills through a cutting edge course work. Department allows its students to build knowledge across the breadth of the discipline while concentrating in depth, on a particular area of specialization. The infrastructure of the department is pivotal to its vision of multi-disciplinary education and research. It comprises state of the art and well equipped teaching and research laboratories, workshops, lecture halls and faculty offices. The department offers BS degree in Mechanical Engineering, Robotics and intelligent systems along with MS and PhD in Mechanical Engineering, and a MS degree in Engineering Management with different specializations in all graduate programs. As Mechanical

Engineering is closely intertwined with the industry and business, these programs are aimed to provide opportunities to create industrial linkages and act as a bridge for flow of the cross-disciplinary knowledge among all departments.

The phenomenal growth observed in automobile and aerospace industry, in recent past, is primarily based on the advancement of Mechanical Engineering knowledge. A degree in Mechanical Engineering gives knowledge and skills to be involved in the design, development and manufacturing of products, machines and mechanical engineering systems, including engines and turbines, land transport vehicles, ships, aircrafts, building services (air conditioning, pumps, fans), refrigeration systems, manufacturing processes and industrial plants.





BS Mechanical Engineering

■ Program Educational Objectives (PEOs)

The BS Mechanical Engineering Program aims to produce leading professionals who will:

- (i) Apply knowledge and skills to provide sustainable solutions to challenging Mechanical Engineering problems in industry and academia.
- (ii) Demonstrate professional growth and exhibit continual improvement in learning modern engineering techniques and their applications in practice.
- (iii) Make positive contribution towards society by strong ethical values, communication skills and leadership.

■ Program Learning Outcomes (PLOs)

At the time of graduation, the graduates of BS(ME) program will possess the following attributes:

- (i) **Engineering Knowledge:** An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
- (ii) **Problem Analysis:** An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
- (iii) **Design/Development of Solutions:** An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and

safety, cultural, societal, and environmental considerations.

- (iv) **Investigation:** An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.
- (v) **Modern Tool Usage:** An ability to 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.
- (vi) **The Engineer and Society:** An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.
- (vii) **Environment and Sustainability:** An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
- (viii) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
- (ix) **Individual and Team Work:** An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.
- (x) **Communication:** An ability to communicate effectively, orally as well as in writing, 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.

- (xi) **Project Management:** An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.
- (xii) **Lifelong Learning:** An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

■ Admission Requirements

- (i) Higher Secondary School Certificate (F.Sc. Pre-Engineering) or Equivalent with Physics, Chemistry and Mathematics securing at least 60% marks in aggregate.

OR

Intermediate of Computer Science (ICS) or Equivalent with Physics, Computer Science and Mathematics securing at least 60% marks in aggregate.

OR

Diploma of Associate Engineering in relevant disciplines securing at least 60% marks in aggregate.

- (ii) CUST Admission Test/HEC Approved Test

■ Degree Requirements

Each candidate for the BS Mechanical Engineering degree is required to complete successfully 136 credit hours (Cr. Hrs.) as per the following details:

Area	Cr. Hrs.
a) General Education Courses	38
b) Disciplinary or Major Courses	75
c) Interdisciplinary / Allied Courses	14
d) Field Experience / Internship	03
e) Capstone / Design Project	06
f) Community Service	00
Total	136

■ General Education Courses (38 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Calculus and Analytical Geometry	MEG1513	03
Probability & Statistics	MEG2523	03
Applied Physics	MEG1312	02

Applied Physics Lab	MEG1311	01
Function English	MEG1113	03
Expository Writing	MEG1123	03
Islamic Studies/Ethics	MEG1012	02
Ideology and Constitution of Pakistan	MEG1022	02
Personal Grooming	MEG1212	02
Sociology	MEG1412	02
Applications of Information & Communication Technologies	MEG1612	02
Applications of Information & Communication Technologies Lab	MEG1611	01
Civics and Professional Ethics	MEG2812	02
Entrepreneurship	MEG2712	02
Applied Differential Equation	MTME1043	03
Complex Variables & Transforms	MTME2053	03
Project Management	HMME4722	02

■ Disciplinary or Major Courses (75 Cr. Hrs.)

