Faculty of Engineering, School of Automobile, Mechanical and Mechatronics Engineering
Department of Mechatronics Engineering
Degree: B. Tech. Mechatronics Engineering
Total Credit: 160

	Third Semester						**Fourth Semester**				
Code	**Subject Name**	**L**	**T**	**P**	**C**	**Code**	**Subject Name**	**L**	**T**	**P**	**C**
MAS21XX/ MEE22XX[i]	Engineering Economics	3	0	0	3	MAS21XX MEE22XX	Statistics & Probability	3	0	0	3
MBB21XX	Management of Technology	3	0	0	3	MCE2201	Kinematics and Dynamics of Machines	3	1	0	4
MCE2101	Linear Integrated Circuits	3	1	0	4	MCE2202	Sensors and Control Systems	3	1	0	4
MCE2102	Embedded Controllers	3	1	0	4	MCE22XX	Flexi Core 2	3	1	0	4
MCE2103	Strength of Materials	3	0	0	3	MCE22XX	Program Elective 1	3	0	0	3
MCE21XX	Flexi Core 1	3	1	0	4	MCE20XX	Open Elective 1	3	0	0	3
MCE2130	Embedded Controllers Lab	0	0	2	1	MCE2230	Sensors and Control Systems Lab	0	0	2	1
MCE2131	PLC Lab	0	0	4	2	MCE2231	Integrated Electronics Lab	0	0	2	1
MCE2170	Project-based Learning-1	0	0	2	1	MCE2270	Project-based Learning-2	0	0	2	1
	Total Contact Hours (L+T+P)	**18**	**3**	**8**	**25**		**Total Contact Hours (L+T+P)**	**18**	**3**	**6**	**24**
	Fifth Semester						**Sixth Semester**				
Code	**Subject Name**	**L**	**T**	**P**	**C**	**Code**	**Subject Name**	**L**	**T**	**P**	**C**
MCE3101	Design of Machine Elements	3	1	0	4	MCE32.0	Drives and Automation	3	1	0	4
MCE3102	Robotics	3	0	0	3	MCE32XX	Program Elective 4	3	0	0	3
MCE31XX	Flexi Core 3	3	1	0	4	MCE32XX	Program Elective 5	3	0	0	3
MCE31XX	Program Elective 2	3	0	0	3	MCE32XX	Program Elective 6	3	0	0	3
MCE31XX	Program Elective 3	3	0	0	3	MCE30XX	Open Elective 3	3	0	0	3
MCE30XX	Open Elective 2	3	0	0	3	MCE3202	Professional Practice	0	0	2	1
MCE3130	Design and Modelling Lab	0	0	2	1	MCE3230	Robotics Lab	0	0	2	1
MCE3131	Pneumatics and Hydraulics Lab	0	0	4	2	MCE3231	Drives and Automation Lab	0	0	2	1
MCE3170	Project-based Learning-3	0	0	2	1	MCE3270	Project-based Learning-4				3
	Total Contact Hours (L+T+P)	**18**	**2**	**6**	**24**		**Total Contact Hours (L+T+P)**	**15**	**1**	**6**	**22**
	Seventh Semester						**Eighth Semester**				
Code	**Subject Name**	**L**	**T**	**P**	**C**	**Code**	**Subject Name**	**L**	**T**	**P**	**C**
MCE41XX	Program Elective 7	3	0	0	3	MCE4270	Major Project				12
MCE41XX	Program Elective 8	3	0	0	3						
MCE40XX	Open Elective 4	3	0	0	3						
MCE40XX	Open Elective 5	3	0	0	3						
MCE4170	Internship (Industry or Research)	0	0	2	1						
	Total Contact Hours (L+T+P)	**12**	**0**	**2**	**13**		**Total Contact Hours (L+T+P)**	**0**	**0**	**0**	**12**

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Degree: B. Tech. Mechatronics Engineering
Total Credit: 160

