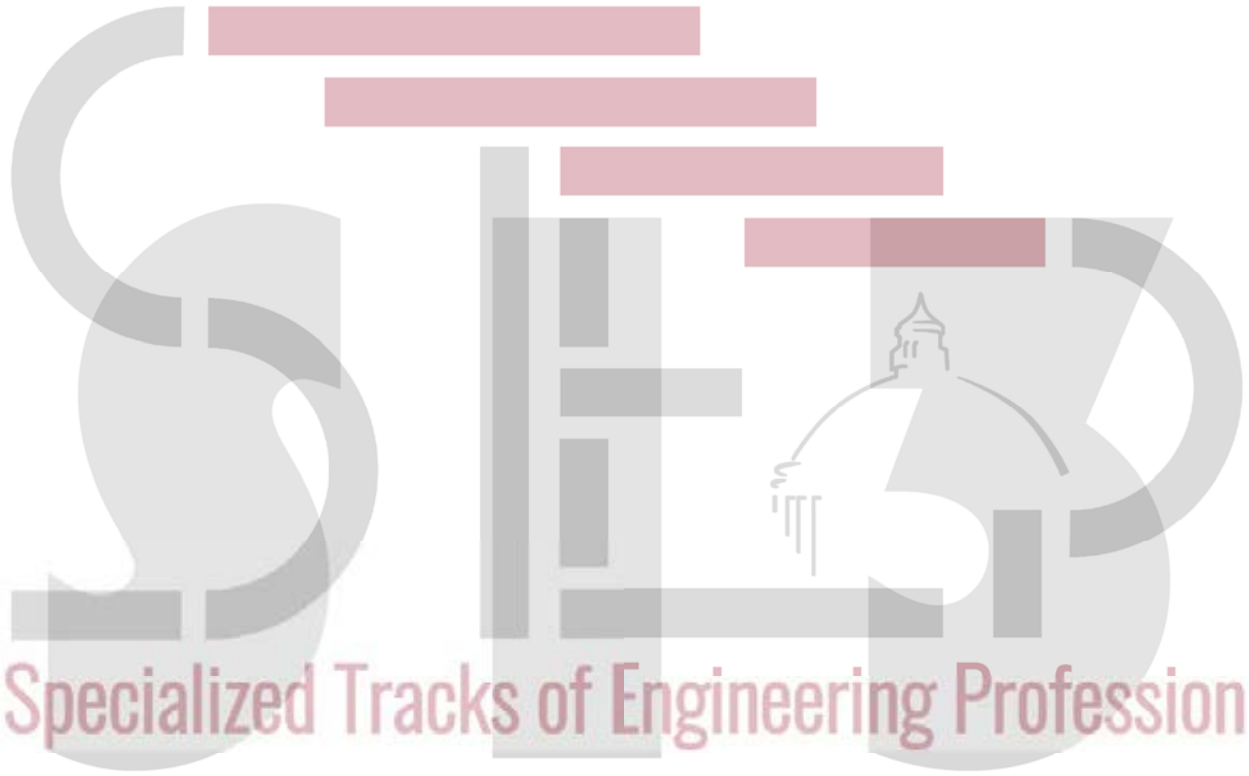

PART [C]: SPECIALIZED PROGRAMS

(13) INDUSTRIAL ENGINEERING AND MANAGEMENT Program (IEM)

برنامج الهندسة الصناعية والإدارة

(13) Industrial Engineering and Management Program (IEM)

برنامج الهندسة الصناعية والإدارة

VISION رؤية البرنامج

The Industrial Engineering and Management program of the future will prepare students to become innovative problem-solvers and leaders in a rapidly changing technological landscape. Our graduates will be equipped with the knowledge and skills to optimize complex systems and processes across a wide range of industries, creating value for both organizations and society as a whole.

سيقوم برنامج الهندسة الصناعية والإدارة في المستقبل بإعداد الطلاب ليصبحوا مبتكرين في حل المشكلات والقادة في مشهد تكنولوجي سريع التغير. سيتم تجهيز خريجينا بالمعرفة والمهارات اللازمة لتحسين النظم والعمليات المعقدة عبر مجموعة واسعة من الصناعات، وخلق قيمة لكل من المنظمات والمجتمع ككل.

MISSION رسالة البرنامج

The mission of our Industrial Engineering and Management program is to provide students with a comprehensive education in the principles, tools, and techniques of industrial engineering, preparing them to become effective problem-solvers and leaders in a wide range of industries.

تتمثل مهمة برنامج الهندسة الصناعية والإدارة لدينا في تزويد الطلاب بتعليم شامل في مبادئ وأدوات وتقنيات الهندسة الصناعية، وإعدادهم ليصبحوا قادة وفعالين في حل المشكلات في مجموعة واسعة من الصناعات.

GRADUATE ATTRIBUTES مواصفات الخريج

1. Systems thinking: The ability to view complex systems as a whole and to analyze and optimize their components to achieve organizational objectives.
2. Analytical skills: The ability to apply mathematical and statistical methods to analyze data and make informed decisions.
3. Problem-solving skills: The ability to identify, define, and solve problems using a structured approach.
4. Leadership skills: The ability to lead and manage teams, communicate effectively, and make decisions in a fast-paced and dynamic environment.
5. Technical skills: The ability to use a wide range of tools and technologies such as simulation, optimization, and data analytics to design and improve systems.

6. Business acumen: The ability to understand the broader business context and to use this knowledge to make strategic decisions that create value for the organization.
7. Creativity and innovation: The ability to think outside the box, generate new ideas, and develop innovative solutions to complex problems.
8. Continuous improvement mindset: The ability to constantly evaluate processes and systems and to identify areas for improvement.
9. Ethical and social responsibility: The ability to recognize and address the ethical and social implications of industrial engineering decisions and actions.
10. Lifelong learning: The ability to continue learning and developing skills throughout their career, keeping up to date with new technologies and best practices in the field.

PROGRAM BENCHMARK مرجعية البرنامج

NARS 2018	LEVEL A	LEVEL B	LEVEL C	LEVEL D
√	Totally Adopted	Totally Adopted	See below	NA

The IEM program has adopted the National Academic Reference Standards (NARS) for Engineering issued by the National Authority for Quality Assurance and Accreditation for Education (NAQAAE) as the program objects to ensure the satisfaction of the national quality assurance standards. The NARS 2018 for Engineering are broad statements that define the main characteristics and performance expected from all engineering students (LEVEL A) upon their graduation so that the graduate attributes of the IEM program can be achieved as follows:

1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.
2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.
3. Behave professionally and adhere to engineering ethics and standards.
4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.
5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.
6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.
7. Use techniques, skills, and modern engineering tools necessary for engineering practice.