a) Foundation Courses (24 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Workshop-I	ME1801	01
Workshop-II	ME1811	01
Engineering Materials	ME2412	02
Thermodynamics-I	ME1113	03
Engineering Statics	ME1213	03
Engineering Dynamics	ME2223	03
Mechanics of Materials-I	ME2233	03
Fluid Mechanics-I	ME2513	03
Manufacturing Processes	ME3613	03
Engineering Mechanics Lab	ME2221	01
Manufacturing Processes Lab	ME3611	01

b) Breadth Courses (23 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Thermodynamics-II	ME2123	03
Mechanics of Materials-II	ME2243	03
Fluid Mechanics-II	ME3523	03
Machine Design-I	ME3043	03
Mechanics of Machines	ME3033	03
Heat and Mass Transfer	ME3133	03
Thermodynamics Lab	ME2121	01
Mechanics of Materials Lab	ME2241	01
Fluid Mechanics Lab	ME3521	01
CAD Lab	ME2081	01
Heat and Mass Transfer Lab	ME3131	01

c) Depth Courses (22 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Machine Design-II	ME3052	02
Internal Combustion Engines	ME4142	02
Refrigeration & Air Conditioning	ME4153	03
Mechanical Vibrations	ME4253	03
Internal Combustion Engines Lab	ME4141	01
Refrigeration & Air Conditioning Lab	ME4151	01
Mechanisms and Mechanical Vibrations Lab	ME4261	01
Power Plants	ME4173	03
Technical Elective*	ME4xx3	03
Computer Aided Engineering	ME3092	02
Computer Aided Engineering Lab	ME3091	01

■ *Technical Elective Courses

Students are required to take 03 Cr. Hrs. as technical elective courses. A list of technical elective courses is given below:

Course Title	Code	Cr. Hrs.
Renewable Energy Technology	ME4163	03
Gas Dynamics	ME4533	03
Aerodynamics	ME4543	03
Machining and Automation	ME4623	03
Introduction to Mechatronics	ME4423	03
Introduction to Robotics	ME4443	03
CAD/CAM	ME4073	03
Computational Fluid Dynamics	ME4553	03
Introduction to Electric and Hybrid Vehicles	ME4703	03
Dynamics of Machinery	ME4273	03
Advanced Manufacturing Technologies	ME4633	03
Industrial Engineering	ME4643	03
Refrigerants and Environment	ME4183	03
Tribology	ME4093	03
Introduction to Biomedical Engineering	ME4783	03

d) Computer and Information Sciences - C&I (06 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Artificial Intelligence	ME3793	03
Numerical Analysis	ME3752	02
Numerical Analysis Lab	ME3751	01

■ Interdisciplinary / Allied Courses (IDC) (14 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Basic Electrical Engineering	EEME3702	02
Control Engineering	EEME4742	02
Control Engineering lab	EEME4741	01
Health Safety & Environment	HMME4761	01
Applied Chemistry	CHME1012	02
Engineering Drawing & Graphics	ME1011	01

Engineering Drawing & Graphics Lab	ME1021	01
Basic Electrical Engineering lab	EEME3701	01
Instrumentation & Measurement	ME3772	02
Instrumentation & Measurement Lab	ME3771	01

■ Capstone / Design Project (06 Cr. Hrs.)

After the completion of 90 Cr. Hrs., the students are required to register for Design Project (Part-I) of 3 Cr. Hrs. in the 7th semester of their degree program. Design Project (Part-II) of 3 Cr. Hrs. can be taken in the next i.e. 8th semester provided Design Project (Part-I) is passed.

Course Title	Code	Cr. Hrs.
Design Project (Part-I)	ME4913	03
Design Project (Part-II)	ME4923	03

■ Field Experience / Internship (03 Cr. Hrs.)

Each student is required to complete 8 weeks industrial internship training usually after 6th semesters or on the completion of 90 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Field Experience / Internship	ME4003	03

■ Community Service (VIS4000)

Each student is required to complete 65 hours community work, usually after 1st semester which would be a prerequisite for the award of degree. It will be assessed as satisfactory (S) / unsatisfactory (US). In case of unsatisfactory, it will be done from scratch.

■ CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

■ Program Duration

This is a four year degree program comprising of 8 semesters. There will be a Fall and a Spring semester in each year. The summer semester will be utilized for internship or deficiency courses. The maximum duration to complete BS Mechanical Engineering degree is 07 years.

SCHEME OF STUDIES

BS Mechanical Engineering Program

□ Semester-I (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MEG1113	Function English	3
MEG1212	Personal Grooming	2
MEG1513	Calculus and Analytical Geometry	3
MEG1312	Applied Physics	2
MEG1311	Applied Physics Lab	1
CHME1012	Applied Chemistry	2
MEG1612	Applications of Information & Communication Technologies	2
MEG1611	Applications of Information & Communication Technologies Lab	1
ME1801	Workshop-I	1

□ Semester-II (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MTME1043	Applied Differential Equation	3
MEG1123	Expository Writing	3
MEG1412	Sociology	2
ME1213	Engineering Statics	3
ME1011	Engineering Drawing & Graphics	1
ME1021	Engineering Drawing & Graphics Lab	1
ME1113	Thermodynamics-I	3
ME1811	Workshop-II	1

□ Semester-III (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MEG2812	Civics and Professional Ethics	2
MEG1022	Ideology and Constitution of Pakistan	2
MEG2523	Probability & Statistics	3

