Teaching and Evaluation Scheme for S Y B. Tech.

Department of Automation and Robotics Engineering

Semester: IV

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Dept. Of Automation And
Robotics Engineering
SITCOE, Yadrav

Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering
(An Autonomous Institute)
Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur

Department: Automation & Robotics Engineering   **Rev:** Course Structure/00/2022-23

Class: S.Y. B.Tech   **Semester:** IV

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
AR401	BSC	Engineering Mathematics-III	3	-	-	3	10	10	30	50	100	3
AR402	PCC	Kinematics and Theory of Machines	3	-	-	3	10	10	30	50	100	3
AR403	PCC	Microcontrollers and Embedded system	3	-	-	3	10	10	30	50	100	3
AR404	PCC	CAD CAM and Automation	3	-	-	3	10	10	30	50	100	3
AR405	PCC	Python Programming	3	-	-	3	10	10	30	50	100	3
AR406	PCC	Kinematics and Theory of Machines Laboratory	-	-	2	2	15	15	-	20	50	1
AR407	PCC	Microcontrollers and Embedded System Laboratory	-	-	2	2	15	15	-	20	50	1
AR408	PCC	CAD CAM and Automation Laboratory	-	-	2	2	15	15	-	20	50	1
AR409	PCC	Python Programming Laboratory	-	-	2	2	15	15	-	20	50	1
AR410	PCC	Principles of Robotics Laboratory	-	-	2	2	15	15	--	20	50	1
MDC02	MC	Environmental Sciences	2	-	-	2	25	25	-	-	50	Audit
HMS03	HSMC	Aptitude Skills-II	1	-	-	1	25	25	-	-	50	Audit
HMS04	HSMC	Language Skills-II	-	-	2	2	25	25	-	-	50	1
PRJ03	PROJ	Mini Project-III	-	-	2	2	25	25	-	-	50	1
IFT01	PROJ	Industrial Training/Field Training – I	-	-	-	-	-	-	-	50	50	Audit
		Total	18	-	14	32	225	225	150	400	1000	22

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Engineering Mathematics-III

AR401	BSC	Engineering Mathematics-III	3-1-0	4 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	Continuous Assessment –I :10 Marks
Tutorial: 1hr/week	Continuous Assessment –II :10 Marks
	Mid Semester Exam: 30 Marks
	End Semester Exam: 50 Marks

Pre-Requisites: Engineering Mathematics-I & II

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply the definition & properties of Laplace Transform to evaluate the integral & to find Laplace transform of elementary functions and special functions like periodic function, Dirac-delta function & unit step function.
CO2	Apply the knowledge of Laplace transformation to find solution of linear differentiation equations with constant coefficient.
CO3	Solve partial differential equations & use of separation of variable method to solve heat and Laplace equations.
CO4	Develop the concept of Fourier series expansion of different periodic functions so as to use them in harmonic analysis.
CO5	Solve problems related to Fourier transform and inverse Fourier transform.
CO6	Solve finite difference equation using Z- transform.

Course Contents:

	[8]
Unit 1: Laplace Transform Definition-condition for existence; Transform of elementary functions; Properties of Laplace Transforms-Linearity property, First shifting property, transforms of functions multiplied by t^n , transforms of function divided by t, transform of derivatives equation.	

	[7]
Unit 2: Inverse Laplace Transform Introductory remarks; Inverse Laplace transform of some elementary functions; General method of finding Inverse transforms; Partial fraction method and Convolution theorem for finding inverse Laplace transform. Application to find solution of linear differential	

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Unit 3- Z-Transform: Definition; Z-transform of basic sequences $(a^n, n, \frac{a^n}{n!}, n^2 \ for \ n \geq 0)$, properties of Z-transform. Z-transform of some standard discrete function, Inverse Z- transform by binomial expansion method, partial fraction method and convolution method	[8]
Unit 4: Interpolation and Numerical Integration Finite differences: Interpolation/extrapolation using Newton's forward and backward differences, Newton's divided differences and Lagrange's formulae, Numerical Integration: Simpson's (1/3) th rule, Simpson's (3/8) th rule, Weddle's rule	[7]
Unit 5: Correlation Introduction, Type of correlation, method of studying correlation, Karl Pearson's correlation, Spearman's rank correlation	[6]
Unit 6: Linear Regression Analysis Introduction, Linear and non- linear regression, Coefficient of regression, Lines of regression: X on Y and Y on X.	[6]

Text Books:
1. P. N. Wartikar& J. N. Wartikar, A Text Book of Applied Mathematics (Vol I & II), PuneVidyarthiGrihaPrakashan, Pune.
2. N. P. Bali, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.

Reference Books:

1. C. R. Wylie & L. C. Barrett, Advanced Engineering Mathematics, McGraw Hill Publishing Company Ltd.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publications, New Delhi.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
5. Peter O" Neil, A Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd., Singapore.

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Kinematics and Theory of Machines

AR402	PCC	Kinematics and Theory of Machines	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	Continuous Assessment –I :10 Marks
	Continuous Assessment –II :10 Marks
	Mid Semester Exam: 30 Marks
	End Semester Exam: 50 Marks

Pre-Requisites: Engineering Mechanics

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify Various links in popular mechanism.
CO2	Analyze graphically velocity and acceleration of planer mechanism.
CO3	Construct cam contour for given motion.
CO4	Recommend relevant belts and dynamometers for different applications.
CO5	Use principles of friction in designing clutch and bearings.
CO6	Explain the basics of Gear, Gear Geometry and types of gear profiles.