8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.
9. Communicate effectively using different modes, tools, and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.
10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

In addition to the Competencies for All Engineering Programs the BASIC MECHANICAL Engineering graduate (LEVEL B) must be able to:

1. Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of: Thermodynamics, Heat Transfer, Fluid Mechanics, solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis, Dynamics and Vibrations.
2. Plan, manage and carry out designs of mechanical systems and machine elements using appropriate materials both traditional means and computer-aided tools and software contemporary to the mechanical engineering field.
3. Select conventional mechanical equipment according to the required performance.
4. Adopt suitable national and international standards and codes; and integrate legal, economic, and financial aspects to design, build, operate, inspect and maintain mechanical equipment and systems.

In addition to the competencies of all engineering and basic mechanical engineering, the Industrial Engineering and Management (LEVEL C) graduate should be able to:

1. Identify, analyze, and optimize complex systems and processes, utilizing tools and techniques such as Lean Six Sigma, simulation, and data analysis.
2. Integrate engineering principles with business strategies, enabling them to understand the impact of their work on organizational performance and drive strategic decision-making.
3. Identify new opportunities for process improvement and develop their own start-up ventures while fostering a culture of innovation and entrepreneurship.

SPECIALIZED COURSES CONTENTS توصيف المقررات

Code	Name	Credit Hours	Category	Pre-requisite
IEMS280	Engineering Seminar	1	DR	30 CR.HRS. + AA APROVAL
IEMS281	Industrial Training-1	1	FR	60 CR.HRS. + AA APROVAL
IEMS381	Industrial Training-2	2	DR	IEMS281 + AA APROVAL
IEMS481	Graduation Project-1	1	FR	110 CR.HRS. + SOPHOMORE
IEMS482	Graduation Project-2	3	DR	IEMS481
Total		**2+6**		

COURSES CONTENTS توصيف المقررات

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
Faculty Requirements										
IEMS280	Engineering Seminar	1	1	0						1
	Pre-requisites: 30 CR.HRS. + AA APROVAL									
	Talks and presentations are invited from industrial establishments relevant to the program. The guest speaker should discuss the organization, management, and recent technologies implemented in his/her industrial establishment. Students exercise writing brief technical reports on the guest presentation and deliver their own presentation about the topic. The course is graded as Pass/Fail grade-system.									
IEMS281	Industrial Training-1	1	0	0						1
	Pre-requisites: 60 CR.HRS. + AA APROVAL									
	Training on industrial establishments relevant to the program. Training lasts for total of 90 hours, during a minimum period of three weeks. The program training advisor schedules at least one follows up visit to the training venue and formally report on performance of trainee(s). A Mentor in the industrial establishment provides a formal report on the student's performance during training. The student submits a formal report and presentation to be evaluated by a panel of three members with one member being an external examiner appointed from industry or other colleges of engineering. The course is graded as Pass/Fail grade-system.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
IEMS381	Industrial Training-2	2	0	0						0
	Pre-requisites: IEMS281 + AA APPROVAL									
	Training on industrial establishments relevant to the program. Training lasts for total of 180 hours, during a minimum period of six weeks. The program training advisor schedules at least two follow-up visits to the training venue and formally report on performance of trainee(s). A Mentor in the industrial establishment provides a formal report on the student's performance during training. The student submits a formal report and presentation to be evaluated by a panel of three members with one member being an external examiner appointed from industry or other colleges of engineering. The course is graded as Pass/Fail grade-system.									
IEMS481	Graduation Project-1	1	0	2						2
	Pre-requisites: 110 credits + SOPHCMORE									
	Students – in groups (or individually in some programs) - undertake a final project as part of the program. In GP1, students provide a clear identification of a real-life problem that represents an actual need for the incustry or the community and reflects the mission and strategic objective of CUFE. Students are expected to survey the related literature, collect, and interpret market data, and proposed an approach for the solution, using the engineering knowledge and skills acquired. The course is graded as Pass/Fail based upon a report/oral presentation stating the expected cost and required material, tools, and facilities as well as a timed list of deliverables.									
IEMS482	Graduation Project-2	3	1	4						5
	Pre-requisites: IEMS481									
	Graduation Project-2 is the second phase of the graduation project. The aim is to develop innovative solutions to problems encountered during the implementation process thus fulfilling the deliverables stated in Graduation Project-1. A dissertation on the project is submitted taking into consideration technical, economic, social, and environmental requirements while analysing the major resu ts and presenting direct conclusions.									

PROGRAM REQUIREMENTS متطلبات البرنامج

Category		No. of courses	Course Credit Hour	Total Credit Hours
Discipline Requirements (DR)	core/ compulsory	1	4	4
		19	3	57
	Elective	0	0	0
Total DR courses		20		61
Program Requirement (PR)	core/ compulsory	1	2	2
		7	3	21
	Elective	0	2	0
		7	3	21
Total PR courses		15		44
Total Elective courses (DR & PR)		7	3	21

- **Discipline Requirements (DR) core/compulsory courses list**

Code	Name	Credit Hours	Pre-requisite
MTHS102	Linear Algebra and Multivariable Integrals	3	MTHS002
MTHS104	Differential Equations	3	MTHX003
MTHS114	Numerical Analysis	3	MTHS102+ MTHS104
EPES201	Electrical Engineering Fundamentals	3	PHYS002
EPES303	Electric Drive Systems	3	EPES201
MCNS101	Thermodynamics	3	PHYS001
MCNS202	Fluid Mechanics	3	MTHS002
MCNS326	Heat Transfer	3	MCNS101
MDPS217	Machine Drawing	3	INTS001
MDPS352	Machine Design	3	MDPS261
MDPS354	Machine and System Design	4	MDPS352+ MDPS355
MDPS132	Material Science	3	NONE
MDPS232	Engineering Materials	3	MDPS132
MDPS241	Manufacturing Processes I	3	PHYS001
MDPS242	Manufacturing Processes II	3	MDPS132
MDPS261	Stress Analysis	3	EMCS002

Code	Name	Credit Hours	Pre-requisite
MDPS251	Kinematics of Machine Components	3	EMCS001
MDPS355	Dynamics of Machine Components	3	MDPS251
MDPS372	Control System Dynamics	3	MDPS355
MDPS371	Mechanical Vibrations	3	MDPS355
Total		**61**	

- **Program Requirements (PR) core/compulsory courses list**

Code	Name	Credit Hours	Pre-requisite
MDPS381	Fundamentals of Industrial Engineering	3	NONE
MDPS382	Engineering Economy and Financial Management	3	E-A (GENS120)
MDPS383	Operations Research I	3	MTHS102
MDPS481	Facilities Planning and Design	3	MDPS383
MDPS482	Quality Management	3	MTHS005
MDPS483	System Modeling and Simulation	3	MTHS005
MDPS484	Production and Operations Management	3	MDPS381
MDPS485	Industrial Engineering Lab	2	MDPS481
Total		**23**	