ME2412	Engineering Materials	2
ME2233	Mechanics of Materials-I	3
ME2123	Thermodynamics-II	3
ME2221	Engineering Mechanics Lab	1
ME2121	Thermodynamics Lab	1

□ Semester-IV (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MTME2053	Complex Variables & Transforms	3
MEG1012	Islamic Studies/Ethics	2
MEG2712	Entrepreneurship	2
ME2223	Engineering Dynamics	3
ME2243	Mechanics of Materials-II	3
ME2081	CAD Lab	1
ME2513	Fluid Mechanics-I	3
ME2241	Mechanics of Materials Lab	1

□ Semester-V (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
ME3752	Numerical Analysis	2
ME3751	Numerical Analysis Lab	1
ME3033	Mechanics of Machines	3
ME3043	Machine Design-I	3
ME3613	Manufacturing Processes	3
ME3611	Manufacturing Processes Lab	1
ME3523	Fluid Mechanics-II	3
ME3521	Fluid Mechanics Lab	1

☐ **Semester-VI (18 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
ME3092	Computer Aided Engineering	2
ME3091	Computer Aided Engineering Lab	1
ME3052	Machine Design-II	2
ME3133	Heat and Mass Transfer	3
ME3131	Heat and Mass Transfer Lab	1
ME3793	Artificial Intelligence	3
EEME3702	Basic Electrical Engineering	2
EEME3701	Basic Electrical Engineering Lab	1
ME3772	Instrumentation & Measurement	2
ME3771	Instrumentation & Measurement Lab	1

☐ **Semester-VII (17 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
EEME4742	Control Engineering	2
EEME4741	Control Engineering lab	1
HMME4761	Health Safety & Environment	1
ME4153	Refrigeration & Air Conditioning	3
ME4151	Refrigeration & Air Conditioning Lab	1
ME4xx3	Technical Elective	3
ME4142	Internal Combustion Engines	2
ME4141	Internal Combustion Engines Lab	1
ME 4913	Design Project-I	3

☐ **Semester-VIII (12 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
HMME4722	Project Management	2
ME4253	Mechanical Vibrations	3
ME4261	Mechanisms and Mechanical Vibrations Lab	1
ME4173	Power Plants	3
ME 4923	Design Project-II	3



BS Robotics and Intelligent Systems

■ Program Educational Objectives (PEOs)

The BS Robotics and Intelligent Systems Program aims to produce leading professionals who will:

- (i) Applies knowledge and skills to provide innovative solutions to challenging problems in the domain of robotics and intelligent systems across industry and academia.
- (ii) Demonstrates professional growth and exhibits continual learning of intelligent robotic systems for research and industrial applications.
- (iii) Makes positive contribution towards society by strong ethical values, communication skills and leadership.

■ Program Learning Outcomes (PLOs)

At the time of graduation, the graduates of BS Robotics and Intelligent Systems program will possess the following attributes:

- (i) **Engineering Knowledge:** An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
- (ii) **Problem Analysis:** An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
- (iii) **Design/Development of Solutions:** An ability to design solutions for complex engineering

problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

- (iv) **Investigation:** An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.
- (v) **Modern Tool Usage:** An ability to 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.
- (vi) **The Engineer and Society:** An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.
- (vii) **Environment and Sustainability:** An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
- (viii) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
- (ix) **Individual and Team Work:** An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.
- (x) **Communication:** An ability to communicate effectively, orally as well as in writing, 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.

(xi) **Project Management:** An ability to demonstrate management skills and apply

engineering principles to one’s own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

(xii) **Lifelong Learning:** An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

■ Admission Requirements

- (i) Higher Secondary School Certificate or equivalent securing at least 50% marks in aggregate with Mathematics.
- (ii) CUST Admission Test/HEC Approved Test

■ Degree Requirements

Each candidate for the BS Robotics and Intelligent Systems degree is required to complete successfully 130 credit hours (Cr. Hrs.) as per the following details:

Area	Cr. Hrs.
a) General Education Courses	30
b) Disciplinary or Major Courses	79
c) Interdisciplinary / Allied Courses	12
d) Field Experience / Internship	03
e) Capstone / Design Project	06
f) Community Service	00
Total	130

■ General Education Courses (30 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Applications of Information and Communication Technologies	RISG1612	02
Applications of Information and Communication Technologies Lab	RISG1611	01
Basic Mathematics	RISG1593	03
Functional English	RISG1113	03
Entrepreneurship	RISG2712	02

Calculus and Analytical Geometry	RISG1513	03
Applied Physics	RISG1312	02
Applied Physics Lab	RISG1311	01
Personal Grooming	RISG1212	02
Ideology and Constitution of Pakistan	RISG1022	02
Islamic Studies / Ethics	RISG1012	02
Expository Writing	RISG1123	03
Civics and Professional Ethics	RISG2812	02
Sociology	RISG1412	02

