B.Tech (Mechatronics)

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL					
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHERS ASSESSMENT	END SEM UNIVERSITY EXAM	TEACHERS ASSESSMENT	Th	T	P	CREDITS
BTMT601		SCADA	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To know about the types of transducers and display systems associated with it.
2. To understand the function of Data Acquisition system .
3. To gain information about data acquisition, data logging and application of sensors in condition based monitoring.
4. To learn about communication devices used in Data Acquisition system .

Course Outcomes (COs):

The students will be able to

1. Identify different elements of SCADA.
2. Interpret the functionality of various elements of SCADA.
3. Control process parameters of given process using SCADA

SYLLABUS

Unit-I **7hr**

Introduction to SCADA and PLC: SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.

Unit II **8hr**

SCADA system components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server.

Unit-III **8hr**

SCADA Architecture-Various SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.

Unit-IV **9hr**

SCADA Communication-Various industrial communication technologies- wired and wireless methods and fiber optics, open standard communication protocols.

Unit-V **10hr**

Operation and control of interconnected power system-Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation.

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SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises.

Text Books:

1. M Stuart A Boyer: SCADA supervisory control and data acquisition.
2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols.

Reference Books

1. Green, J. N, Wilson, R, "Control and Automation of Electric Power Distribution Systems", Taylor and Francis, 2007

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
BTME510		CNC MACHINING TECHNOLOGY	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

Use of CNC machine tools has become very common in the manufacturing industries(A)A lot of developments have taken place in the CNC machine tools thanks to the developments in the microprocessors and electronics(B)The main objective of the course is to provide the student with an understanding of the construction of the modern CNC machine tools and their programming methods (C) In the programming (D)effort will be made to develop some of the industry standard programming methods such as those used for Fanuc controls (E)In the end the student should be able to develop reasonably complex programs using either manual or computer aided part programming methods.

Course Outcomes (COs):

After completion of this course the students are expected to be able to

1. Understand evolution and principle of CNC machine tools
2. Describe constructional features of CNC machine tools
3. Explain drives and positional transducers used in CNC machine tools
4. Write simple programs for CNC turning and machining centers
5. Generate CNC programs for popular CNC controllers
6. Describe tooling and work holding devices for CNC machine tools

Syllabus

Unit - I

INTRODUCTION TO CNC MACHINE TOOLS:

Evolution of CNC Technology, principles, features, advantages, applications, CNC and DNC concept, classification of CNC Machines – turning centre, machining centre, grinding machine, EDM, types of control systems, CNC controllers, characteristics, interpolators– Computer Aided Inspection.

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Unit - II

STRUCTURE OF CNC MACHINE TOOL:

CNC Machine building, structural details, configuration and design, guide ways – Friction, Anti friction and other types of guide ways, elements used to convert the rotary motion to a linear motion – Screw and nut, recirculating ball screw, planetary roller screw, recirculating roller screw, rack and pinion, spindle assembly, torque transmission elements – gears, timing belts, flexible couplings, Bearings.

Unit - III

DRIVES AND CONTROLS:

Spindle drives – DC shunt motor, 3 phase AC induction motor, feed drives –stepper motor, servo principle, DC and AC servomotors, Open loop and closed loop control, Axis measuring system – synchrony, synchrony-resolver, gratings, moiré fringe gratings, encoders, inductosysn, laser interferometer.

Unit - IV

CNC PROGRAMMING:

Coordinate system, structure of a part program, G & M Codes, tool length compensation, cutter radius and tool nose radius compensation, do loops, subroutines, canned cycles, mirror image, parametric programming, machining cycles, programming for machining centre and turning centre for well-known controllers such as Fanuc, Heidenhain, Sinumerik etc., generation of CNC codes from CAM packages.

Unit-V

TOOLING AND WORK HOLDING DEVICES:

Introduction to cutting tool materials – Carbides, Ceramics, CBN, PCD–inserts classification-PMK, NSH, qualified, semi qualified and preset tooling, tooling system for Machining centre and Turning centre, work holding devices for rotating and fixed work parts, economics of CNC, maintenance of CNC machines.

References

1. *Radhakrishnan P, "Computer Numerical Control Machines", New Central Book Agency, 2002.*
2. *Rao P.N., "CAD/CAM", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2002.*
3. *HMT, "Mechatronics", Tata McGraw-Hill Publishing Company Limited, New Delhi.*
4. *Warren Seamers, "Computer Numeric Control", Fourth Edition, Thomson Delmar, 2002*
5. *James Madison, "CNC Machining Hand Book", Industrial Press Inc., 1996.*
6. *Ken Evans, John Polywka & Stanley Gabrel, "Programming of CNC Machines", Second Edition, Industrial Press Inc, New York, 2002*
7. *Peter Smid, "CNC Programming Hand book", Industrial Press Inc., 2000*
8. *Berry Leathan – Jones, "Introduction to Computer Numerical Control", Pitman, London, 1987.*