List of Flexi Core Course

Flexi Core 1	Flexi Core 2	Flexi Core 3
MCE2120 Manufacturing Process CSE21XX Data Structures and Algorithms	MCE2220 Fluid Mechanics CSE22XX Object Oriented Programming	MCE3120 Flexible Manufacturing CSE31XX Relational Database Management Systems

List of Program Electives Courses			
IV	**V**	**VI**	**VII**
PE1 • MCE2240: Digital System Design • MCE2241: IOT Systems	**PE2** • MCE3140: Finite Element Methods • MCE3141: Signals and Systems • MCE3142: Drone Modelling and Control **PE3** • MCE3150: Advance Control Theory • MCE3151: Cyber-Physical System • MCE3152: Mobile Robots	**PE 4** • MCE3240: Optimal Control • MCE3241: Drone Applications • MCE3242: Building Automation **PE5** • MCE3250: MEMS and NEMS • MCE3251: Robot Path Planning and Control • MCE3252: Artificial Intelligence **PE6** • MCE3260: Wireless Sensor Networks • MCE3261: Machine Vision • MCE3262: Production and Operations Management	**PE 7** • MCE4140: Farming Automation • MCE4141: Electric Vehicles • MCE4142: Additive Manufacturing **PE8** • MCE4150: industrial IOT • MCE4151: Intelligent Systems • MCE4152: Collaborative Robots

List of Open Electives Courses	
Graded OE	**Non-Graded OE**
OE1 MCE2201: Fundamental of Robotics OE2 MCE3101: Automation in Industry OE3 MCE3201: Building Automation OE4 MCE4101: Sensor Technologies OE5 MCE4102: Smart Agriculture OE1 MCE4103: Predictive Maintenance OE2 MCE4104: Inventory and Quality Control	

[i] Statistics & Probability: CSE, AIML, SEEC students will take in 3rd semester. Engineering Economics: SIT, SCCE, All Core (-) SEEC will take in 3rd semester. In 4th semester, these courses are switched.

Faculty of Engineering, School of Automobile, Mechanical and Mechatronics Engineering
Department of Mechatronics Engineering
Degree: B. Tech. (Hons) Mechatronics Engineering
Total Credit: 178 (160 + 18*)

	Third Semester						**Fourth Semester**				
Code	**Subject Name**	**L**	**T**	**P**	**C**	**Code**	**Subject Name**	**L**	**T**	**P**	**C**
MAS21XX/ MEE22XX[i]	Engineering Economics	3	0	0	3	**MAS21XX MEE22XX**	Statistics & Probability	3	0	0	3
MBB21XX	Management of Technology	3	0	0	3	**MCE2201**	Kinematics and Dynamics of Machines	3	1	0	4
MCE2101	Linear Integrated Circuits	3	1	0	4	**MCE2202**	Sensors and Control Systems	3	1	0	4
MCE2102	Embedded Controllers	3	1	0	4	**MCE22XX**	Flexi Core 2	3	1	0	4
MCE2103	Strength of Materials	3	0	0	3	**MCE22XX**	Program Elective 1	3	0	0	3
MCE21XX	Flexi Core 1	3	1	0	4	**MCE20XX**	Open Elective 1	3	0	0	3
MCE2130	Embedded Controllers Lab	0	0	2	1	**MCE2230**	Sensors and Control Systems Lab	0	0	2	1
MCE2131	PLC Lab	0	0	4	2	**MCE2231**	Integrated Electronics Lab	0	0	2	1
MCE2170	Project-based Learning-1	0	0	2	1	**MCE2270**	Project-based Learning-2	0	0	2	1
	Total Contact Hours (L+T+P)	**18**	**3**	**8**	**25**		**Total Contact Hours (L+T+P)**	**18**	**3**	**6**	**24**
	Fifth Semester						**Sixth Semester**				
Code	**Subject Name**	**L**	**T**	**P**	**C**	**Code**	**Subject Name**	**L**	**T**	**P**	**C**
MCE3101	Design of Machine Elements	3	1	0	4	**MCE32.0**	Drives and Automation	3	1	0	4
MCE3102	Robotics	3	0	0	3	**MCE32XX**	Program Elective 4	3	0	0	3
MCE31XX	Flexi Core 3	3	1	0	4	**MCE32XX**	Program Elective 5	3	0	0	3
MCE31XX	Program Elective 2	3	0	0	3	**MCE32XX**	Program Elective 6	3	0	0	3
MCE31XX	Program Elective 3	3	0	0	3	**MCE30XX**	Open Elective 3	3	0	0	3
MCE30XX	Open Elective 2	3	0	0	3	**MCE3202**	Professional Practice	0	0	2	1
MCE3130	Design and Modelling Lab	0	0	2	1	**MCE3230**	Robotics Lab	0	0	2	1
MCE3131	Pneumatics and Hydraulics Lab	0	0	4	2	**MCE3231**	Drives and Automation Lab	0	0	2	1
MCE3170	Project-based Learning-3	0	0	2	1	**MCE3270**	Project-based Learning-4				3
MCE3181	Research Methodology				1	**MCE328X***	Honors Elective1				3
	Total Contact Hours (L+T+P)	**18**	**2**	**8**	**25**		**Total Contact Hours (L+T+P)**	**18**	**1**	**6**	**25**
	Seventh Semester						**Eighth Semester**				
Code	**Subject Name**	**L**	**T**	**P**	**C**	**Code**	**Subject Name**	**L**	**T**	**P**	**C**
MCE41XX	Program Elective 7	3	0	0	3	**MCE4270**	Major Project	0	0	0	12
MCE41XX	Program Elective 8	3	0	0	3	**MCE428X***	Honors Project	0	0	0	8
MCE40XX	Open Elective 4	3	0	0	3						
MCE40XX	Open Elective 5	3	0	0	3						
MCE4170	Internship (Industry or Research)	0	0	2	1						