Course Contents:

Unit 1:Fundamentals of Kinematics and Mechanisms Classification of mechanisms, Basic kinematic concepts and definitions – Kinematic Link, Pair, Chain and its types, Types of constrained motion, Machine & Mechanism, Structure, Degrees of freedom for planer mechanism, Kutzbach and Grublers criteria, Four bar Chain mechanism, Single Slider crank chain , Double slider chain mechanism and its Kinematic inversions, Steering gear mechanisms and condition of correct steering-Davis and Ackerman Steering gear.	[8]
Unit 2: Velocity and Acceleration Analysis Concept of relative Velocity and acceleration of a point on link, angular acceleration, inter-relation between linear and angular velocity and acceleration Velocity and acceleration diagrams using relative velocity method for four bar pin jointed linkages and four bar single slider crank linkages, Velocity and acceleration of single slider crank mechanism by Klein's construction.	[7]

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	[8]
Unit 3:Cams and Followers Classification of cams and followers- Terminology and definitions- Displacement diagrams- Uniform velocity, simple harmonic motion uniform acceleration and retardation, cycloidal. Determination of cam profile based on given motion of reciprocating knife edge and roller follower with and without offset.	
Unit 4: Belts and Dynamometers Types of belt drives, Materials used for belts, advantages of V belt drive over flat beltdrive, Velocity ratio of belt drive, Slip and creep of belt, length of belt-open belt drive and cross belt drive, Power transmitted by belt, Angle of lap. Classification of dynamometers, Study of rope brake absorption dynamometer and belt transmission dynamometer.	[7]
Unit 5:Friction Introduction to friction, Types of friction, Coefficient of friction, Inclined plane, friction between nut and screw, Friction of pivot and collars, Classification of Clutches, torque transmitting capacity of plate clutch.	[6]
Unit 6: Toothed Gearing Classification of gears, Introduction to gear types- Spur, Helical, Spiral gears. Gear geometry, Theory of Spur gear in detail, Interference in involute tooth gears Path of contact, Contact ratio. Types of Gear trains - Simple, Compound, Reverted, Epicyclic gear train, Numerical on simple gear train for finding the speeds of elements in gear train, Torques in gear train.	[6]

Text Books:

1. Thomas Bevan, Theory of Machines, 3rdedition, CBS Publishers & Distributors,2005.
2. Cleghorn W.L., Mechanisms of Machines, Oxford University Press,2005.
3. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGrawHill,2009.
4. Ghosh A. and Mallick A.K., Theory of Mechanisms and Machines, Affiliated East- West Pvt. Ltd, New Delhi

Reference Books:

1 .J. E. Shigely, J. J. Uicker, "Theory of Machines and Mechanisms", Tata McGraw Hill Publications, New York, International Student Edition, 1995.
2.Thomas Beven, "Theory of Machines", CBS Publishers and Distributors, Delhi
3..Shigley, Theory of Machines and Mechanism, McGraw Hill, New York
4. G.S. Rao and R.V. Dukipatti, Theory of Machines and Mechanism, "New Age Int. Publications Ltd. New Delhi.
5.Abdullah Shariff, Theory of Machines, McGraw Hill, New Delhi
6.Shah and Jadhawani, Theory of Machines, DhanpatRai& Sons

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Microcontrollers and Embedded system

AR403	PCC	Microcontrollers and Embedded system	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	Continuous Assessment –I :10 Marks
	Continuous Assessment –II :10 Marks
	Mid Semester Exam: 30 Marks
	End Semester Exam: 50 Marks

Pre-Requisites: Digital Electronics and Microprocessor

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain architecture and addressing modes of 8051.
CO2	Explain instructions set for assembly language programs using 8051.
CO3	Develop code in Embedded to illustrate concepts of serial communication, timers, interrupts and I/O ports.
CO4	Make use of 8051 for interfacing External Peripherals.
CO5	Design 8051 Microcontroller based systems for measuring electrical and physical quantities & Motor control.
CO6	Explain Embedded Systems and Architecture of Arm Processor.

Course Contents:

	[8]
Unit 1:8051 Microcontroller Functional block diagram and pin diagram of 8051, Power supply, clock and reset circuit, Program Counter and ROM space in 8051, Program and Data Memory organization, addressing modes.	

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Unit 2: Instruction Set Instruction Set of 8051: data transfer, arithmetic and logical, program branching instructions, single bit manipulation, shift and Boolean variable manipulation, Interrupt of 8051.	[7]
Unit 3: On-Chip Peripherals And Programming Embedded Programming: Data Types, Operators Embedded Programming: Data Conversion, I/O Programming Timer/Counter: Operating Modes, Programming. UART: Operating Modes, Programming.	[7]
Unit 4: Off-Chip Peripheral Interfacing And Programming Interfacing with 8051: LED, LED pattern display, traffic light display, Switches and Matrix Keyboard, LCD, ADC 0808 with Analog Sensor, DAC and their applications	[7]
Unit 5:Design of Microcontroller Based System Voltage, Current and Frequency Measurement - DC Motor Control - Stepper Motor control - Case Studies: Arduino Board Overview - Arduino IDE - Temperature Control	[6]
Unit 6: Embedded Systems & Architecture of Arm Processor Processor Embedded into a system - Embedded Hardware units and devices in a system - Embedded Software in a System -Classification of Embedded Systems - Embedded Design Life Cycle - Design Example: Model Train Controller. ARM Embedded System - CISC and RISC Processors - ARM Architecture - Programming Model - Operating Modes.	[6]

Text Books:
1. Mazidi, "8051 microcontroller & embedded system" 3rd Edition ,Pearson
2. Mazidi, "PIC microcontroller & embedded system" 3rd Edition ,Pearson

Reference Books:

1. Soumitra Kumar Mandal "Microprocessors and Microcontrollers Architecture Programming and Interfacing using 8085, 8086 & 8051" Tata McGraw Hill Publishing Co Ltd, 1st Edition, 2011.