■ Disciplinary or Major Courses (79 Cr. Hrs.)

a) Robotics (14 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Introduction to Robotics	RIS1002	02
Robot Operating Systems	RIS3013	03
Robot Operating Systems Lab	RIS3021	01
Aerial Robotics and Drones	RIS4033	03
Robotics Design Lab – I	RIS3041	01
Robotics Design Lab – II	RIS3051	01
Industrial Robotics and Digital Manufacturing	RIS4063	03

b) Computing (11 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Object Oriented Programming	RIS1102	02
Object Oriented Programming Lab	RIS1111	01
Data Structures & Algorithms	RIS2123	03
Data Structures & Algorithms Lab	RIS2131	01
Embedded Systems	RIS4143	03
Embedded Systems Lab	RIS4151	01

c) Mechanical Design (16 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Workshop Practice	RIS1301	01
Engineering Statics	RIS2332	02
Engineering Dynamics	RIS2342	02
Engineering Mechanics Lab	RIS2351	01
Robot Kinematics	RIS3363	03
Robotics Machine Design-I	RIS3372	02
Robotics Machine Design-II	RIS3382	02
Pneumatics and Hydraulics Systems	RIS3393	03

d) Electrical and Electronics (16 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Circuit Analysis	RIS1403	03
Circuit Analysis Lab	RIS1411	01
Basic Electronics	RIS2423	03
Basic Electronics Lab	RIS2431	01
Digital Logic Design	RIS2443	03
Digital Logic Design Lab	RIS2451	01
Electrical Machines	RIS3463	03
Electrical Machines Lab	RIS3471	01

e) Control (08 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Control Engineering	RIS3503	03
Control Engineering Lab	RIS3511	01
Sensors and Actuators	RIS3523	03
Sensors and Actuators Lab	RIS3531	01

f) Intelligent Systems (14 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Artificial Intelligence & Machine Learning	RIS3603	03
Artificial Intelligence & Machine Learning Lab	RIS3611	01
Deep Learning	RIS4623	03
Deep Learning Lab	RIS4631	01
Computer Vision and Image Processing	RIS4643	03
Intelligent Adaptive Control	RIS4653	03

■ Interdisciplinary / Allied Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Computer-Aided Drawing	RIS1311	01
Computer-Aided Drawing Lab	RIS1321	01
Applied Differential Equation*	RIS2203	03
Linear Algebra*	RIS2213	03
Probability & Statistics*	RIS3223	03
Health, Safety & Environment	RIS3701	01

* These courses are included in both mathematics and interdisciplinary domains.

■ Capstone / Design Project (06 Cr. Hrs.)

After the completion of 90 Cr. Hrs., the students are required to register for Design Project (Part-I) of 3 Cr. Hrs. in the 7th semester of their degree program. Design Project (Part-II) of 3 Cr. Hrs. can be taken in the next i.e. 8th semester provided Design Project (Part-I) is passed.

Course Title	Code	Cr. Hrs.
Design Project (Part-I)	RIS4913	03
Design Project (Part-II)	RIS4923	03

■ Field Experience / Internship (03 Cr. Hrs.)

Each student is required to complete 8 weeks industrial internship training usually after 6th semesters or on the completion of 90 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Field Experience / Internship	RIS4003	03

■ Community Service (VIS4000)

Each student is required to complete 65 hours community work, usually after 1st semester which would be a prerequisite for the award of degree. It will be assessed as satisfactory (S) / unsatisfactory (US). In case of unsatisfactory, it will be done from scratch.

■ CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

■ Program Duration

This is a four year degree program comprising of 8 semesters. There will be a Fall and a Spring semester in each year. The summer semester will be utilized for internship or deficiency courses. The maximum duration to complete BS Mechanical Engineering degree is 07 years.



SCHEME OF STUDIES

BS Robotics and Intelligent Systems Program

□ Semester-I (16 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
RISG1612	Applications of Information and Communication Technologies	2
RISG1611	Applications of Information and Communication Technologies Lab	1
RIS1002	Introduction to Robotics	2
RISG1593	Basic Mathematics	3
RISG1113	Functional English	3
RIS1311	Computer-Aided Drawing	1
RIS1321	Computer-Aided Drawing Lab	1
RISG2712	Entrepreneurship	2
RIS1301	Workshop Practice	1

□ Semester-II (15 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
RIS1102	Object Oriented Programming	2
RIS1111	Object Oriented Programming Lab	1
RIS1403	Circuit Analysis	3
RIS1411	Circuit Analysis Lab	1
RISG1513	Calculus and Analytical Geometry	3
RISG1312	Applied Physics	2
RISG1311	Applied Physics Lab	1
RISG1212	Personal Grooming	2

□ Semester-III (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
RIS2123	Data Structures & Algorithms	3
RIS2131	Data Structures & Algorithms Lab	1
RIS2423	Basic Electronics	3