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Total Credit: 178 (160 + 18*)

MCE418X*	Honors Elective 2	3	0	0	3							
MCE418X*	Honors Elective 3	3	0	0	3							
	Total Contact Hours (L+T+P)	**18**	**0**	**2**	**19**		**Total Contact Hours (L+T+P)**	**0**	**0**	**0**	**20**

List of Flexi Core Course

Flexi Core 1	Flexi Core 2	Flexi Core 3
MCE2120 Manufacturing Process CSE21XX Data Structures and Algorithms	MCE2220 Fluid Mechanics CSE22XX Object Oriented Programming	MCE3120 Flexible Manufacturing System CSE31XX Relational Database Management Systems

List of Program Electives Courses

IV	V	VI	VII
PE1 • MCE2240: Digital System Design • MCE2241: IOT Systems	**PE2** • MCE3140: Finite Element Methods • MCE3141: Signals and Systems • MCE3142: Drone Modelling and Control **PE3** • MCE3150: Advance Control Theory • MCE3151: Cyber-Physical System • MCE3152: Mobile Robots	**PE 4** • MCE3240: Optimal Control • MCE3241: Drone Applications • MCE3242: Building Automation **PE5** • MCE3250: MEMS and NEMS • MCE3251: Robot Path Planning and Control • MCE3252: Artificial Intelligence **PE6** • MCE3260: Wireless Sensor Networks • MCE3261: Machine Vision • MCE3262: Production and Operations Management	**PE 7** • MCE4140: Farming Automation • MCE4141: Electric Vehicles • MCE4142: Additive Manufacturing **PE8** • MCE4150: industrial IOT • MCE4151: Intelligent Systems • MCE4152: Collaborative Robots

List of Open Electives Courses

Graded OE	Non-Graded OE
OE1 MCE2201: Fundamental of Robotics OE2 MCE3101: Automation in Industry OE3 MCE3201: Building Automation OE4 MCE4101: Sensor Technologies OE5 MCE4102: Smart Agriculture OE1 MCE4103: Predictive Maintenance OE2 MCE4104: Inventory and Quality Control	