2. Myke Predko, "Programming and Customizing the 8051 Microcontroller", 1st Edition, 2012.

3. Chris Braith, "8051 Microcontroller Application based Introduction", Elsevier 2004.

4. Manish K Patel, "The 8051 Microcontroller Based Embedded Systems "Tata McGraw Hill Publishing Co Ltd, 1st Edition, 2014.

5. Jonathan W Valvano, "Embedded Systems: Introduction to Arm® Cortex TM-M Microcontrollers", 5th Edition, 2015.

6. Shibu K.V, "Introduction to Embedded Systems", Tata Mc Graw Hill, 1st Edition, 2009.

7. Jean J.Labrosse, "Embedded Systems Building Blocks", CMP Books, 2nd Edition, 2010.

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CAD/CAM-Automation

AR404	PCC	CAD/CAM-Automation	3-0-0	3Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	Continuous Assessment –I :10 Marks
	Continuous Assessment –II :10 Marks
	Mid Semester Exam: 30 Marks
	End Semester Exam: 50 Marks

Pre-Requisites: Engineering Graphics

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain engineering design process and its role in graphic communication process
CO2	Explain about Geometric Modeling Techniques
CO3	Illustrate the fundamentals of Numerical Control and Computer Numerical Control
CO4	Generate CNC program for Turning / Milling and generate tool path using CAM software
CO5	Explain components of different Automation strategies, FMS and robotics.
CO6	Describe the basic Finite Element procedure

Course Contents:

Unit 1: Computer Aided Design (CAD) Computer Aided Design (CAD) Hardware required for CAD: Interactive input output devices, Graphics software: general requirements and ground rules, 2-D curves like Line, Circle, etc. and their algorithms, 2-D and 3-D transformations such as Translation, Scaling, Rotation and Mirror	[6]
Unit 2: Geometric Modelling Introduction , Geometric modeling techniques ,Classification of Modelling **Wire Frame Modelling**-Cubic Splines, Bezeir Curves ,B-Splines, Wire frame model with linear edges, Wire frame model with curvilinear edges ,Merits& Demerits **Surface Modelling**-Plane Surface Curved Surface ,Types of Surface Modelling , Application of Surface Modelling ,Merits& Demerits **Solid Modelling** -Solid Modelling Primitives ,Application of Solid Modelling Merits& Demerits CSG using Boolean operations -Constructive Solid Geometry (CSG) or C-rep,	[7]

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Boundary Representation (B-rep) ,Comparison of CSG and B-rep ,Comparison of wire frame, surface and solid modeling	
Unit 3: Fundamentals of Numerical Control and Computer Numerical Control Elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system. Definition and designation of control axes, Constructional details of Numerical Control Machine Tools, MCU structure and functions, Methods of improving accuracy and productivity using NC. Computer Numerical Control (CNC): Features of CNC, Elements of CNC machines, the machine control Module for CNC, Direct Numerical Control (DNC) and Adaptive Controls.	[6]
Unit 4: Computer Aided Manufacturing (CAM) Introduction to Computer Aided Manufacturing (CAM), Coordinate system, Basic CNC Principles, G and M codes, Steps in developing CNC part program, Tool and geometric compensations, subroutine and Do loop using canned cycle. [Only theory – 2 hrs] *CNC Lathe part programming* : Linear and circular interpolation, Canned cycles for facing, threading, grooving, etc. [Theory + Program] *CNC Milling part programming* Linear and circular interpolation, Pocketing, contouring and drilling cycles. [Theory + Program]	[6]
Unit 5: Automation Automation: Introduction, Automation strategies, Types of Automation - Hard and Soft Automation, Flexible Manufacturing System, Group Technology: Introduction, Coding Methods, Concepts of Computer Integrated Manufacturing (CIM) and Computer Aided Process Planning (CAPP), Variant & Generative methods of CAPP, advantages of CAPP. [Only theory] Introduction to Material handling system, principles of material handling components of an AGVS, types of AGVS, AGVS guidance system, advantages of AGVSs over other Material handling systems	[6]
Unit 6: Finite Element Methods Introduction, Types of elements, Degrees of freedom, Field variable, Shape function, Boundary conditions, Meshing, Nodal displacements,1-D problems, Static and thermal analysis, Preprocessors – solvers – postprocessor	[7]

Text Books:

1. Ibrahim Zeid, "CAD/CAM Theory and Practice", Tata McGraw Hill Publication,

2. M. P. Grover, Zimmer, "CAD/CAM/CIM", Prentice Hall India.

Reference Books:

1. Rogers D. F. and Adams A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989.

2. Faux I. D. and Pratt M. J., Computational Geometry for Design and Manufacture, John Wiley & sons, NY, 1979

3. Mortenson M. E., Geometric Modeling, John Wiley &sons, NY, 1985

4. Choi B.K., Surface Modeling for CAD/CAM, John Wiley & Sons, NY, 1991.

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5. Mikell P. Grover, Automation, Production System and Computer Integrated Manufacturing,Prentice Hall of India Pvt Ltd, 1995.