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List of Experiments

1. Preparatory activity:
   a. Collect mechanical components manufactured on CNC machines and show difference compared to conventional machining
   b. Identify operations on those components.
   c. Prepare conventional process plan for at least two components.
2. Demonstrate constructional features and modes of operations of CNC
3. Demonstrate inserts, holders and tool management systems.
4. Develop and simulate CNC turning part program (at least five) and identify errors and manufacture on CNC turning machine.
5. Develop and simulate CNC milling part program (at least five) and identify errors and manufacture on CNC milling machine.
6. Prepare part program with CAD/ CAM software (like master cam, NX) and interface with CNC machine.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment *	END SEM University Exam	Teachers Assessment *				
BTMT602		Mechatronics System Design	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To present architecture of the mechatronics system design
2. To study on broad spectrum characteristics of the mechanical and electrical actuators. and their selection for mechatronic systems.
3. Development of process plan and templates for design of mechatronic systems.

Course Outcomes (COs):

On completion of the course the students will be able to:

1. Interface sensor and actuator for a mechatronic system.
2. Indigenously design and develop a mechatronic system.
3. handle Motion control of driver and motion converter.

SYLLABUS

UNIT-I 8hr

Introduction to mechatronics systems. Basic building blocks of mechatronic systems. Mechatronics key elements, Mechatronics in home, office and industry automation, Scope of Mechatronics. Advantages of Mechatronics, pre- requisites for Mechatronics

UNIT-II 9hr

Mechanical translation and rotational systems, Fluid systems, guide ways, Mechanism used in mechatronics (High resolution scanning mechanisms, Indexing mechanisms), compliant mechanisms, Assembly techniques, Hydraulic and pneumatic actuators, micro actuators. Piezoelectric actuators.

UNIT-III 10hr

Electrical systems, Electrical actuators, brushless permanent magnet DC motor, Interfacing of DC motors, stepper motor, interfacing of stepper motors, AC servomotor, Drive selection and its applications. Analog to Digital Conversion, Digital to Analog conversion. Performance characteristics of sensors and transducers. Selection criteria for sensors and actuators, interfacing of sensors and actuators.

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UNIT-IV **10hr**

Generalized Mechatronics Design Process: Recognition of the Need, Conceptual Design and Functional Specification, First principle Modular Mathematical Modeling, Sensor and Actuator Selection, Drivers for Actuators, Control System Design, Design Optimization, Prototyping Hardware in-the- loop Simulation, Deployment/Life Cycle, Deployment of Embedded Software.

UNIT-V **8hr**

Real Time Interfacing: Real time interface – Introduction, Elements of a data acquisition and Control system, overview of I/O process, installation of I/O card and software – Installation of the application software – over framing.

Text Books:

1. **Alciatore, David G., Histand,** Introduction to Mechatronics and Measurement Systems, Tata McGraw-Hill,4th edition,2011.
2. Ahmad Smaili & Fouad Mrad, Applied Mechatronics, OXFORD university press,2008
3. Devdas Shetty & Richard A. Kolk, Mechatronics System Design, 2nd edition CENGAGE Learning India ,2012.
4. Bolton, Mechatronics – Electronic Control Systems in Mechanical and Electrical Engineering, 2nd Edition, Addison Wesly Longman Ltd., 1999.

Reference Books:

1. Dan Necsulescu, Mechatronics, 1st edition, Pearson education, published 2015.
2. Bolton W. , Electronic Control Systems in Mechanical Engineering,5th edition, Pearson eduaction ,2011
3. Singh M.D & Joshi J.G.,Mechatronics, 1st edition,PHI,2006
4. Krassimir Georgiev,Modeling and Design of Mechatronic Systems, VDM Verlag, 2010.

List Of Experiments:

1. To study of mechatronics systems and elements of mechatronics systems.
2. To study and analysis of Mechatronics products and systems in manufacturing.
3. To perform various PLC Ladder logics through Siemens PLC kit and Step-7 Micro/Win software.
4. To design and develop networks for control valve study on H- simulator and P- simulator
5. To perform experiment using Electro pneumatic kit.
6. To perform function of X-Y table and conveyer belt using PLC interface with PC.
7. Analysis of Speed control stepper and servo motor using micro processor kit.
8. Design program for Pic and Place Robot.
9. To make ladder logic for Automatic door opening and closing.
10. To study and perform control valves function on electro pneumatic trainer kit.

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
BTME511		THERMODYNAMICS PRINCIPLES AND APPLICATIONS	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):
(A)To gain knowledge of Basic Concepts of thermodynamics. (B)To study of First law of Thermodynamics. (C)To gain knowledge of Second law of thermodynamics. (D)To gain knowledge of Entropy and Entropy. (E)To study of Gas Power cycles. (F)To study of Properties of gases and gas mixtures.