RIS2431	Basic Electronics Lab	1
RISG1022	Ideology and Constitution of Pakistan	2
RIS2203	Applied Differential Equation	3
RIS2332	Engineering Statics	2
RISG1012	Islamic Studies / Ethics	2

□ Semester-IV (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
RIS2443	Digital Logic Design	3
RIS2451	Digital Logic Design Lab	1
RIS2213	Linear Algebra	3
RISG1123	Expository Writing	3
RIS2342	Engineering Dynamics	2
RIS2351	Engineering Mechanics Lab	1
RISG2812	Civics and Professional Ethics	2
RISG1412	Sociology	2

□ Semester-V (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
RIS3363	Robot Kinematics	3
RIS3013	Robot Operating Systems	3
RIS3021	Robot Operating Systems Lab	1
RIS3223	Probability & Statistics	3
RIS3372	Robotics Machine Design-I	2
RIS3041	Robotics Design Lab – I	1
RIS3701	Health, Safety & Environment	1
RIS3463	Electrical Machines	3
RIS3471	Electrical Machines Lab	1

☐ **Semester-VI (18 Cr. Hrs.)**

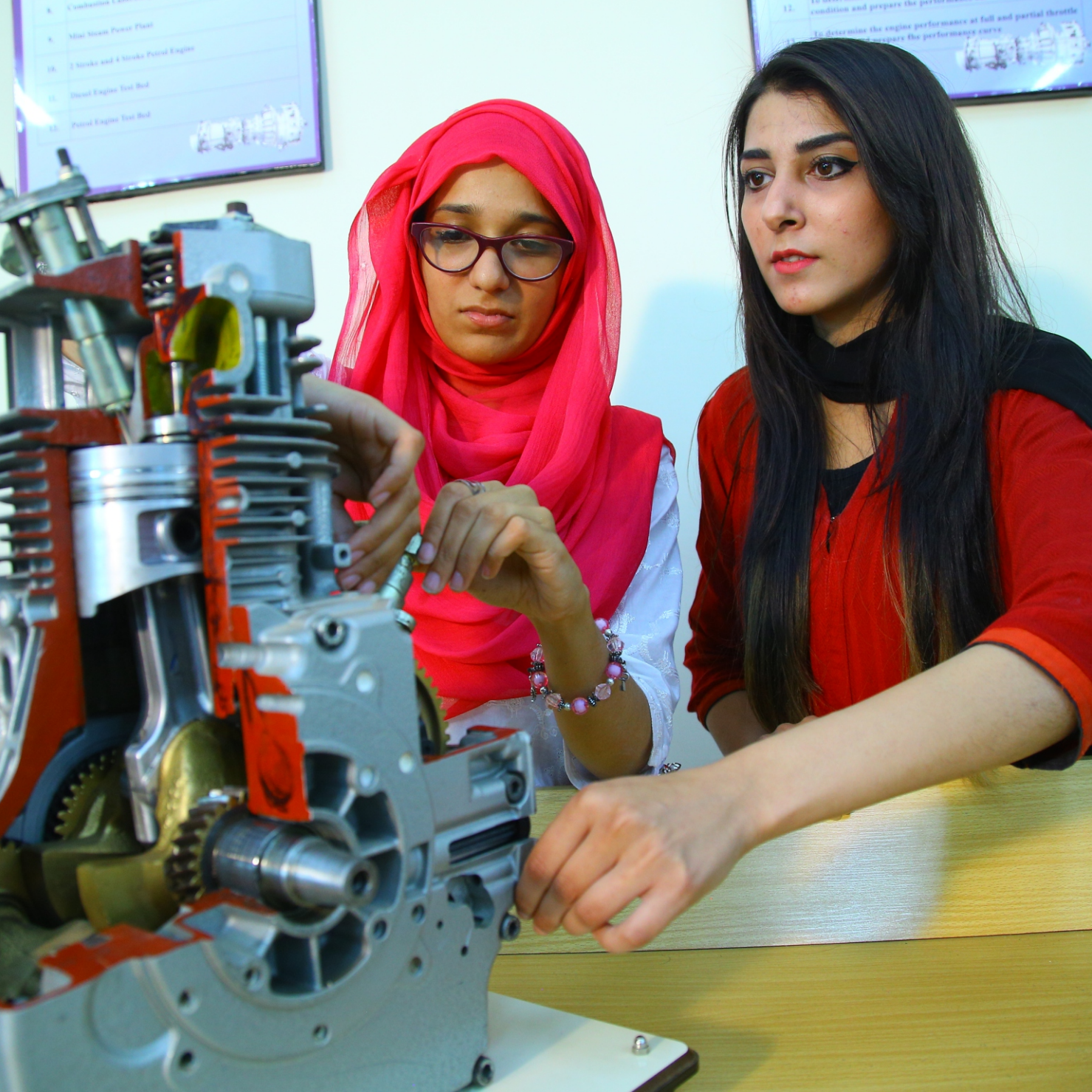
Course Code	Course Title	Cr. Hrs.
RIS3503	Control Engineering	3
RIS3511	Control Engineering Lab	1
RIS3523	Sensors and Actuators	3
RIS3531	Sensors and Actuators Lab	1
RIS3382	Robotics Machine Design-II	2
RIS3603	Artificial Intelligence & Machine Learning	3
RIS3611	Artificial Intelligence & Machine Learning Lab	1
RIS3051	Robotics Design Lab – II	1
RIS3393	Pneumatics and Hydraulics Systems	3