6. C. Ray Astaihe, Robots of Manufacturing automation, John Wiley and Sons, New York

7. Jon Stenerson and Kelly Curran "Computer Numerical Control", Prentice-Hall of India Pvt. Ltd.New Delhi, 2008

8. P. N. Rao "CAD/CAM " principles and operations", Tata McGraw Hill

9. Reference Manuals of FANUC, Siemens, Mazak, etc.

10. Thomas M. Crandell "CNC Machining and Programming, Industrial Press ISBN- 0-8311-3118-7

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Python Programming

AR405	BSC	Python Programming	3-1-0	4 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	Continuous Assessment –I :10 Marks
Tutorial: 1hr/week	Continuous Assessment –II :10 Marks
	Mid Semester Exam: 30 Marks
	End Semester Exam: 50 Marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop algorithmic solutions to simple computational problems.
CO2	Explain and use Python data types and statements
CO3	Make use of control flow statements to develop python programs
CO4	Illustrate compound data typed of Python
CO5	Organize data from/to files in Python programs
CO6	Make use of Python Modules and Packages

Course Contents:

Unit 1: Algorithmic Problem Solving Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems	[8]
Unit 2: Data Types, Expressions, Statements Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, precedence of operators, comments; Illustrative programs	[7]

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Unit 3: Control Flow Statements Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs	[8]
Unit 4: Lists, Tuples And Dictionaries Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing — list comprehension; Illustrative programs	[7]
Unit 5: File Handling Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs	[6]
Unit 6: Python Modules and Packages Modules and functions, function definition and use, flow of execution, parameters and arguments Standard packages: Mathematics, Internet Access, Dates and Times, Data compression, Multithreading, GUI Programming	[6]

Text Books:
1. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
2. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Second edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/).

Reference Books:

1.Anita Goel, Ajay Mittal, Computer Fundamentals and programming in C, Pearson India Publisher, First edition, 2013.
2. John V Guttag, Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press, 2013

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3.RobertSedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

4.Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd. 2015

5.Kenneth A. Lambert, Fundamentals of Python: First Programs, CENGAGE Learning, 2012

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AR406	PCC	Kinematics and Theory of Machines Laboratory	0-0-2	1 Credits

Teaching Scheme:	Evaluation Scheme:
Practical: 2 hours/week/batch	Continuous Assessment –I :15 Marks Continuous Assessment –II :15 Marks End Semester Exam: 20 Marks

Pre-Requisites:

Course Outcomes: At the end of the course students will be able to -

CO1	Select Suitable mechanism for various applications.
CO2	Analyze graphically velocity and acceleration of planer mechanism using relative velocity method.
CO3	Draw Cam profile for specific motion.
CO4	Examine effect of slip on power transmission of belt.
CO5	Determine the torque transmitted in epicyclic gear train.

List of Experiments:

1. Identify and study of inversions of four bar chain mechanisms.

2. Study of inversions of single/double slider crank mechanisms.

3. Determine velocity and acceleration of various links in given mechanism by relative velocity method for analysis of motions of links. (Use drawing sheet)

4. Klien's construction for slider crank mechanism. (Use drawing sheet)

5. To construct cam profile for various types of follower motion. (Use drawing sheet)

6. Experiment on Slip of belt.

7. Experiment on Epicyclic Gear train.

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Text Books:

1. Thomas Bevan, Theory of Machines, 3rdedition, CBS Publishers & Distributors,2005.
2. Cleghorn W.L., Mechanisms of Machines, Oxford University Press,2005.
3. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGrawHill,2009.
4. Ghosh A. and Mallick A.K., Theory of Mechanisms and Machines, Affiliated East- West Pvt.

Ltd, New Delhi

Reference Books:

1 .J. E. Shigely, J. J. Uicker, "Theory of Machines and Mechanisms", Tata McGraw Hill
Publications, New York, International Student Edition, 1995.
2.Thomas Beven, "Theory of Machines", CBS Publishers and Distributors, Delhi
3..Shigley, Theory of Machines and Mechanism, McGraw Hill, New York
4. G.S. Rao and R.V. Dukipatti, Theory of Machines and Mechanism, "New Age Int.
Publications Ltd. New Delhi.
5.Abdullah Shariff, Theory of Machines, McGraw Hill, New Delhi
6.Shah and Jadhawani, Theory of Machines, DhanpatRai& Sons

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Microcontroller and Embedded System Laboratory

AR407	PCC	Microcontroller and Embedded System Laboratory	0-0-2	1 Credits

Teaching Scheme:	Evaluation Scheme:
Practical: 2 hours/week/batch	Continuous Assessment –I :15 Marks Continuous Assessment –II :15 Marks End Semester Exam: 20 Marks

Pre-Requisites:

Course Outcomes: At the end of the course students will be able to -

CO1	Develop 8051 Assembly Language Programs for Arithmetic, Logic, Bit manipulation, String operations.
CO2	Demonstrate an application for 8051 microcontroller using Traffic light controller, ADC & DAC interfacing boards
CO3	Demonstrate 8051 Embedded C Coding for Programming the GPIO, Timer, Interrupts & Serial Port and a system for temperature monitoring using Ardiuno target Board
CO4	Develop communication skills and capability to work in team

List of Experiments:

At least minimum 10 experiments should be performed from the following list.