Course Outcomes (COs):
After learning the course, the students should be able to

1. Understand basic terms used in thermodynamics.
2. Understand laws of thermodynamics and its applications.
3. Comprehend the concept and applications of energy, entropy and exergy.
4. Understand various gas and vapor power cycles.
5. Understand the properties of gas mixtures.

Syllabus
Unit - I
Basic Concepts: Microscopic & macroscopic point of view, thermodynamic system and control volume, thermodynamic properties, processes and cycles, work and heat, Thermodynamic equilibrium, Quasi-static process, work transfer and heat transfer processes.
First law of Thermodynamics: First law for a closed system undergoing a cycle and change of state, energy, PMM1, first law of thermodynamics for steady flow process, steady flow energy equation applied to nozzle, diffuser, boiler, turbine, compressor, pump, heat exchanger and throttling process, filling and emptying process.

Unit – II
Second law of thermodynamics: Limitations of first law of thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, PMM2, causes of irreversibility, Carnot theorem, corollary of Carnot theorem, thermodynamic temperature scale.

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Unit – III

Entropy: Clausius theorem, property of entropy, inequality of Clausius, entropy change in an irreversible process, principle of increase of entropy, entropy change for non-flow and flow processes, third law of thermodynamics.

Unit - IV

Energy: Energy of a heat input in a cycle, exergy destruction in heat transfer process, exergy of finite heat capacity body, exergy of closed and steady flow system, irreversibility and GouyStodola theorem and its applications, second law efficiency.

Unit-V

Gas Power cycles: Recapitulation of Carnot, Otto and Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles, air standard efficiency, mean effective pressure, brake thermal efficiency, relative efficiency, Brayton cycle, effect of reheat, regeneration, intercooling and turbine and compressor efficiency on Brayton cycle.

Properties of gases and gas mixtures: Avogadro's law, equation of state, ideal gas equation, Vander Waal's equation, reduced properties, law of corresponding states, compressibility chart, Gibbs-Dalton law, internal energy; enthalpy and specific heat of gas mixtures.

Reference Books:

1. *Engineering Thermodynamics by P.K. Nag, McGraw-Hill Education.*
2. *Fundamentals of Thermodynamics by Borgnakke & Sonntag, 7th Ed. Wiley India (P) Ltd.*
3. *Thermodynamics – Engineering Approach by Yunus Cengel & Boles, McGraw-Hill Education.*
4. *Engineering Thermodynamics by Gordon Rogers and Yon Mayhew, Pearson Education Ltd.*
5. *Engineering Thermodynamics by Krieth, CRC Press.*
6. *Engineering Thermodynamics by Jones and Dugan, PHI Learning Pvt. Ltd*

List of Experiments:

1. Study of positive displacement work (PdV work) and Heat transfer for various processes.
2. Study of First Law of Thermodynamic.
3. Study of second Law of thermodynamic.
4. Determination of efficiency of Otto cycle.
5. Determination of efficiency of Diesel cycle.
6. Study of Properties of gases and gas mixtures.
7. Study of entropy of system.
8. Study of steady flow energy equation applied to nozzle, diffuser, boiler, turbine, compressor, pump, heat exchanger and throttling process.

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COURSE CODE	Category	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS502	-	Operating System	60	20	20	30	20	3	1	2	5

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES
The student will have ability to:
1. To learn the fundamentals of Operating Systems.
2. To study the mechanisms of Operating System to handle processes and threads and their communication.
3. To gain knowledge of process management concepts that includes architecture, Mutual exclusion algorithms, deadlock detection and recovery algorithms.
4. To learn the mechanisms involved in memory management in Operating System.
5. To know the components and management aspects of disc scheduling.

COURSE OUTCOMES
Upon completion of the subject, students will be able to:
1. To describe the detail structure of Operating System.
2. To design and Implement Process management Techniques in Operating System.
3. To calculate CPU Scheduling criteria.
4. To understand The Memory Management of Operating System.
5. To elaborate Disc Scheduling.

SYLLABUS

UNIT–I
Introduction to Operating System
Introduction and need of operating system, layered architecture/logical structure of operating system, Type of OS(Multiprogramming , Time Sharing, Real Time ,Networked, Distributed, Clustered, Hand Held), operating system as resource manager and virtual machine, OS services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader.

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Threads- processes versus threads, threading, concepts, models, kernel & user level threads, thread usage, benefits, multithreading models.

UNIT–II

Process Management:- Process model, creation, termination, states & transitions, hierarchy, context switching, process implementation, process control block, Basic System calls- Linux & Windows.
Basic concepts, classification, CPU and I/O bound, CPU scheduler- short, medium, long-term, dispatcher, scheduling:- preemptive and non-preemptive, Static and Dynamic Priority Criteria/Goals/Performance Metrics, scheduling algorithms- FCFS, SJFS, shortest remaining time, Round robin, Priority scheduling, multilevel queue scheduling, multilevel feedback queue scheduling.