☐ **Semester-VII (14 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
RIS4913	Final Year Project – I	3
RIS4623	Deep Learning	3
RIS4631	Deep Learning Lab	1
RIS4063	Industrial Robotics and Digital Manufacturing	3
RIS4143	Embedded Systems	3
RIS4151	Embedded Systems Lab	1

☐ **Semester-VIII (12 Cr. Hrs.)**

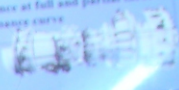
Course Code	Course Title	Cr. Hrs.
RIS4923	Final Year Project – II	3
RIS4033	Aerial Robotics and Drones	3
RIS4643	Computer Vision and Image Processing	3
RIS4653	Intelligent Adaptive Control	3



- 9. Combustion Engines
- 8. Mini Steam Power Plant
- 10. 2 Stroke and 4 Stroke Petrol Engine
- 11. Diesel Engine Test Bed
- 12. Petrol Engine Test Bed



- 12. To determine the engine performance at full and partial throttle condition and prepare the performance curve
- 13. To determine the engine performance at full and partial throttle condition and prepare the performance curve



MS Mechanical Engineering

■ Admission Requirements

- (i) A minimum of 16 years of education leading to BS/BE in Mechanical Engineering/Aerospace/Avionics or equivalent.
- (ii) Minimum 2.00/4.00 CGPA or 50% marks
- (iii) Admission Test/HEC Approved Test

■ Mechanical Design

Course Title	Code	Cr. Hrs.
Finite Elements Methods	ME5003	3
Theory of Elasticity	ME5013	3
Experimental Stress Analysis	ME5023	3
Continuum Mechanics	ME5033	3
Advanced Engineering Materials	ME5043	3
Advanced Mechanical Vibration	ME6003	3
Advanced Solid Mechanics	ME6013	3
Fracture Mechanics	ME6063	3
Advanced Mechanical Design	ME6073	3
Theory of Plates and Shells	ME6033	3
Design of Machine Tools	ME6043	3
Tribology	ME6053	3
Engineering Plasticity	ME6083	3
Mechanics of Composite Materials	ME6093	3
Research Methodologies for Engineers	ME5703	3
Optimization Methods for Engineers	ME5713	3

■ Degree Requirements

A student admitted in this program will have to complete the degree requirements by following any one of the options given below:

- (i) 24 Cr. Hrs. course work with 6 Cr. Hrs. Thesis
- (ii) 30 Cr. Hrs. course work only (10 Courses)

The students are required to register courses offered by the department from the list appended below:

Experimental Methods	ME5723	3
Numerical Methods	ME5733	3
Applied Machine learning for Engineers	ME6713	3
Modelling and Simulation	ME6723	3

■ Thermal Science

Course Title	Code	Cr. Hrs.
Advanced Engineering Thermodynamics	ME5103	3
Internal Combustion Engines	ME5113	3
Thermal Power Generation	ME5123	3
Gas Dynamics	ME5133	3
Energy Conversion	ME5143	3
Combustion	ME5153	3
Conduction Heat Transfer	ME5203	3
Convective Heat Transfer	ME5213	3
Thermal Design of Heat Exchangers	ME5223	3
Radiation Heat Transfer	ME5233	3
Computational Heat Transfer	ME5243	3
Advanced Fluid Mechanics	ME5503	3
Computational Fluid Dynamics	ME5513	3
Fluid Mixing and Separation	ME5523	3
Transport Phenomena	ME5533	3
Viscous Flow	ME5543	3
Thermal Energy Storage	ME6123	3
Fluid Mechanics and Thermodynamics of Turbomachinery	ME6563	3
Solar Energy Utilization	ME6103	3
Energy Management	ME6113	3
Renewable Energy Technologies	ME6133	3
Energy Systems	ME6143	3
Advanced Propulsion	ME6153	3
Advanced Heat and Mass Transfer	ME6203	3