Microcontroller Lab: Developing Assembly Language Programs using 8051 Microcontroller Keil simulator or Kits

- ➢ Arithmetic and Logical operations using 8051Microcontroller
- ➢ Data manipulating Operations and Delay Routines
- ➢ LED pattern display
- ➢ String operations
- ➢ Interfacing Traffic light controller
- ➢ Interfacing AC
- ➢ Interfacing DAC

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Embedded Laboratory

1. Keyboard Interfacing to 8051Microcontroller.

2. Stepper Motor Interfacing to 8051Microcontroller

3. Voltage Measurement with display Designing a voltmeter to measure voltage from 0 to 5 volts and displaying the measured value using 7 segment displays

4. Design of Water Pump Controller to sense the water level in a tank

5. Digital Clock with LCD display

64. Temperature Measurement with 7 segment display

7. PC Communication Interfacing the microcontroller to a PC through RS232 interface and displaying the messages sent by the microcontroller on the PC using Visual Basic program running in PC

8. Remote Control through FM Link Establishing an FM link between two microcontrollers for data transfer.

9. Hot Chamber Controller to maintain the temperature at the set point.

10. Obstacle Detector using ultrasonic transmitter- receiver

11. Moisture sensor and sprinkler controller design

12. Designing a lamp controller having a light sensor and a timer

Text Books:

1. Krishna Kant, ―Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096‖, PHI, 2014.

2. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinley, "The 8051 Microcontroller and Embedded Systems Using Assembly and C ", 2nd Edition, Pearson Education 2013.

3. Kenneth J. Ayala, "The 8051 Microcontroller. Architecture, Programming and Applications", 3rd Edition, West publishing company 2014

4. Andrew N.Sloss, Dominic Symes and Chris Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", Morgan Kaufmann Publishers, 1st Edition, 2004.

5. Raj Kamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw Hill, 2nd Edition, 2009

Reference Books:

1. Soumitra Kumar Mandal "Microprocessors and Microcontrollers Architecture Programming and Interfacing using 8085, 8086 & 8051" Tata McGraw Hill Publishing Co Ltd, 1st Edition, 2011.

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2. Myke Predko, "Programming and Customizing the 8051 Microcontroller", 1st Edition, 2012.

3. Chris Braith, "8051 Microcontroller Application based Introduction", Elsevier 2004.

4. Manish K Patel, "The 8051 Microcontroller Based Embedded Systems "Tata McGraw Hill Publishing Co Ltd, Ist Edition, 2014.

5. Jonathan W Valvano, "Embedded Systems: Introduction to Arm® Cortex TM-M Microcontrollers", 5th Edition, 2015.

6. Shibu K.V, "Introduction to Embedded Systems", Tata Mc Graw Hill, 1st Edition, 2009.

7. Jean J.Labrosse, "Embedded Systems Building Blocks", CMP Books, 2nd Edition, 2010.

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CAD/CAM-Automation Laboratory

AR408	PCC	CAD/CAM/CAE Laboratory	0-0-2	1 Credits

Teaching Scheme:	Evaluation Scheme:
Practical: 2 hours/week/batch	Continuous Assessment –I :15 Marks Continuous Assessment –II :15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Engg. Graphics

Course Outcomes: At the end of the course students will be able to -

CO1	Demonstrate Computer Aided Design methods and procedures
CO2	Illustrate various creating and editing commands in 3D software
CO3	Model machine parts using 3D software.
CO4	Generate Shape optimization of any mechanical component
CO5	Develop physical 3D mechanical structure using any one of the rapid prototyping
CO6	Explain concepts of finite element analysis procedures

List of Experiments:

1. Part modeling using any 3D modeling software

2. Assembly modeling of assembly or sub-assembly of engineering products using software

3. Minimum 2 Jobs (Programs) on CNC Turning operations

4. Minimum 2 Jobs (programs) on CNC Milling operation

5. Shape optimization of any mechanical component using Software

6. Write a program to generate a curve/surface

7. Development of physical 3D mechanical structure using any one of the rapid prototyping processes.

8. Minimum 2 structural analysis problems to be solved using any CAE software

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Text Books:

1. Basu, S. K. and Pal, D.K., Design of Machine Tools, Allied Publishers (2008).
2. Acherkhan, N.S., Machine Tool Design, University Press of the Pacific, (2000).
3. Boothroyd G and Knight Wiston A., Fundamentals of Machining and Machine Tools, CRC Press (2005).
4. Sharma, P. C., A Text Book of Machine Tools & Tool Design, S. Chand Limited, (2005).

Reference Books:

1. Rogers D. F. and Adams A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989.
2. Faux I. D. and Pratt M. J., Computational Geometry for Design and Manufacture, John Wiley & sons, NY, 1979
3. Mortenson M. E., Geometric Modeling, John Wiley &sons, NY, 1985
4. Choi B.K., Surface Modeling for CAD/CAM, John Wiley & Sons, NY, 1991.
5. Mikell P. Grover, Automation, Production System and Computer Integrated Manufacturing,Prentice Hall of India Pvt Ltd, 1995.
6. C. Ray Astaihe, Robots of Manufacturing automation, John Wiley and Sons, New York.
7. Jon Stenerson and Kelly Curran "Computer Numerical Control", Prentice-Hall of India Pvt. Ltd.New Delhi, 2008
8. P. N. Rao "CAD/Cam principles and operations", Tata McGraw Hill
9. Reference Manuals of FANUC, Siemens, Mazak, etc.
10. Thomas M. Crandell "CNC Machining and Programming, Industrial Press ISBN- 0-8311-3118-7

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AR409	PCC	Python Programming Laboratory	0-0-2	1 Credits

Teaching Scheme:	Evaluation Scheme:
Practical: 2 hours/week/batch	Continuous Assessment –I :15 Marks Continuous Assessment –II :15 Marks End Semester Exam: 20 Marks

Pre-Requisites:

Course Outcomes: At the end of the course students will be able to -

CO1	Test and debug simple Python programs.
CO2	Make use of conditionals in Python programs
CO3	Develop Python programs step-wise by using functions, packages, modules.
CO4	Apply Python lists, tuples, dictionaries for representing compound data.