- **Program Requirements (PR) elective courses list**

Code	Name	Credit Hours	Pre-requisite
ELECTIVES: 7 courses (21 Credits)			
MDPS390	Project Management	3	MDPS381
MDPS391	Reliability and Maintenance Engineering	3	MTHS005
MDPS392	Operations Research II	3	MDPS383
MDPS393	Engineering Data Analysis	3	MTHS005
MDPS394	Design of Experiments	3	MTHS005
MDPS395	Human Factors and Ergonomics	3	MDPS381
MDPS396	Work Design and Measurement	3	MDPS381
MDPS397	Safety Engineering	3	MDPS381

Code	Name	Credit Hours	Pre-requisite
MDPS398	Material Handling Systems	3	MDPS381
MDPS399	Product Development and Innovation	3	MDPS381
MDPS490	Design for Manufacturing	3	MDPS381 + MDPS242
MDPS491	Supply Chain Management	3	MDPS381 + MDPS383
MDPS492	Computer Integrated Manufacturing CIM	3	MDPS381 + MDPS242
MDPS493	Industrial Management	3	MDPS381
MDPS494	Industrial Information Systems	3	MDPS381 + 120 Credit
MDPS495	Manufacturing Systems Design	3	MDPS381
MDPS496	Machine Learning for Industrial Engineering	3	MDPS381 + MTHS005
MDPS497	Lean Manufacturing and Six Sigma	3	MDPS381
MDPS498	Business Process Reengineering	3	MDPS481
MDPS499	Sustainable Operations	3	MDPS481
CMPS102	Programming Techniques	3	INTS005
EPES305	Industrial Instrumentation	3	EPES303
MDPS332	Computer Aided Design and Manufacturing CAD/CAM	3	MDPS241
MDPS323	Modern Manufacturing Processes	3	MDPS241 + MDPS242
MDPS428	Advanced Topics in Manufacturing Processes	3	85 Credits+ AA Approval
MDPS324	Material Selection in Design	3	MDPS232
MDPS327	Modeling and Simulation of Materials Processing	3	MDPS132 + MDPS242
MDPS464	Failure Analysis	3	MDPS261 + MDPS232
MDPS423	Robotics Engineering	3	MDPS251

Proposed Study Plan - 8 semesters - Including Freshman Level

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off Tut	OffHr	Total
SEMESTER 1	MTHS002	Calculus I	3	2	2						4
	EMCS001	Engineering Mechanics - Dynamics	3	1	2		1				4
	PHYS001	Mechanical Properties of Matter and Thermodynamics	3	2		2	1				5
	INTS001	Engineering Graphics	3	2				3			5
	INTS005	Information Technology	2	1			3				4
	CHES001	Chemistry for Engineers	2	1	2						3
	GENS001	Critical and Creative Thinking	2	2							2
	GENS004	Proficiency and Capacity Building	1	1							1
		Sub-Total	**19**	**13**	**6**	**2**	**4**	**3**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App. Tut	Lab	Stud	Off Tut	Off. Hrs	Total
SEMESTER 2	MTHS003	Calculus 2	3	2	2						4
	EMCS002	Engineering Mechanics - Statics	2	1	2						3
	PHYS002	Electricity and Magnetism	3	2		2	1				5
	MTHS005	Introduction to Probability and Statistics	3	2	2						4
	MCNS101	Thermodynamics	3	2	2						4
	MDPS132	Materials Science	3	2	0	2	1				5
	MDPS001	Fundamentals of Manufacturing Engineering	2	1		1	2				4
		Sub-Total	**19**	**12**	**8**	**5**	**4**	**0**	**0**	**0**	**29**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off Tut	Off Hr	Total
SEMESTER 3	MDPS261	Stress Analysis	3	2	2						4
	MDPS217	Machine Drawing	3	1	2	0	2				5
	MDPS241	Manufacturing Processes I	3	2		1	2				5
	MTHS102	Linear Algebra and Multivariable Integrals	3	2	2						4
	MTHS104	Differential Equations	3	2	2						4
	GENS005	Writing and Presentation Skills (E-A)	2	2							2
	GENS120	Fund. of Economics and Accounting (E-A)	2	2							2
		Sub-Total	**19**	**13**	**10**	**1**	**2**	**0**	**0**	**0**	**26**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App. Tut	Lab	Stud	Off Tut	Off. Hrs	Total
SEMESTER 4	MTHS114	Numerical Analysis	3	2	2	0					4
	EPES201	Electrical Engineering Fundamentals	3	2		3					5
	MCNS202	Fluid Mechanics	3	2	2						4
	MDPS251	Kinematics of Machine Components	3	2		3					5
	MDPS242	Manufacturing Processes II	3	2		2	1				5
	MDPS232	Engineering Materials	3	2	2						4
	IEMS280	Seminar	1	1							1
		Sub-Total	**19**	**13**	**6**	**8**	**1**	**0**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off Tut	Off Hr	Total
SEMESTER 5	GENS002	Societal Issues	2	2							2
	MDPS352	Machine Design	3	2		3					5
	MCNS326	Heat Transfer	3	2	2						4
	MDPS381	Fundamentals of Industrial Eng neering	3	2		3					5
	MDPS355	Dynamics of Machine Components	3	2		3					5
	EPES303	Electric Drive Systems	3	2		3					5
	GENS110	Fundamental of Management, Risk and Environment (E-A)	2	2							2
		Sub-Total	**19**	**14**	**2**	**12**	**0**	**0**	**0**	**0**	**28**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App. Tut	Lab	Stud	Off Tut	Off. Hrs	Total
SEMESTER 6	MDPS372	Control System Dynamics	3	2		2	1				5
	MDPS354	Machine and System Design	4	2	4						6
	MDPS371	Mechanical Vibrations	3	2	2	0	0				4
	MDPS382	Engineering Economy and Financial Management	3	2	2						4
	MDPS383	Operations Research I	3	2	0	2	1				5
	XXXSXXX	Program Elective 1	3	2	2						4
		Sub-Total	**19**	**12**	**12**	**2**	**1**	**0**	**0**	**0**	**27**

S	Code	Name	Credit Hours	Contact Hours							
				Lec	Tut (2)	App Tut	Lab	Stud	Off Tut	Off.Hrs	Total
SEMESTER 7	MDPS481	Facilities Planning and Design	3	2	2						4
	MDPS482	Quality Management	3	2	2						4
	MDPS483	System Modeling and Simulation	3	2		3					5
	XXXSXXX	Program Elective 2	3	2	2						4
	XXXSXXX	Program Elective 3	3	2	2						4
	XXXSXXX	Program Elective 4	3	2	2						4
	IEMS481	Graduation Project - 1	1	0	2						2
		Sub-Total	**19**	**12**	**12**	**3**	**0**	**0**	**0**	**0**	**27**