Boiling and Condensation Heat Transfer	ME6213	3
Industrial Air Conditioning and Refrigeration	ME6223	3
Design of Industrial Boilers and Furnaces	ME6233	3
Fuel Cell Technology	ME6243	3
Turbulent Flow	ME6503	3
Boundary Layer Theory	ME6513	3
Two Phase Flow	ME6523	3
Kinetic Theory of Gases	ME6533	3
Theory of Granular Flows	ME6543	3
Aerodynamics	ME6553	3
Research Methodologies for Engineers	ME5703	3
Optimization Methods for Engineers	ME5713	3
Experimental Methods	ME5723	3
Numerical Methods	ME5733	3
Applied Machine learning for Engineers	ME6713	3
Modelling and Simulation	ME6723	3

■ Manufacturing

Course Title	Code	Cr. Hrs.
Computer Integrated Manufacturing	ME5613	3
Mechanism Design	ME5623	3
Automation and Control	ME5633	3
Digital Manufacture and Rapid Manufacture	ME5643	3
Manufacturing System Design and Analysis	ME5653	3
Product Design and Development	ME5663	3
Production Planning and Control	ME5673	3
Operations Research	ME5683	3
Material Selection and Design	ME6603	3
Robotics and Manufacturing Automation	ME6633	3
Advanced CAD/CAM	ME5603	3
Multiple criteria decision-making methods (MCDM)	ME6703	3
Modern Manufacturing Processes	ME6613	3
Gradient Optimization Techniques	ME6623	3

Nano Fabrication and Manufacturing	ME6643	3
Quality Engineering and Management	ME6653	3
Product Life Cycle Management	ME6663	3
Productivity Engineering	ME6673	3
Scheduling and Sequencing	ME6683	3
Theory of Metal Cutting	ME6693	3
Research Methodologies for Engineers	ME5703	3
Optimization Methods for Engineers	ME5713	3
Experimental Methods	ME5723	3
Numerical Methods	ME5733	3
Applied Machine learning for Engineers	ME6713	3
Modelling and Simulation	ME6723	3

■ Research Thesis

Course Title	Code	Cr. Hrs.
Research Thesis	ME6916	6

■ CGPA Requirement

A student is required to earn a minimum 3.00/4.00 CGPA on the completion of his/her degree requirements.

■ Program Duration

This is normally a two year program comprising of 4 semesters. There will be a Fall and a Spring semester in each year. The maximum duration to complete MS in Mechanical Engineering is 4 years.



MS Engineering Management

■ Admission Requirements

- (i) A minimum of 16 years of education leading to BS Degree in Engineering/Applied Sciences or equivalent
- (ii) Minimum 2.00/4.00 CGPA or 50% marks
- (iii) Admission Test/HEC Approved Test

■ Manufacturing Management

Course Title	Code	Cr. Hrs.
Manufacturing System Design and Analysis	ME5653	3
Operation Research	EM6323	3
Quality and Productivity Improvement	EM6133	3
Supply Chain Management	EM6343	3
Finance and Accounting for Engineers	EM6213	3
Industrial Safety and Maintenance Management	EM6373	3
Research Methods/Research Methods for Social Sciences	EM6143	3
Manufacturing Strategy	EM6353	3
Production Planning and Control	EM6333	3
Product Design & Development	EM6363	3
Advance Topics in Manufacturing Management	EM6383	3

■ Software Project Management

Course Title	Code	Cr. Hrs.
Software Matrices	EM6513	3
Software Quality Management	EM6523	3
Software Requirements Engineering	EM6533	3
Software Risk and Configuration Management	EM6543	3
Project Management Information Systems	EM6443	3
Competitive Strategies in Technology Management	EM6773	3
Modelling and Simulation	EM6143	3

■ Degree Requirements

A student admitted in this program will have to complete the degree requirements by following any one of the options given below:

- (i) 24 Cr. Hrs. course work with 6 Cr. Hrs. Thesis
- (ii) 30 Cr. Hrs. course work only (10 Courses)

The students are required to register courses offered by the department from the list appended below:

■ Engineering Project Management

Course Title	Code	Cr. Hrs.
Engineering Management Techniques	EM6113	3
Engineering Project Management	EM6403	3
Project Risk Assessment and Decision Analysis	EM6433	3
Project Scheduling, Planning and Control	EM6463	3
Management of Project Based Organization	MPM6113	3
Project Processes, Planning and Control	MPM6123	3

■ Technology Management

Course Title	Code	Cr. Hrs.
Technology Management	EM6703	3
Innovation in Market Place	EM6713	3
Entrepreneurial Basic Plan Preparation	EM6733	3
Competitive Strategies in Technology Management	EM6773	3
Environmental and Energy Management	EM6763	3
Advance Topics in Technology Engineering	EM6783	3
Managing technology innovations	EM6723	3
Technology and Entrepreneurship	EM6743	3
Transfer of Technology	EM6753	3
Optimization Methods for Engineers	ME5713	3
Multiple Criteria Decision-Making Methods (MCDM)	EM6123	3
Applied Machine learning for Engineers	EM6783	3