List of Experiments:

1 Syntax basics, Arithmetic/String Operations, Input/Output

2. Control Flow constructs: If-else, Relational and Logical Operators

3. Iteration: While loop, For loop

 4. Collections: Lits, Tuples

5. Collections: Sets, Dictionary

6. Functions and Modules:sys, math, time

7. File Handling: Data streams, Access modes, Read/Write/Seek

8. Exception handling: hierarchy, raise, assert

Text Books:

1.Exploring Python, Timothy Budd, Mc Graw Hill Publication, ISBN:9780073523378, August 2010

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2. Beginning Python, Peter C. Norton, Alex Samuel, Dave Aitel, Eric Foster-Johnson, Leonard Richardson, Jason Diamond, Aleatha Parker, Michael Roberts, ISBN: 978- 0-7645-9654-4, August 2005.

Reference Books:

1. Python: Create - Modify - Reuse, James O. Knowlton, Wrox Publication, ISBN: 978-0-470-25932-0, July 2008.

2. Professional Python Frameworks: Web 2.0 Programming, Dana Moore, Raymond Budd, William Wright, Wrox Publication, ISBN: 978-0-470-13809-0, October 2007.

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Principle of Robotics Laboratory

AR410	PCC	Principle of Robotics Laboratory	0-0-2	1 Credits

Teaching Scheme:	Evaluation Scheme:
Practical: 2 hours/week/batch	Continuous Assessment –I :15 Marks Continuous Assessment –II :15 Marks End Semester Exam: 20 Marks

Pre-Requisites:

Course Outcomes: At the end of the course students will be able to -

CO1	Demonstrate analysis of robot manipulators.
CO2	Illustrate the functionality and limitations of robot actuators.
CO3	Develop program a robot to perform a specified task in a target environment and solve problems in areas such as robot control and navigation.

List of Experiments:

At least minimum 8 experiments should be performed from the following list

1. Determination of maximum and minimum position of links.

2. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system (simulate different motion commands for given system)

3. Estimation of accuracy, repeatability and resolution.

4. Robot programming and simulation for pick and place

5. Robot programming and simulation for specific movement of the tool

6. Robot programming and simulation for palletizing the object

7. Robot programming and simulation for identification color and shape

8. Robot programming and simulation for any industrial process (Packaging, Assembly)

10. Demonstration of various robotic configurations using industrial robot

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11. Demonstration components of a real robot and its DH parameters.

12. simulate different end effectors for given system

12 One Industrial visit for Industrial robotic application or Case study for robots in automobile Industry

Text Books:

1. Groover, M.P. Weiss, M. Nagel, R.N. & Odrey, N.G., Ashish Dutta, Industrial Robotics, Technology, Programming & Applications, Tata McGraw Hill Education Pvt. Ltd. New Delhi

2. S. R. Deb, Robotics Technology and Flexible Automation, Tata McGraw Hill.

3. Groover M.P.-Automation, production systems and computer integrated manufacturing-Prentice Hall of India.

Reference Books:

1. S B Niku, Introduction to Robotics, Analysis, Control, Applications, 2nd Edition, Wiley Publication, 2015.

2. Mikell P. Groover, Automation, Production Systems & Computer Integrated Manufacturing, PHI Learning Pvt. Ltd. , New Delhi, ISBN:987-81-203-3418-2, 2012

3. John Craig, Introduction to Robotics, Mechanics and Control, 3rd Edition, Pearson Education, 2009

4. R K Mittal & I. J. Nagrath, Robotics and Control, McGraw Hill Publication, 2015.

5. Mike Wilson, Implementation of Robotic Systems, ISBN: 978-0-124-04733-4

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Environmental Sciences

MDC02	MC	Environmental Sciences	2-0-0	Audit

Teaching Scheme:	Examination Scheme:
Lecture: 2 hrs/week	Continues Assessment 1: 25 Marks Continues Assessment 2: 25 Marks

Pre-Requisites: NA

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain various natural resources and associated Problems
CO2	Summarize various ecosystems
CO3	Explain the importance of conservation of biodiversity and its importance in balancing the earth.
CO4	Recognize various causes of environmental pollution along with various protection acts in India to limit the pollution
CO5	Extract the information based of field study and prepare a report.