Faculty of Engineering, School of Automobile, Mechanical and Mechatronics Engineering
Department of Mechatronics Engineering
Degree: B. Tech. (Hons) Mechatronics Engineering
Total Credit: 178 (160 + 18*)

List of Program Electives for Hons.
VI / VII
MCE3281: Robotics and its Control – **Pre-Requisite:** Nil MCE4181: Smart Manufacturing – **Pre-Requisite:** (Manufacturing Process course offered as Flexi core -1 and Flexible Manufacturing System course offered as Flexi core -3 by Mechatronics Department) MCE4182: AI-based Controllers **Pre-Requisite:** Nil

[i] Statistics & Probability: CSE, AIML, SEEC students will take in 3rd semester. Engineering Economics: SIT, SCCE, All Core (-) SEEC will take in 3rd semester. In 4th semester, these courses are switched.

Faculty of Engineering, School of Automobile, Mechanical and Mechatronics Engineering
Department of Mechatronics Engineering
Degree: B. Tech Mechatronics Engineering with Minor Specialization in Robotics
Total Credit: 178 (160 + 18*)

List of Program Electives Program Electives for Minor Specialization

VI / VII
MCE3290: Robotics and its Control - Pre-Requisite-(**Fundamental of Robotics** course offered as OE1 by Mechatronics Department) MCE4191: Wheeled Robots, Pre-Requisite-Nil MCE4192: Advance Robotics and Applications, Pre-Requisite-Nil

Eligibility Criteria for Minor Specialization[i]

SN	**Minor Program**	**Eligible Branch of Students**	**@ Offering Department**	**Award of Degree**
1	Robotics	All (Except Mechanical Engineering and Electronics & Communication Engineering)	Mechatronics	B. Tech. in "**branch"** name with Minor in Robotics

[i] For Eligibility criteria, refer the AICTE APH.

MANIPAL UNIVERSITY JAIPUR

DEPARTMENT OF MECHATRONICS

BACHELOR OF TECHNOLOGY MECHATRONICS ENGINEERING

Batch (2023-2027)

DETAILED SYLLABUS OF SECOND YEARS

ME XXXX ENGINEERING ECONOMICS [3 0 0 3] -Common Course at FOE Not Run Through Department

MB XXXX MANAGEMENT OF TECHNOLOGY [3 0 0 3]-Common Course at FOE Not Run Through Department

MCE 2101 LINEAR INTEGRATED CIRCUITS [3 1 0 4]

Operational amplifier- Block diagram, characteristics, Open loop, and closed loop configurations. Inverting and Non-Inverting amplifier: Voltage follower, summing, scaling and averaging amplifiers, AC amplifiers; Linear applications of OPAMP Waveform Generators: Sine-wave generators, square/triangle/Saw-tooth wave generators; IC 555 timer- Monostable operation and its applications, a stable operation and its applications; Phase-locked loop and its applications, Voltage controlled oscillator, Active filters & voltage regulator-low pass filter, high pass filter, band pass filter and band reject filters, All pass filters, switched capacitor filters; Voltage regulators, linear voltage regulators using OPAMP – IC regulators (78xx, 79xx, LM 337, 723), Digital-to Analog-Conversion, Analog-to-Digital Conversion

References:

1. Roy Choudhury and Shail Jain, Linear Integrated Circuits, 6th Edition, New Age International Publishers, 2021
2. S. Salivahanan and V. S. Kanchana Bhaaskaran, Linear Integrated Circuits,Tata McGraw-Hill, 2018
3. Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 4th Edition, Prentice Hall, 2015
4. Robert F. Coughlin, Frederick F. Driscoll, Operational-Amplifiers and Linear Integrated Circuits, 6th Edition, Prentice Hall, 2001

MCE 2102 EMBEDDED CONTROLLERS [3 1 0 4]

Comparison between microprocessor and microcontroller, Introduction to embedded controllers, Architecture of microcontroller: Register Banks; Programming model, Pin diagram & details, I/O Ports & details. Assembly Language Programming: Assembler Directives, Addressing Modes, Instruction set, calculation of delay, delay programs. Timers, Counters, Serial Communication, Interrupts, Programming examples. Programming in Embedded C: Data types in embedded C, arithmetic & logic operators, control statements and loops in embedded C, functions & arrays, Hardware Interfacing: Stepper Motor, Seven Segment Display, LCD, Design of Microcontroller based systems: Introduction to other Microcontroller families (PIC, AVR and ARM).