S	Code	Name	Credit Hours	Contact Hours							
				Lec.	Tut (2)	App. Tut	Lab	Stud	Off Tut	Off. Hrs	Total
SEMESTER 8	MDPS484	Production and Operations Management	3	2	2						4
	MDPS485	Industrial Design Lab	2	1			3				4
	GENS2XX	UR Free Elective	2	2							2
	XXXSXXX	Program Elective 5	3	2	2						4
	XXXSXXX	Program Elective 6	3	2	2						4
	XXXSXXX	Program Elective 7	3	2	2						4
	IEMS482	Graduation Project - 2	3	1	4						5
		Sub-Total	**19**	**12**	**12**	**0**	**3**	**0**	**0**	**0**	**27**

COURSES CONTENTS توصيف المقررات

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
Discipline Compulsory Courses										
MTHS102	Linear Algebra and Multivariable Integrals	3	2	2						4
	Pre-requisites: MTHS002									
	Solving Linear Systems, Vector Spaces and Subspaces, Inner Product Spaces and Orthonormal Bases, The Eigenvalue Problem; Diagonalization of Matrices, Computing Functions of Matrices. Functions of Several Variables, The Gradient of a Scalar Function and its Applications, Vector Fields, Curl and Divergence, Double and Triple Integrals with Applications, Line and Surface Integrals with Applications.									
References	Calculus Early Transcendentals", by J. Stewart, 8th edition, 2015, Cengage Learning Elementary Linear Algebra with Applications" by B. Kolman and D. Hill, 2013, Pearson.									
MTHS104	Differential Equations	3	2	2	0					4
	Pre-requisites: MTHS003									
	First-order differential equations, separable, exact, linear, homogeneous and Bernoulli equations; modeling with first order differential equations; higher-order differential equations; method of undetermined coefficients; variation of parameters; modeling with higher order differential equations; series solutions; Laplace transform; properties and applications, shifting theorems, convolution theorem; solutions of differential equations using Laplace transform; Fourier series; Fourier transform.									
References	1- "A First Course in Differential Equations with Modeling Applications" 11th Edition 2017, by Dennis G. Zill 2- "Fundamentals of Differential Equations", 9th Edition, 2017, by R. Nagle, Edward Saff, Arthur Snider									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
MTHS114	Numerical Analysis	3	2	2	0					4
	Pre-requisites: MTHS102 + MTHS104									
	Basic concepts of floating- point arithmetic- Conditioning of a problem-Numerical stability of an algorithm – Linear systems: direct methods (Gauss elimination, LU factorization, Choleski) – Iterative methods (Jacobi –Gauss-Seidle – SOR). Approximation of Functions: polynomials and piecewise polynomial interpolation, splines, discrete least squares. Nonlinear equations: Newton's method and its discrete variants, fixed point iteration. Numerical integration: Newton- Cotes formulas, Gaussian quadrature rules, composite rules. Initial value problems for ordinary differential equation: one-step methods (Runge-Kutta methods) and multistep (Adams) methods. Stiff problems.									
References	S. Chapra and R. Canali, Numerical Methods for Engineers, 7th ed., McGraw Hill, 2014.									
EPES201	Electrical Engineering Fundamentals	3	2	0	3					5
	Pre-requisites: PHYS002									
	Electrical elements and electrical quantities. Basic electrical laws (voltage and current divider rules, star-delta transformation). Analysis of DC circuits (branch currents, node voltages and Thevenin's theorem). First order capacitive transients. Time varying signals (average and RMS values, voltage and current waveforms). Analysis of AC circuits (vector and complex representations of sine waves, concept of impedance, power analysis, power factor correction). Three phase circuits (line and phase voltages, star and delta connected balanced loads, three phase power). Transformers circuits. Course project.									
References	A. R. Hambley, Electrical Engineering: Principles and Applications, 7th ed. Pearson, 2018.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
EPES303	Electric Drive Systems	3	2	0	3					5
	Pre-requisites: EPES201									
	Power Electronic Converters for Motor Drives: Controlled Rectifiers, DC Choppers, Inverters. DC Motor Drives: Structure and Operation of DC Motors, Types of DC Motors, Thyristor and Chopper DC Drives. Incuction Motor Drives: Motor Structure and Operation, Speed Control, Inverter-fed Drives. Stepper Motor Drives: Principle of Operation, Motor Characteristics, Drive Circuits. Course Project.									
References	P. C. Sen, Principles of Electric Machines and Power Electronics, 3rd ed., Wiley, 2013									
MCNS101	Thermodynamics	3	2	2	0					4
	Pre-requisites: PHYS001									
	Basic concepts. Pure substances – First law of thermodynamics and applications – second law of thermodynamics and corollaries – entropy. May include a visit to a power plant, course project									
References	Claus Borgnakke and Richard E. Sonntag, Fundamentals of Thermodynamics, 10th Edition, Wiley, 2019.									
MCNS202	Fluid Mechanics	3	2	2	0					4
	Pre-requisites: MTHS002									
	Fluid kinematics. flow types. Integral analysis of flow: Continuity, Linear momentum, Angular momentum and Energy equations, Applications. Similitude and dimensional analysis and modeling, Viscous flow in pipes and ducts. Flow measurement. General applications. Course project compute oriented.									
References	Philip M. Gerhart, Andrew L. Gerhart, John I. Hochstein, Munson, Young and Okiishi's Fundamentals of Fluid Mechanics, 8th Edition, Wiley, 2018.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
MCNS326	Heat Transfer	3	2	2	0					4
	Pre-requisites: MCNS101									
	Conduction: General equation of conduction, one dimensional steady-state conduction, steady-state conduction with internal heat generation, steady conduction with variable thermal conductivity, fins and extended surfaces, unsteady conduction. Convection: fundamentals of convection, dimensionless groups, natural and forced convection, use of empirical correlations. Radiation: Fundamentals of heat transfer by radiation. Case studies and computer applications.									
References	Frank P. Incropera, David P. DeWitt, Theodore L. Bergman, Adrienne S. Lavine , Fundamentals of Heat and Mass Transfer, 6th Edition, John Wiley & Sons, 2006.									
MDPS001	Fundamentals of Manufacturing Engineering	2	1	0	1	2				4
	Pre-requisites: NONE									
	Engineering Materials - Elements of Manufacturing Processes - Casting and molding processes- metal forming processes - Shaping of plastic material - Joining processes - Metal cutting and finishing processes - Modern Manufacturing, additive manufacturing and 3D printing									
References	Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 7th Edition, Wiley, 2019.									
MDPS217	Machine Drawing	3	1	2	0	2				5
	Pre-requisites: INTS001									
	Sketching and drafting of actual Mechanical components and Assemblies - Assembly drawing, working drawing, dimensioning, limits, fits, Geometrical and dimensional tolerances, surface roughness. Standard machine elements (threads, fasteners, locking devices, keys, splines, gears, pulleys, bearings, pipe connections, etc.) - Welding and riveting conventions. Standardization and designation of machine elements. Computer aided graphics application.									
References	David A. Madsen, David P. Madsen, Engineering Drawing and Design, 6th Edition, Cengage Learning, 2016.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
MDPS132	Materials Science	3	2	0	2	1				5
	Pre-requisites: NONE									