Course Contents:

Unit 1: Nature of Environmental Studies: Definition, scope and importance, Multidisciplinary nature of environmental studies. Need for public awareness.	[2]
Unit 2: Natural Resources and Associated Problems: a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Energy resources: Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. e) Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification. f) Role of individuals in conservation of natural resources	[6]

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Unit 3: Ecosystems: Concept of an eco-system. Structure and function of an ecosystem. Producers, consumers and de composers. Energy flow in the eco system. Ecological succession. Food chain etc. in concern with forest ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with Grassland ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with Desert ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with various aquatic ecosystems	**[4]**
Unit 4: Biodiversity: Introduction- Definition: genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Various approaches for the conservation of biodiversity.	**[4]**
Unit 5: Environmental Pollution and Environmental Protection: Definition: Causes, effects and control measures of various types of pollution. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Concept of sustainable development: From Unsustainable to Sustainable development, Various environmental Protection Acts and their scope.	**[4]**
Unit 6: Field Work: The student should Visit to a local area to document environmental Assets-River/Forest/Grassland/Hill/Mountain. Or Visit to a local polluted site - Urban / Rural / Industrial /Agricultural. Or Study of common plants, insects, birds. or Study of simple ecosystems - ponds, river, hill slopes, etc. **The student should expect to do this activity in a group size of 4-5 and prepare and submit a report on it.**	**[4]**

Text/Reference Books:

1. Agarwal, K.C.2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India, Email:mapin@icenet.net
3. Brunner R.C.,1989, Hazardous Waste Incineration, McGraw Hill Inc.480p

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Aptitude Skills–II

HMS03	HSMC	Aptitude Skills- II	1-0-0	Audit

Teaching Scheme:	Examination Scheme:
Lecture: 1 hrs/week	Continues Assessment 1: 25 Marks Continues Assessment 2: 25 Marks

Pre-Requisites: Communication Skills, Aptitude Skills- I

Verbal Ability (12Hrs) (Compulsory)

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand basic concepts of sentences and its structure
CO2	Understand the tenses and its use in daily life
CO3	Explain basic uses of speeches and voices in day to day life
CO4	Understand the use of modal verbs in sentence construction
CO5	Summarize various Phrases, Idioms and Proverbs
CO6	Summarize different words used in daily life

Unit 1: English Grammar Structure and Types of Sentence, Conditional Sentences	[2]
Unit 2: Tenses Present tense, Past tense, Future tense, Use of Tenses in Sentence forming	[2]
Unit 3: Speeches and Voices Direct and Indirect Speech, Active and Passive Voice	[2]
Unit 4: Modal Use of Modal verbs in Sentence Forming, Substitution and Elimination	[2]
Unit 5: Proverbs, Idioms and Phrases Use of Proverbs, Idioms and Phrases in Sentence Construction, Judgment and Inference Sentence	[2]
Unit 6: Vocabulary Vocabulary Building in Various Situations	[2]

Text Books:
   1.   Raymond Murphy, Essential English Grammar with Answers, Murphy
 	
   2. Objective General English by R.S. Aggarwal, S Chand Publishing; Revised edition (15	

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March 2017)

Reference Books:

1. Rao N, D, V,Prasada, Wren & Martin High School English Grammar and Composition Book, S Chand Publishing, 2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press;Second edition

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Language Skills- II

HMS04	HSMC	Language Skills- II	0-0-2	1 Credit

Teaching Scheme:	Examination Scheme:
Practical: 2 hrs/week	Continuous Assessment –I :25 Marks Continuous Assessment –II :25 Marks

Pre-Requisites: Communication Skills, Language Skills- I

Languages (Any One)

C Programming (Technical Language) (24Hrs)

Syllabus for C Programming

Course Outcomes: At the end of the course, students will be able to:

CO1	Illustrate the concept of Function Types, and its type
CO2	Make use of Structures and Unions.
CO3	Make use of Pointers
CO4	Illustrate the concept of File handling in C programming.

Unit 1: Function Editing, Basic of functions, Types of functions, returning non-integers external variables, scope rules, Recursion Function.	[6]
Unit 2: Structures and Unions Variable Defining a Structure, Advantage of Structure, Size of Structure, Arrays of Structures, Structures and Functions, Defining Unions.	[6]
Unit 3: Pointers Pointers to integers, characters, floats, arrays, structures.	[6]
Unit 4: File handling Initializing Introduction to dynamic memory allocation- Malloc, Calloc, Realloc, Introduction to file management, Opening/Closing a file, Input/ Output operations on Files, Error handling during I/O Operations.	[6]

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Text Books

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22 August 2013)
2. C Programming Language 2nd Edition, Pearson Publication

Reference Books

1. C: The Complete Reference, McGraw Hill Education; 4th edition (1 July 2017)
2. C Programming in easy steps, 5th Edition, In Easy Steps Limited
3. The C Programming Language, Second Edition, By PearsonEducation India(1 January 2015)

Foreign Languages (Any One)

Japanese Language Course I (12Hrs)

Course Outcomes: At the end of the course, students will be able to:

CO1	Converse in Standard Japanese to perform basic communicative tasks (e.g., exchange greetings/personal information, give time/directions/daily activities)
CO2	Make use of Japanese vocabulary effectively.
CO3	Demonstrate reading comprehension.

Course Contents:

Unit 1: Basic communicative tasks Learning expressions involving "---ni---gaimasu" pattern, Introduction of counters, simple translations, Communicative situations—shopping, Grammar: Introduction of adjectives, na-adjectives	[4]
Unit 2: Communicative situations Time relations, Communicative situations-confirming schedules etc, Particles and their functional use in Japanese sentences, Reading comprehension—a story	[4]
Unit 3: Easy conversation Introduction of past tense aspect in r/o verbs, and adjectives, Communicative situation: asking questions and answering, Easy conversation, Overall revision, and discussion	[4]

Text Book:

1. NetzwerkArbetisbuch A1 Goyal Publisher.
2. "The Everything Learning German Book: Speak, Write and Understand Basic German in No Time" by Ed Swick
3. "German Made Simple: Learn to Speak and Understand German Quickly and Easily" by Eugene Jackson and Adolph Geiger

Reference Books

1. "Hammer's German Grammar and Usage" (Fifth Edition) by Professor Martin Durrell
2. "Learn German with Stories: Café in Berlin" by André Klein

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Foreign Languages

German Language Course I (12Hrs)

Course Outcomes: At the end of the course, students will be able to:

CO1	Introduce herself or himself in German.
CO2	Understand alphabets, numbers in German language
CO3	Make basic and easy sentences required in day to day situations
CO4	Read, write, speak and listen basic and simple text in German.