■ Construction Management

Course Title	Code	Cr. Hrs.
Advanced Construction Management	CE5803	3
Project Planning and Control	CE5813	3
Advanced Project Management for Construction Projects	CE5823	3
Construction and Safety Management	CE5833	3
Advanced Civil Engineering Practices	CE5843	3
Construction Economics and Financial Management	CE6853	3

Construction Contracts for Civil Engineers	CE6863	3
Sustainability in Construction Projects	CE6873	3
Environment Impact Assessment	CE6723	3

■ Research Thesis

Course Title	Code	Cr. Hrs.
Research Thesis	EM6916	6

■ CGPA Requirement

A student is required to earn a minimum 3.00/4.00 CGPA on the completion of his/her degree requirements.

■ Program Duration

This is normally a two years program comprising of 4 semesters. There will be a Fall and a Spring semester in each year. The maximum duration to complete MS in Engineering Management is 4 years.

Note: The following courses are cross listed with MS Project Management.

Engineering Management	Project Management
Finance & Accounting for Engineers	Financial Management
Project Scheduling, Planning & Control	Project Process, Planning & Control
Engineering Project Management	Advanced Project Management
Project Risk Assessment & Decision Analysis	Project Risk Management

Note: The following courses are cross listed with MS Civil Engineering.

Engineering Management	Civil Management
Project Scheduling, Planning & Control	Project Planning & Control
Project Risk Assessment & Decision Analysis	Project Risk Management
Engineering Project Management	Advanced Project Management for Construction Projects
Finance & Accounting for Engineers	Construction Economics & Financial Management

PhD Mechanical Engineering

The PhD program in Mechanical Engineering is designed to deliver students a broad background in mechanical engineering and related technologies. The program mission is to impart knowledge through a comprehensive and advanced curriculum followed with intense research training so that the graduating PhDs are fully prepared for industrial and technological challenges of future. The students are expected to tackle complex engineering and technological problems through a professional approach by utilizing advanced tools and techniques under the guidance of professional, dedicated and research focused faculty members.

Mechanical engineering department provides students the opportunity to conduct research in Mechanical Design; Thermo-fluids and Manufacturing system. The Department has a close liaison with the industry and R&D organizations to support and foster research activities.

■ Admission Requirements

- (i) MS degree in relevant discipline

- (ii) Minimum CGPA 3.0/4.0 (Semester System) or 60% marks (Annual System)

- (iii) Admission Test/HEC Approved Test

- (iv) Interview

■ Degree Requirements

A PhD candidate shall be awarded degree on successful completion of the following requirements:

- (i) 18 Cr. Hrs. Course Work with minimum CGPA 3.00/4.00

- (ii) Comprehensive Examination (written and oral)

- (iii) 30 Cr. Hrs. Research Work

- (iv) Synopsis Defense

- (v) Dissertation Foreign Reviews

- (vi) Publication/Acceptance of at least one research paper in HEC approved journal.

- (vii) Dissertation Final Defense

Note: PhD scholars are required to comply with the following timeline:

Activity	Preferred Time	Maximum
Course Work	2 Semesters	3 Semesters
Comprehensive Exam	3 Semesters	5 Semesters
Synopsis Qualification	4 Semesters	6 Semesters
Thesis Submission	6 Semesters	10 Semesters

PhD Engineering Management

The PhD program in Engineering Management is a rigorous and interdisciplinary academic journey, providing students with advanced knowledge and skills to succeed as leaders in the ever-evolving field. The program offers cutting-edge research opportunities, specialized training, and a focus on practical application, allowing students to contribute to the advancement of theory and practice. The program covers various specializations such as Industrial Engineering, Project Management, Supply Chain Management, Manufacturing Systems Management, Construction Management, Software/ Information Project Management, Technology and Innovation Management, and Total Quality Management.

■ Admission Requirements

- (i) MS degree in relevant discipline
- (ii) Minimum CGPA 3.0/4.0 (Semester System) or 60% marks (Annual System)

- (iii) Admission Test/GAT General/HEC Test
- (iv) Interview

■ Degree Requirements

A PhD candidate shall be awarded degree on successful completion of the following requirements:

- (i) 18 Cr. Hrs. Course Work with minimum CGPA 3.00/4.00
- (ii) Comprehensive Examination
- (iii) 30 Cr. Hrs. Research Work
- (iv) Synopsis Defense
- (v) Dissertation Foreign Reviews
- (vi) Publication of at least one research paper in HEC approved journal.
- (vii) Dissertation Final Defense

Note: PhD scholars are required to comply with the following timeline:

Activity	Preferred Time	Maximum
Course Work	2 Semesters	3 Semesters
Comprehensive Exam	3 Semesters	5 Semesters
Synopsis Qualification	4 Semesters	6 Semesters
Thesis Submission	6 Semesters	12 Semesters