	Introduction to materials engineering, atomic structure and interatomic bonding, Crystal structures, crystal imperfections, Diffusion, Mechanical properties, Strengthening mechanisms and plastic deformation, phase diagrams, Iron carbon phase diagram, Types of cast iron, Phase transformations and isothermal heat treatments (TTT), Classification of Metals. Mechanical testing of metals: tension, compression, bending, torsion, hardness.									
References	William D. Callister Jr., David G. Rethwisch, Materials Science and Engineering: An Introduction, 10th Edition, Wiley, 2018.									
MDPS241	Manufacturing Processes I	3	2	0	1	2				5
	Pre-requisites: PHYS001									
	Examination of metal cutting processes including turning, shaping, drilling and milling. Mechanics of cutting, chip formation, shear plane, velocity relations, merchant circle, tool material, tool wear, tool life, economy in metal cutting. Introduction and definitions of metrology – Gauges – Errors in measurement – Linear and angle measuring instruments test of geometrical shape: straightness and flatness.									
References	Fundamentals of Machining and Machine Tools, Geoffrey Boothroyd, 3rd edition, Taylor & Francis Inc									
MDPS261	Stress Analysis	3	2	2	0					4
	Pre-requisites: EMCS002									
	Equilibrium, continuity, material mechanical behavior. Normal force, shearing force, bending and twisting moment diagrams. Stresses in simply loaded elastic bars: axial loading, bending and torsion, deformation, stiffness, strain energy. Stresses in elastic and elasto-plastic bars, residual stresses. Combined loading, eccentric normal load, oblique bending, combined bending and torsion. Two-dimensional stresses, principal stresses, maximum shear stress, allowable stresses, Mohr's circle representation. Application to simple frames, thin-walled vessels, springs, load and displacement measurement. Course project computer oriented.									
References	Russell C. Hibbeler, Mechanics of Materials in SI Units, 10th edition, Pearson, 2018.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
MDPS232	Engineering Materials	3	2	2	0					4
	Pre-requisites: MDPS132									
	Heat treatments of steel, Classification of Alloy steels, Non-ferrous metals and alloys: copper and its alloys and aluminum and its alloys, Age hardening, Introduction to Polymers, Introduction to Composites, Introduction to Ceramics.									
References	William D. Callister Jr., David G. Rethwisch, Materials Science and Engineering: An Introduction, 10th Edition, Wiley, 2018.									
MDPS242	Manufacturing Processes II	3	2	0	2	1				5
	Pre-requisites: MDPS132									
	Casting: Types of foundries, steps in making a casting; cast metals; types, materials and allowances of patterns; Moulding processes and materials; gating and risering; casting defects. Forming: Metal forming process classification, basic metal working concepts and plasticity; yield criterion; slip line fields; estimation of force and energy requirements; technology of bulk and sheet metal forming processes; precision forming processes; features of different types of metal forming dies; principles of powder forming. Welding: Welding processes; welding energy sources and their characteristics; fluxes and coatings; weldability and welding of various metals and alloys; metallurgical characteristics of welded joints; weld testing and inspection. Course project.									
References	Manufacturing Technology, Vol. 1 Foundry, Forming and Welding, RAO, 4th Edition, McGraw Hill 2013									
MDPS251	Kinematics of Machine Components	3	2	0	3					5
	Pre-requisites: EMCS001									
	Kinematics fundamentals: geometry of motion and mechanism topology, Machine components, indexing mechanisms, linkage mechanisms and planar robots: (position, velocity and acceleration), Cam-follower mechanisms: design and analysis, standard cams and equivalent mechanisms, Gear trains (simple, compound and planetary): Kinematics, geometry and assembly conditions, Simulation using Computer Graphics and Matlab Software and case studies, Course project									
References	R.L. Norton, Design of Machinery, 6th ed. McGraw Hill, 2019.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
MDPS352	Machine Design	3	2	0	3					5
	Pre-requisites: MDPS261									
	Design procedures – Factors affecting design details – Selection of materials – Modes of loading – Safety factors and allowable stresses – Design variants and inversions. The various design calculations. Interpretation and usage of component data sheets. Design of detachable joints: (threaded joints, keys and splines) – Design of permanent joints: (welding, interference fitting, riveting, riveting, adhesion) – Design of some machine elements: springs, power screws. Applications to small-scale mechanical systems. Course project.									
References	Richard Budynas, Keith Nisbett, Shigley's Mechanical Engineering Design, 10th Edition, McGraw Hill, 2014.									
MDPS355	Dynamics of Machine Components	3	2	0	3					5
	Pre-requisites: MDPS251									
	Dynamics fundamentals and basic concepts, Plane Kinetics of Rigid bodies: force-mass-acceleration, work and energy, virtual work, balancing of machinery: rotating elements, 4-bar linkage, reciprocating elements, Engine dynamics, balancing of single cylinder engine, Flywheel design and turning moment diagram, multi-cylinder engines: Line engines, V-engines, W-engines, Simulation using Computer Graphics and Matlab Software and case studies, Course project									
References	R.L. Norton, Design of Machinery, 6th ed. McGraw Hill, 2019.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs	Total
MDPS354	Machine and System Design	4	2	4	0					6
	Pre-requisites: MDPS352 + MDPS355									
	Design of Power transmission elements, Shaft design, Bearing design and Selection, Gear design (spur, helical and bevel gears) Sprocket and chain design, Belts and Pulley, Brake Design, Clutch design. Course Project is a major activity and is evaluated by 40% of the course term grades. In the project students in small groups will apply the knowledge acquired on the mechanics of machines and components and on mechanical design to handle the design of some mechanical modules. These will be selected such as to be of educational value and of an accuracy level commensurate with their functional requirements. The designs will be constructed and assessed as to the extent of verifying and coping with their requirements. The evaluation of the project will be in form of a presentation by each group before their fellow students and the instructor.									
References	Richard Budynas, Keith Nisbett, Shigley's Mechanical Engineering Design, 10th Edition, McGraw Hill, 2014.									
MDPS372	Control Systems Dynamics	3	2	0	2	1				5
	Pre-requisites: MDPS355									
	Introduction to system dynamics; Mathematical modeling of dynamic systems (mechanical, electrical, electronic, hydraulic, pneumatic, and thermal); Transfer-function approach; State-space approach; Time-domain analysis – Block diagrams - Transient response – Stability analysis – Root locus; Frequency-comain analysis– Bode diagrams – Nyquist plots. Computer simulation and case studies. Course project.									
References	K. Ogata, Modern Control Engineering, 5th ed., Pearson, 2010									
MDPS371	Mechanical Vibrations	3	2	2						4
	Pre-requisites: MDPS355									
	Introduction and basic concepts, sources and causes of vibrations, free and forced vibrations of SDOF systems, vibration transmissibility, vibration control, free and forced vibrations of 2DOF systems, vibration absorber, MDOF systems: (natural frequencies and normal modes, forced vibrations), vibration measurement methods, computer-aided simulation and case studies, course project									
References	S. S. Rao, Mechanical Vibrations, 6th ed , Pearson, 2017.									