References:

1. Muhammad Ali Mazidi, Janice Gillipse Mazidi, Rolin D. Mckinlay, 8051 Microcontroller and Embedded Systems Using Assembly and C, Pearson Education, 2010.
2. Kenneth J. Ayala, The 8051 Microcontroller and Embedded Systems using Assembly and C, Cengage Learning, 2010.
3. Ajay V. Deshmukh, Microcontrollers- Theory and Applications, Tata McGraw Hill, 2011.
4. K. Uma Rao and Andhe Pallavi, 8051 and MSP430 Microcontrollers: Architecture, Programming and Applications, Wiley, 2019

MCE 2103 STRENGTH OF MATERIAL [3 0 0 3]

Stress, Strain and Deformation of Solids: Concept of stress and strain. Deformation of simple and compound bars under axial load, Hooke's law, Stress-Strain diagrams for materials, factor of safety, Elongation of tapering bars of circular and rectangular cross sections, Saint Venant's principle, Thermal stress, Elastic constants, Strain energy, Analysis of stresses in 2D: Biaxial state of stresses, Deformation in thick & thin cylindrical and spherical shells, Stresses on inclined plane, Principal planes and stresses, Mohr's circle of biaxial stresses, Maximum shear stress. Thick and thin cylindrical shells, Spherical shells, Deformations in thick and thin cylindrical shells. Shear force and Bending Moment in Cantilever, Simply supported and Overhanging beams, Theory of simple bending, Effect of shape of beam section on stress induced with different types of loading, Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', and 'T' sections, Torsion: Analysis of torsion of circular bars, Shear stress distribution for Solid and hollow circular section, Stepped shaft, Twist and torsion stiffness, Fixed and simply supported shafts, Introduction, short and long columns. Euler's theory; Assumptions, Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.

References:

1. E. P. Popov, Engineering Mechanics of Solids, (2e), Prentice-Hall of India, New Delhi. 2015
2. S. M. A. Kazimi, Solid Mechanics, 2nd Edition, Tata McGraw-Hill, New Delhi 2017.
3. R. C. Hibler, Mechanics of Materials, Pearson, ISBN: 978:93-325-1860-5, 2014.
4. F. P. Beer, E. R. Johnston Jr., J. T. Dewolf, and D. F. Mazurek, Mechanics of Materials, 6th Edition, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2013.
5. Dr. B. C. Punamia, A. K. Jain, and A. K. Jain, SMTS-I Strength of Materials, Laxmi Publication Pvt. Ltd., 10th Edition, 2011.

MCE 2120 MANUFACTURING PROCESS [3 1 0 4]

Metal Casting Process: Classification of metal casting, Pattern Allowances, Molding Materials, Gating system design. Casting defects: Causes and remedies, Inspection of castings. Introduction to Machine Tools: Classification of machine tool, Mechanics of Metal Cutting: Principles of metal machining, cutting tools and tool materials, tool signature, mechanics of chip removal, tool wear, tool life, economics of machining. Metal Joining Processes: Principle of welding, soldering, Brazing and adhesive bonding. Classification of welding and allied processes. Resistance welding: Spot, Projection and seam welding process, atomic hydrogen, ultrasonic, Plasma and laser beam welding, Electron beam welding, and special welding process e.g. TIG, MIG, friction and explosive welding. Metal Shaping and Forming: Metal

working, Elastic and plastic deformation, Hot and cold working, Rolling, Principle and operations, Forging, Forging operations, extrusion, Wire, and tube drawing processes. Forging: Principle of forging tool design,

Reference:

1. S. Kalpakjian, and S. R. Schmid, Manufacturing Engineering and Technology, Pearson Education, 6th Edition, 2009.
2. Ghosh, and A. K. Malik, Manufacturing Science, Affiliated East West Press Pvt. Ltd., 2nd Edition, 2010.
3. P.C. Sharma, A textbook of Production Technology, S. Chand and Company, 4th Edition, 2006.
4. R. K. Jain., Production Technology: Manufacturing Processes, Technology and Automation, Khanna Publishers, 17th Edition, 2011.
5. P. N. Rao, Manufacturing Technology Volume-1, Tata McGraw-Hill Education, 4th Edition, 2013.

MCE 2130 EMBEDDED CONTROLLERS LAB [0 0 2 1]

Microcontroller: Introduction to 8051, arithmetic instructions, array handling and code conversions, bit manipulations and logic instructions, timer/counter programming, serial communication and interrupts, interfacing ADC with 8051, interfacing stepper motor with 8051, interfacing DAC with 8051, interfacing logic controller with 8051, interfacing seven segment display with 8051, interfacing LCD with 8051, implementing a traffic light controller using 8051.

References:

1. Muhammad Ali Mazidi, Janice Gillipse Mazidi, Rolin D. Mckinlay, 8051 Microcontroller and Embedded Systems Using Assembly and C, Pearson Education, 2010.
2. Myke Predko, Programming and Customizing the 8051 Microcontroller, Tata McGraw Hill, 2007.
3. Kenneth J. Ayala, The 8051 Microcontroller and Embedded Systems Using Assembly and C, Cengage Learning, 2010.
4. Krishna Kant, Microprocessors and Microcontrollers: Architecture Programming and System Design, PHI, 2013

MCE 2131 PROGRAMMABLE LOGIC CONTROLLER LAB [0 0 4 2]

Introduction of PLC, study basic components, networking and different programming technique of PLC. Study NO, NC and holding circuit programs, Implementation of Ladder program for timers, counters, math, logical and program control instructions. Study different applications using ladder logic. Analog PLC operations – Accessing Analog inputs and control analog outputs, Conveyor control Systems, Stepper Motor Control, Traffic light Control, Lift Control, Bottling Plant, Mini project.

References:

1. F. D. Petruzella, Programmable Logic Controllers, 4th edition, McGraw- Hills Publications, 2010.
2. John W. Webb and Ronald A. Reiss, Programmable logic controllers-Principle and applications, 5th edition, PHI, 2003.

3. Fassih, Alireza. A Practical Handbook to Programmable Logic Controller. United States: New Generation Publishing, 2012.
4. Bolton, William. Programmable Logic Controllers. Netherlands: Elsevier Science, 2015.
5. Siemens PLC Handbook, Siemens

MCE 2170 PROJECT BASED LEARNING-I [0 0 2 1]

Project-based learning involves students designing, developing, and constructing hands-on solutions to a problem. The educational value of Project based learning is that it aims to build students' creative capacity to work through difficult or ill-structured problems, commonly in small teams. Typically, Project based learning takes students through the following phases or steps: Identifying a problem, Agreeing on or devising a solution and potential solution path to the problem (i.e., how to achieve the solution), Designing and developing a prototype of the solution, refining the solution based on feedback from experts, instructors, and/or peers. Depending on the goals of the instructor, the size and scope of the project can vary greatly.

MA XXXX STATICS AND PROBABAILITY [3 0 0 3] Common Course at FOE Not Run Through Department

MC 2201 KINEMATICS AND DYNAMICS OF MACHINES [3 1 0 4]

Basic Concepts: Mechanism and machine, four bar mechanism, Kutzbach criterion, Grashoph's law, inversions, transmission angle, toggle position and mechanism, Mechanical advantage, snap action mechanism, indexing mechanism. Position analysis: using graphical method, algebraic method. Velocity analysis, acceleration analysis, using graphical method, analytical method, and I-Centre method. Synthesis of linkages: function generation and path generation, graphical method– two- and three-point synthesis, freudenstein's equation. Static analysis and Dynamic analysis: Equilibrium of four force members, four link mechanism, dynamically equivalent system. Gears and gear train: introduction, planetary or epicyclic gear train, differentials. Gyroscope: effect of gyroscopic couple on aeroplane, naval ship, stability of a four wheel and two-wheel drive moving in a curved path**.**