Unit 1: Introduce oneself Introduction, Greetings, German Alphabets, Numbers (1 -100), Giving and asking Information related to numbers	[3]
Unit 2: Formal and Informal form Difference between Formal and Informal form, Personal Pronouns, verb conjugation	[3]
Unit 3: Everyday situations Learning about the things in the classroom, Definite, indefinite, negative articles, Possessive Articles of all the nouns	[3]
Unit 4: Simple activities Watch timings learning, Routine activities	[3]
Text Books 1. NetzwerkArbetisbuch A1 Goyal Publisher 2. "The Everything Learning German Book: Speak, Write and Understand Basic German in No Time" by Ed Swick 3. "German Made Simple: Learn to Speak and Understand German Quickly and Easily" by Eugene Jackson and Adolph Geiger	
Reference Books 1. "Hammer's German Grammar and Usage" (Fifth Edition) by Professor Martin Durrell 2. "Learn German with Stories: Café in Berlin" by André Klein	

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Mini Project -III

PRJ03	PROJ	Mini Project III	0-0-2	1 Credit

Teaching Scheme:	Examination Scheme:
Practical: 2 hrs/week	Continuous Assessment –I :25 Marks
	Continuous Assessment –II :25 Marks

Pre-Requisites: NA

Course Outcomes: At the end of the course, students will be able to:

CO1	Select the appropriate method for solving the problem
CO2	Make use of various engineering techniques and tools to give a solution
CO3	Justify the method/tools used to develop the solution.
CO4	Demonstrate tangible solutions to the problem
CO5	Describe the solution with the help of a project report and presentation.

The project is a part of addressing societal and industrial needs. Mini project is one of the platforms that students will use to solve real-world challenges. This course focuses on the selection of methods/engineering tools/analytical techniques for problem-solving. Through this course, students gain a thorough understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills, and responsibility.

Guidelines

1. Every student shall undertake the Mini project activity for semester IV.
2. The same group of minimum three and maximum of five students who were working for mini project II should work together in Mini project III
3. The students have to work on different approaches and finalize the best methodology to solve the problem in consultation with the project guide.
4. The students should use different tools /Techniques for the development of the solution to the problem.
5. While developing solutions, the student can take care of effective use of resources, follow ethical practices, finance management,
6. The solution should be optimal, affordable, user-friendly and environment friendly.
7. Critically analysis and testing of the solution provided.

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8. By using IPR, students should reserve their rights of innovations as well as communicate new findings to society with the help of research papers.

The committee of senior faculty members and a project guide will be appointed to monitor the progress and continuous evaluation of each project. The assessment shall be done jointly by the guide and committee members.

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Field Training /Industrial Training

IFT01	PROJ	Field training /Industrial training	0-0-0	Audit

Teaching Scheme:	Examination Scheme:
	End Semester Exam: 50 Marks

Course Description:-

Internship / Training is educational and career development opportunity, providing practical experience in a field or discipline. At the end of the fourth semester, every student should undergo practical training in an industry / professional organization / Research laboratory with the prior approval of the HoD/TPO/Principal of the college and submit the report along with the completion certification from the Industry/ Organization. The report will be evaluated during the fifth semester by the department.

Course Outcomes: Students will be able to

CO1	Verify the Technical knowledge in real industrial situations
CO2	Develop interpersonal communication skills.
CO3	Discuss activities and functions of the industry in which the Internship/training has done.
CO4	Write the technical report

Prerequisite: - Basics of (Programme) Engineering, Good written and Oral Communication.

Guideline for Students:-

1. Arrive at work as per schedule, ready to work and stay for the agreed upon time.
2. Present yourself in a professional manner at all times, including being appropriately dressed at workplace.
3. Communicate any concerns with your supervisor and the internship/Training coordinator in a timely manner and respectfully.
4. Demonstrate enthusiasm and interest in what you are doing, ask questions and take the initiative as appropriate.
5. Complete and submit assigned tasks by designated timelines. Meet all deadlines.

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Student's Diary/ Daily Log

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the SITCOE immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

• Regularity in maintenance of the diary.
• Adequacy & quality of information recorded.
• Drawings, sketches and data recorded.
• Thought process and recording techniques used.
• Organization of the information.

Internship Report

After completingthe internship, the student should prepare a comprehensive report to indicate what he/she has observed and learned in the training period. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The competent authority should sign the training report. The Internship report should be evaluated on the basis of following criteria:

i. Originality.
ii. Adequacy and purposeful write-up.
iii. Organization, format, drawings, sketches, style, language etc.
iv. Variety and relevance of learning experience.
v. Practical applications, relationships with basic theory and concepts taught in the course.

Evaluation of Internship/Training

The student should be evaluated based on his training report and presentation, before an expert committee constituted by the concerned department as per norms. The evaluation will be based on the following criteria:

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- Quality of content presented.

- Proper planning for presentation.

- Effectiveness of presentation.

- Depth of knowledge and skills.

- Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.

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