Program Courses (Compulsory)										
Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS381	Fundamentals of Industrial Engineering	3	2	0	3					5
	Pre-requisites: NONE									
	This course provides an introduction to the field of industrial engineering, covering the basic concepts, principles, and tools used by industrial engineers to improve productivity, efficiency, and quality in manufacturing and service industries. Topics covered include production systems design, work methods and measurement, production planning and control, and quality control. The course also covers the history and current state of the field, as well as the various career opportunities available in industrial engineering.									
References	"Introduction to Industrial Engineering" by Avraham Shtub and Jonathan F. Bard.									
MDPS382	Engineering Economy and Financial Management:	3	2	2						4
	Pre-requisites: E-A (GENS120)									
	principles of economics and finance as they apply to engineering projects and organizations, including time value of money, investment analysis, cost estimation, financial accounting, budgeting, risk management, and financial reporting.									
References	"Engineering Economic Analysis" by Donald G. Newnan, Jerome P. Lavelle, and Ted G. Eschenbach.									
MDPS383	Operations Research I	3	2	0	2	1				5
	Pre-requisites: MTHS102									
	Introduction to Operations Research. Formulation of linear programming problems. Graphical solution. The Simplex algorithm. Duality and sensitivity analysis. Transportation and assignment problems. Integer and Goal programming.									
References	Frederick Hillier, Gerald Lieberman, Introduction to Operations Research 11th Edition, McGraw Hill, 2021.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS481	Facilities Planning and Design	3	2	2	0	0				4
	Pre-requisites: MDPS383									
	Fundamentals of facilities planning. Facilities design. Flow, space, and activity relationships. Material handling systems. Layout planning models. Warehouse operations. Quantitative facilities planning models. Preparing, presenting, implementing and maintaining facilities plan.									
References	Alberto Garcia-Diaz, J. MacGregor Smith, Facilities Planning and Design, Pearson, 2007.									
MDPS482	Quality Management	3	2	2	0	0				4
	Pre-requisites: MTHS005									
	Introduction to quality systems. Cost of quality. Total quality management. Quality systems and standards: six sigma and ISO. Reengineering. Statistical quality control: control charts for variables and attributes, process capability analysis, acceptance-sampling plans. Quality function deployment. Quality circles. Quality loss functions.									
References										
MDPS483	Systems Modelling and Simulation	3	2	0	2	1				5
	Pre-requisites: MTHS005									
	Basic theory of industrial simulation. Building simulation models. Organization of simulation studies. Simulation modeling and application to medium and large-scale production and service system problems. Output analysis. Variance reduction and optimization. Use of software such as ARENA for discrete and continuous system simulation.									
References	Frederick Hillier, Gerald Lieberman, Introduction to Operations Research 11th Edition, McGraw Hill, 2021.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS484	Production and Operations Management	3	2	2	0	0				4
	Pre-requisites: MDPS381									
	Basic concepts of Production and Operations Management (POM). Design of products and services. Processes and technologies, Inventory management. Forecasting. Material Requirements Planning (MRP). Scheduling. Supply-Chain management. Just-in-time and lean production. Introduction to Enterprise Requirement Planning (ERP). Capacity and Aggregate planning.									
References	Khojasteh Yacob, Production Management: Advanced Models, Tools, and Applications, CRC Press, 2017.									
MDPS485	Industrial Engineering Lab	2	1	0	0	3				4
	Pre-requisites: MDPS481									
	Introduction to Work Study (WS). Productivity and WS. WS approaches. Basic procedure of method study involving job selection, recording facts, critical examination etc. String diagram, Multiple activity chart, Travel chart. Principles of motion economy. Two-handed chart. Fundamental hand motions. Micro-motion and Memo-motion studies. Cycle-graph and Chrono-cycle-graph. Work Measurement (WM). Work sampling. Time study. Computerized WM. PMTS: MTM, Work factor and Standard data.									
References	No specific reference is required for this course, as it is a practical lab-based course									