References:

1. S. S. Rattan, Theory of Machines (4e), McGraw Hill Educations, 2017
2. John J. Uicker, Theory of Machines and Mechanisms, (4e), Oxford, 2014
3. R.L Norton, Kinematics & Dynamics of Machinery, (5e), McGraw Hill Educations, 2017
4. Kevin Russell, Kinematics, and dynamics of mechanical systems Implementation in MATLAB and Sim Mechanics, (2e), 2015

MC 2230 SENSOR AND CONTROL SYSTEMS [3 1 0 4]

Sensor: Classification of sensors, Sensor calibration, Temperature Sensors, Proximity Sensors - Magnetic, Inductive, Capacitive, Optical, Range Sensors –Ultrasonic, Reflective, LIDAR. Piezo-electric sensor, Tactile sensor, Strain Gage, Hall Effect transducer, Piezo-electric sensor, Smart Sensors Film sensor, MEMS & Nano Sensors, LASER sensors, Gyroscope. Pressure, force, displacement, acceleration, vibration, weight, and flow measurement. Data acquisition and SCADA Control: Open loop-and closed loop control systems, mathematical modelling, transfer functions, Time response characteristics, stability, Frequency response analysis, Basics of control design- PID.

References:

1. Patranabis D, “Sensors and Transducers”, 2nd Edition, PHI, New Delhi, 2010.
2. D.V.S. Murty, “Transducers and Instrumentation”, Prentice Hall India.
3. Shawhney A. K. "A Course in Electrical and Electronics Measurements and Instrumentation”, DhanpatRai& Sons, 11th Ed., 1999.
4. Nagarath I. J. and Gopal M., Control System Engineering, Wiley Eastern, 2008.
5. Nise N. S., Control Systems Engineering, 6/e, Wiley Eastern, 2010.
6. Ogata K., Modern Control Engineering, Prentice Hall of India, New Delhi, 2010.

MCE XXXX FLUID MECHANICS [3 1 0 4] Common Course at School Not Run Through Department

PROGRAM ELECTIVE-I COURSES

MCE 2240 DIGITAL SYSTEM DESIGN [3 0 0 3]

Number system, Boolean algebra, Logic gates, Concept of K-Maps reduction, Design of combinational circuits: Adder, Subtractor, Encoder, Decoder, Multiplexer, Demultiplexer. Design sequential circuits by using memory elements like latches, flip-flops, Counters, Registers, Synchronous Counters, Asynchronous counters, Logic families, Analysis and Design of Finite State Machines, Sequence Generator and Sequence Detector-Lock out condition, Design examples, Basics of FPGA Architecture.

References:

1. Morris Mano, Digital design, Prentice Hall Publishers, 5th Edition, 2013.
2. Anand Kumar, Switching theory and Logic Design, PHI Learning, 3rd Edition, 2019
3. David J. Comer, Digital Logic State Machine Design, Oxford University Press, 3rd Edition, 2012
4. Samir Palnitkar, Verilog HDL: A guide to digital design and synthesis, Prentice Hall PTR, 2nd Edition, 2003

MCE 2241 INTERNET OF THINGS (IoT) SYSTEM [3 0 0 3]

Introduction to M2M communication and IoT, industrial structure for IoT, IoT system architecture, reference model, deployment and operational view, physical devices and endpoints, Communication, and networking protocols-MQTT, CoAP, Web Sockets, HTTP and AMQP protocols, IoT enabling technologies-RFID, WSN, SCADA etc., Future internet design for various IoT use cases such as smart cities, smart environments, smart homes, smart health etc.