Program Courses (Electives)										
Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS390	Project Management	3	2	2	0	0				4
	Pre-requisites: MDPS381									
	Introduction to Project planning and scheduling, Project charter, Scope statement, Work Breakdown Structure, Responsibility Chart. Network diagram, Schedule analysis and possibilities using the Critical Path Method (CPM) and the Program Evaluation and Review Technique (PERT). Resource leveling and allocation, Time-cost trade off (Crashing a schedule), Gantt Chart, Time overlaps, Time and cost control, Risk monitoring and control, Computer applications with case studies.									
References	"A Guide to the Project Management Body of Knowledge (PMBOK Guide)" by Project Management Institute.									
MDPS391	Reliability and Maintenance Engineering	3	2	2	0	0				4
	Pre-requisites: MTHS005									
	This course focuses on the management of reliable engineering systems, with a particular emphasis on different maintenance strategies and practices. It covers the principles of reliability theory, failure analysis, preventive and corrective maintenance strategies, and life cycle cost analysis. The course also covers the use of software tools for reliability analysis and maintenance planning, as well as the implementation of maintenance programs and the management of maintenance resources.									
References	"Maintenance Planning and Scheduling Handbook" by Richard (Doc) Palmer.									
MDPS392	Operations Research II	3	2	2	0	0				4
	Pre-requisites: MDPS383									
	This course builds upon the concepts covered in Operations Research I and introduces advanced techniques for optimization and decision-making in engineering systems. Topics include nonlinear programming, game theory, and stochastic programming. The course also covers the use of software tools for solving complex optimization problems.									
References	"Operations Research: Applications and Algorithms" by Wayne L. Winston.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS393	Engineering Data Analysis	3	2	2	0	0				4
	Pre-requisites: MTHS005									
	This course covers the principles and techniques of data analysis for engineering applications. Topics include statistical inference, hypothesis testing, regression analysis, design of experiments, and data visualization. The course also covers the use of software tools for data analysis and modeling, such as MATLAB, R, and Python.									
References	"Data Analysis and Statistics for Engineering and Physical Science" by Edward L. Ginzton.									
MDPS394	Design of Experiments	3	2	2	0	0				4
	Pre-requisites: MTHS005									
	Principles of experimental design. Randomized complete block designs. Latin square and Greco-Latin square designs. General factorial designs. 2k Factorial designs. Response surface methodology and robust design. Planning, performing and analyzing industrial experiments.									
References	"Design and Analysis of Experiments" by Douglas C. Montgomery									
MDPS395	Human Factors and Ergonomics	3	2	2	0	0				4
	Pre-requisites: MDPS381									
	This course covers the principles and techniques of human factors and ergonomics, which focus on designing products, systems, and environments that are safe, efficient, and comfortable for human use. Topics include human physiology and anatomy, cognitive psychology, biomechanics anthropometry, and human-computer interaction. The course also covers the application of human factors and ergonomics in various industries, such as manufacturing, healthcare, and transportation.									
References	"Handbook of Human Factors and Ergonomics" by Gavriel Salvendy									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS396	Work Design and Measurement	3	2	2	0	0				4
	Pre-requisites: MDPS381									
	This course covers the principles and techniques of work design and measurement, which focus on designing jobs and work processes that are efficient, effective, and safe for workers. Topics include job analysis, work measurement, work standards, work sampling, and work design principles. The course also covers the application of work design and measurement in various industries, such as manufacturing, healthcare, and service industries.									
References	"Work Systems: The Methods, Measurement & Management of Work" by Mikell P. Groover and Jeffrey E. Herrmann									
MDPS397	Safety Engineering	3	2	2	0	0				4
	Pre-requisites: MDPS381									
	This course covers the principles and techniques of safety engineering, which focus on identifying and controlling hazards in various industries to prevent accidents and injuries. Topics include hazard analysis, risk assessment, safety regulations and standards, accident investigation, and safety management systems. The course also covers the application of safety engineering in various industries, such as manufacturing, construction, and healthcare.									
References	"Safety Engineering: Principles and Practices" by G. D. Hale									
MDPS398	Material Handling Systems	3	2	2	0	0				4
	Pre-requisites: MDPS381									
	This course covers the principles and techniques of material handling systems, which focus on the movement, storage, control, and protection of materials in various industries. Topics include material handling equipment, systems, and operations; transportation systems; storage systems; and control systems. The course also covers the application of material handling systems in various industries, such as manufacturing, distribution, and logistics.									
References	"Material Handling and Logistics" by John A. White, Jr., et al.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS399	Product Development and Innovation	3	2	2	0	0				4
	Pre-requisites: MDPS381									
	This course covers the theory and practice of product development and innovation, with an emphasis on the industrial engineering perspective. Topics include the product development process, creativity and ideation techniques, concept development and selection, design for manufacturability, prototyping and testing, and commercialization. The course also covers the application of product development and innovation principles in various industries, such as consumer goods, electronics, and medical devices.									
References	"Product Design and Development" by Karl T. Ulrich and Steven D. Eppinger.									
MDPS490	Design for Manufacturing	3	2	2	0	0				4
	Pre-requisites: MDPS381 + MDPS242									
	This course covers the principles and practices of designing products for efficient and cost-effective manufacturing. Topics include design guidelines for various manufacturing processes, such as casting, forming, machining, and assembly, as well as considerations for material selection, geometric tolerancing, and design for sustainability. The course also covers the use of computer-aided design (CAD) and computer-aided manufacturing (CAM) tools to optimize the design and production process.									
References	"Design for Manufacturability Handbook" by James G. Bralla.									
MDPS491	Supply Chain Management	3	2	2	0	0				4
	Pre-requisites: MDPS381 + MDPS383									
	The Supply Chain Management (SCM) course introduces students to the concepts, tools, and techniques used in managing supply chain operations. It provides an overview of the design, planning, and management of supply chains. The course covers topics such as demand forecasting, inventory management, distribution network design, logistics and transportation planning, procurement, and supplier management. It also covers key supply chain metrics, such as supply chain cost, service level, and lead time. The course emphasizes the importance of collaboration and coordination among supply chain partners and the use of information technology to support supply chain decision making.									
References	"Supply Chain Management: Strategy, Planning, and Operation" by Sunil Chopra and Peter Meindl.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS492	Computer Integrated Manufacturing CIM	3	2	2	0	0				4
	Pre-requisites: MDPS381 + MDPS242									
	The Computer Integrated Manufacturing (CIM) course provides an overview of the principles and practices of computer-based manufacturing systems. The course covers the key activities involved in CIM, such as computer-aided design (CAD), computer-aided manufacturing (CAM), computer numerical control (CNC), and robotics. It also covers emerging topics in CIM, such as additive manufacturing, virtual manufacturing, and smart manufacturing. The course emphasizes the integration of computer-based technologies with traditional manufacturing processes, such as casting, machining, and assembly.									
References	"Computer Integrated Manufacturing" by James A. Rehg and Henry W. Kraebber.									
MDPS493	Industrial Management	3	2	2	0	0				4
	Pre-requisites: MDPS381									
	Industrial Management is a course that covers the principles and practices of managing industrial organizations. The course focuses on the planning, organization, leadership, and control of industrial operations. Topics covered in the course include strategic planning, organizational design, human resource management, performance measurement, and quality management. The course also covers emerging trends in industrial management, such as lean management, agile management, and Industry 4.0.									
References	"Industrial Management" by A. B. Gupta.									
MDPS494	Industrial Information Systems	3	2	2	0	0				4
	Pre-requisites: MDPS381 + 120 Credit									
	Industrial Information Systems is a course that covers the use of information technology in industrial settings. The course focuses on the design, implementation, and management of information systems that support industrial operations. Topics covered in the course include data management, database systems, decision support systems, enterprise resource planning systems, and supply chain management systems. The course also covers emerging technologies such as big data analytics, the Internet of Things (IoT), and Industry 4.0.									
References	"Industrial Information Systems: A Guide to Design, Analysis, and Implementation" by N. B. Fichman and C. F. Kemerer.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS495	Manufacturing Systems Design	3	2	2	0	0				4
	Pre-requisites: MDPS381									
	Manufacturing Systems Design is a course that provides students with the knowledge and skills to design and optimize manufacturing systems. The course covers the principles of manufacturing systems design, inclucing system architecture, material flow analysis, and work cell design. Students will learn how to use computer-aided design (CAD) and simulation tools to model and optimize manufacturing systems. The course also covers topics such as lean manufacturing, Just-In-Time (JIT) production, and flexible manufacturing systems.									
References	"Manufacturing Systems Design and Analysis" by Mesut Pervizpour and Nader Asnafi.									
MDPS496	Machine Learning for Industrial Engineering	3	2	2	0	0				4
	Pre-requisites: MDPS381 + MTHS005									
	This course covers the fundamental concepts and techniques of machine learning as they apply to industrial engineering problems. Students will learn how to formulate problems as machine learning tasks, select appropriate algorithms and models, preprocess and transform data, and evaluate and interpret results. Applications of machine learning to problems in quality control, production planning, predictive maintenance, and supply chain management will be explored.									
References	"Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron.									
MDPS497	Lean Manufacturing and Six Sigma	3	2	2	0	0				4
	Pre-requisites: MDPS381									
	The Lean Manufacturing and Six Sigma course teaches students the principles and techniques of Lean Manufacturing and Six Sigma. Lean Manufacturing is a method for eliminating waste in production processes, while Six Sigma is a method for reducing variation and defects in those processes. Students will learn how to apply these methods to manufacturing operations and other industries, and how to use data and statistical analysis to identify and solve problems.									
References	"Lean Six Sigma: Combining Six Sigma with Lean Speed" by Michael L. George.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS498	Business Process Reengineering	3	2	2	0	0				4
	Pre-requisites: MDPS481									
	Brief description: The course introduces students to the concept of Business Process Reengineering (BPR), which is the analysis and redesign of workflows within and between organizations. The course covers the fundamental principles of BPR, the steps involved in a typical BPR project, and the tools and techniques used in BPR. The course also explores the potential benefits and risks associated with BPR, and the challenges that organizations face when implementing BPR initiatives.									
References	"Reengineering the Corporation: A Manifesto for Business Revolution" by Michael Hammer and James Champy.									
MDPS499	Sustainable Operations	3	2	2	0	0				4
	Pre-requisites: MDPS481									
	Brief Description: The course on Sustainable Operations focuses on sustainable operations management concepts and practices, which are critical to achieve economic, social, and environmental sustainability in industrial systems. The course includes topics such as sustainable supply chain management, green manufacturing, and eco-design of products and services. It also covers the assessment and optimization of sustainability performance using various techniques and tools, including life cycle assessment (LCA), carbon footprint analysis, and energy efficiency.									
References	"Sustainable Operations and Closed-Loop Supply Chains" by R. Uzsoy and S. K. Gupta									
CMPS102	Programming Techniques	3	2			3				5
	Pre-requisites: INTS005									
	Introduction to software design - evolution and comparison of programming languages - types and characteristics of translators - structured programming - function versus object-oriented programming- introduction to parallel programming- program maintenance & testing - documentation - numerical and non-numerical examples-programming project.									
References	• Programming and Problem Solving with C++: Comprehensive 6th Edition. Jones & Bartlett Learning, 2016. • Programming: principles and practice using C++, 2nd edition. Pearson Education, 2014.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
EPES305	Industrial Instrumentation	3	2	2	0	0				4
	Pre-requisites: EPES303									
	Logic gates, circuit design with logic gates. Operational amplifier circuits and applications. Digital electronics. Performance of analogue and digital transducers; selecting a proper transducer for a given application. Analogue transducers: solenoids, thermocouples, pressure transducers. Digital transducers: optical encoders, ultrasonic sensors. Signal conditioning: signal analysis, frequency response, filter design, op-amp circuits. Data acquisition systems (A/D and D/A converters). Stepper motors: microprocessors: structure, programming, applications. Course project.									
References										
MDPS332	Computer Aided Design and Manufacturing CAD/CAM	3	2	2	0					4
	Pre-requisites: MDPS241									
	Product Cycle and CAD/CAM, Automation and CAD/CAM, Programming for lathe, drilling and milling machines, canned cycles, subroutines, Do Loops, Computer assisted part programming, DNC, CNC, Adaptive control. Industrial robotics: Robot physical configurations, robot motions, accuracy, repeatability, end effecter, sensors, robot programming, robot languages. Group Technology: part families, part classifications and coding systems, group technology machine, cell, concepts of composite part, benefits and limitations. Computer aided process planning: Retrieval type process planning systems, generative process planning systems, machinability data systems, computer generated time standard. Computer Integrated Manufacturing: Types of manufacturing systems, types of CIMS, special manufacturing systems, Flexible Manufacturing Systems FMS, Manufacturing Cells, Course project.									
References										
MDPS323	Modern Manufacturing Processes	3	2	2	0	0				4
	Pre-requisites: MDPS241 + MDPS242									
	Gear and thread manufacturing; non-conventional metal cutting; Electro-chemical machining; Electro discharge machining; Laser beam machining; Electron beam machining; Water jet machining; Rapid Prototyping; micro system product; micro fabrication processes; Property enhancing of metals; cleaning and surface treatment; Coating and deposition processes; Thermal and mechanical coating; Processing of integrated circuit.									
References	Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 7th Edition, Wiley, 2019									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS428	Advanced Topics in Manufacturing Processes	3	2	2	0	0				4
	Pre-requisites: 85 Credits + AA Approval									
	The course covers advanced topics in manufacturing of relevance to emerging technologies. The topic may include: flexible manufacturing systems, reverse engineering and prototyping, integrated manufacturing, manufacturing intelligence, 3-D printing, Additive manufacturing, The course includes independent research project on advanced manufacturing processes.									
References	N/A									
MDPS324	Material Selection in Design	3	2	2	0	0				4
	Pre-requisites: MDPS232									
	Classification of all engineering material; Materials properties; Performance indices; Materials selection charts; Performance indices with geometry factors; Case studies.									
References	M. Ashby, Materials Selection in Mechanical Design, 5th Edition, Butterworth-Heinemann, 2017.									
MDPS327	Modeling and Simulation of Materials Processing	3	2	2						4
	Pre-requisites: MDPS132 + MDPS242									
	Overview and hand-on practice for programs used to simulate metal casting, bulk metal forming, sheet metal forming, polymer injection, etc. summary of numerical methods before going to each technique, insight to the underlying numerical methods for each software.									
MDPS464	Failure Analysis	3	2	2						4
	Pre-requisites: MDPS261 + MDPS232									
	Functional and structural failures. Tribological surface failure, abrasive, adhesive, fatigue wear, fretting and corrosive wear. Design against wear. Modes of bulk failures, excessive deformation, buckling, yielding, plastic instability, creep and creep rupture. Incremental collapse, fracture mechanics and crack propagation. Damage-tolerant design. Identification and detection of failures. Applications to some mechanical components. Case studies. Course project.									
References	Russell C. Hibbeler, Mechanics of Materials in SI Units, 10th edition, Pearson, 2018.									

Code	Name/Content	Credit Hours	Contact Hours							
			Lec.	Tut (2)	App. Tut	Lab	Stud	Off. Tut	Off. Hrs.	Total
MDPS423	Robotics Engineering	3	2	2						4
	Pre-requisites: MDPS251									
	Introduction to Robotics Technology, Robot structures and components, Kinematics and dynamics of planar robots, Kinematics of 3-D robots and homogeneous transformation, Trajectory planning and robot control methods, computer simulation and practical training. course project									
References	J. Craig, Introduction to Robotics: Mechanics and Control, 4th ed. Pearson, 2017.									