References:

1. Holler J., Tsiatsis V., Mulligan C., Karnouskos., Boyle D., From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence (1e), Elsevier 2014.
2. Bahga A., Madisetti V., Internet of Things-A Hands on Approach (1e), Orient Blackswan Private Limited, 2015.
3. Roderick O., Marko N., Sanchez D. and Aryasomajula A., Internet of Things and Data Analytics Handbook (1e), Wiley-Blackwell, 2017.

4. Patil Y., Azure IoT Development Cookbook (1e), Packt publishing Ltd, 2017

MCE 2230 SENSOR AND CONTROL SYSTEMS LAB [0 0 2 1]

Behaviour of proximity sensors. Switching frequency and switching distance of proximity sensor. Characteristics of Temperature sensor, Strain Measurement, Displacement measurement using LVDT. Sensor data analysis using Raspberry Pi, open and close loop control, implementation of PID controller.

References:

1. Shawhney A. K. "A Course in Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai & Sons, 11th Ed., 1999.
2. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi, 2010.
3. D.V.S. Murty, "Transducers and Instrumentation", Prentice Hall India.
4. Nagarath I. J. and Gopal M., Control System Engineering, Wiley Eastern, 2008.
5. Nise N. S., Control Systems Engineering, 6/e, Wiley Eastern, 2010.
6. Ogata K., Modern Control Engineering, Prentice Hall of India, New Delhi, 2010.

MCE 2231 INTEGRATED ELECTRONICS LAB [0 0 2 1]

Analog circuit designs using 741 IC, linear applications of Op-amps: design of rectifiers, DACs and ADCs, filters, multivibrators & Schmitt trigger using 555 IC, regulators. Digital circuit designs- combinational circuit's, implementation of Boolean functions and arithmetic circuits, multiplexers, encoders, decoders, code converters, design of sequential circuits- ripple counters, shift registers and ring counters, synchronous counters, sequence detectors.

References:

1. Franco Sergio, Design with Op amps & Analog Integrated Circuits, McGraw Hill, 3rd Edition, 2001
2. M. Morris, and M. D. Ciletti, Digital design- with an introduction to the Verilog HDL, Pearson, 5th edition, 2013.

MCE 2270 PROJECT BASED LEARNING-II [0 0 2 1]

Project-based learning involves students designing, developing, and constructing hands-on solutions to a problem. The educational value of Project based learning is that it aims to build students' creative capacity to work through difficult or ill-structured problems, commonly in small teams. Typically, Project based learning takes students through the following phases or steps: Identifying a problem, agreeing on or devising a solution and potential solution path to the problem (i.e., how to achieve the solution), Designing and developing a prototype of the solution, refining the solution based on feedback from experts, instructors, and/or peers. Depending on the goals of the instructor, the size and scope of the project can vary greatly.

OPEN ELECTIVE-I COURSE

MCE 2201 FUNDAMENTALS OF ROBOTICS [3 0 0 3]

Introduction- Basics of robotics, Laws of Robotics, Different kinds of Robots, Degrees of freedom (DOF), types of movements, vertical, radial, and rotational, roll, pitch and yaw, Wok envelope, robot configuration space. Sensors- sensor classification, applications of sensors, need of sensors, selections of sensors. Actuators- transmission and drives systems, Hydraulic, Pneumatic and Electric drive systems, classification of end effectors. Automation- Types of automation, Levels of Automation, need of automation, AI- Introduction to artificial intelligence, AI techniques, Need and application of AI. Robot programming – Deferent methods of robot programming, Robot applications, future of robots.

Reference Books:

1. John J. Craig, Introduction to Robotics - Mechanics and Control, Pearson Education International, 2004.
2. S. R. Deb, Robotics Technology and Flexible Automation, 2nd Edition, McGraw Hill Education, 2012
3. M. Vidyasagar Mark W. Spong, Robot Dynamics and Control, Wiley India Private Limited, 2008
4. FU, Robotics Control Sensing Vision and Intelligence, 1st Edition, McGraw Hill Education, 2010