UNIT–III

Interprocess communication- Introduction to message passing, Race condition, critical section problem, Peterson's solution, semaphore, classical problems of synchronization Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem, Sleeping Barber Problem etc... **Deadlock-** System model, resource types, deadlock problem, deadlock characterization, methods for deadlock handling, deadlock prevention, Deadlock Avoidance: Banker's algorithm, deadlock detection, recovery from deadlock.

UNIT–IV

Memory management- concepts, functions, logical and physical address space, address binding, degree of multiprogramming, swapping, static & dynamic loading- creating a load module, loading, static & dynamic linking, shared libraries, memory allocation schemes- first fit, next fit, best fit, worst fit and quick fit. Free space management- bitmap, link list/free list.
Virtual Memory- concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation, demand paging ,working set model, page fault frequency, thrashing, page replacement algorithms- optimal, FIFO,LRU; Bleady's anomaly; TLB (translation look aside buffer).

UNIT–V

File Management- concepts, naming, attributes, operations, types, structure, file organization & access (Sequential, Direct ,Index Sequential) methods, memory mapped files, directory structures one level, two level, hierarchical/tree, acyclic graph, general graph, file system mounting, file sharing, path name, directory operations, overview of file system in Linux & windows.
Input/output subsystems- concepts, functions/goals, input/output devices- block and character, spooling, disk structure & operation, disk attachment, disk storage capacity, disk scheduling algorithm- FCFS, SSTF, scan scheduling, C-scan schedule.

TEXT BOOKS:

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1. Abraham Silberschatz," Operating system concepts",7th,John Willey & Sons. INC, 2005
2. Andrew S.Tannanbaum, "Modern operating system", 3rd,Pearson Education, 2009
3. Dhananjay M. Dhamdhere, "Operating Systems:A concept Based Approach", 3rd TMH, 2012,
4. SibsankarHaldar, Alex AlagarsamyAravind," Operating System", 8th ,Pearson Education India,, 2010,

REFERENCES:

1. Achyut S Godbole," Operating System",,3rd TMH,2010.
2. William Stalling, "operating system" 7th, Pearson Education, ,2012.
3. Vijay Shukla, "Operating System", 3rd, Kataria& Sons ,2010.
4. Singhal& Shivratri," Advanced Concept in Operating Systems", TataMc-Graw Hill Education, edition 2001.

LIST OF EXPERIMENTS: (At least 10 based on Syllabus)

1. Study of BIOS, Bootstrap Program & System calls.
2. Study of Process Life Cycle.
3. Implement First Come First Serve CPU Scheduling.
4. Implement Non Preemptive Priority CPU Scheduling.
5. Implement Non Preemptive Shortest Job first CPU Scheduling.
6. Implement Preemptive Shortest Job first CPU Scheduling.
7. Implement Preemptive Priority CPU Scheduling.
8. Implement Round-Robin CPU scheduling.
9. Write a program to implement Semaphore.
10. Design and implement Deadlock Avoidance algorithm; Banker's Algorithm.
11. Write a program for Memory Management Algorithms e.g. First Fit, Best Fit, Worst Fit.
12. Demonstrate Virtual memory Techniques like, LRU, FIFO etc.
13. Implement First Come-First Serve Disk Scheduling Algorithm.
14. Implement Shortest Seek Time First Disk Scheduling Algorithm.
15. Implement Scan Scheduling Disk Scheduling Algorithm.
16. Implement Circular Scan Disk Scheduling Algorithm.
17. Implement Look Disk Scheduling Algorithm.

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SEMESTER V

COURSE CODE	Category	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTIT502		COMPUTER NETWORKS	60	20	20	30	20	3	1	2	5

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.

COURSE OUTCOMES:

1. Independently understand basic computer network technology.
2. Understand and explain Data Communications System and its components.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
5. Identify the different types of network devices and their functions within a network
6. Understand and building the skills of sub netting and routing mechanisms.

SYLLABUS

UNIT–I

Computer Network: Definitions, goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISO-OSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Network standardization.

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SEMESTER V

UNIT–II

Data Link Layer: Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Bit oriented protocols: SDLC, HDLC, BISYNC, LAP and LAPB.

UNIT–III

MAC Sublayer: MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted-ALOHA), CSMA/CA, CSMA/CD Ethernet, token bus, token ring, (IEEE 802.3, IEEE 802.4, IEEE 802.5)

UNIT–IV

Network Layer: Need, Services Provided , Design issues, Routing and congestion in network layer, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multi cast Routing. IP protocol, IP Addresses, Subneeting, Comparative study of IPv4 & IPv6, Mobile IP.

UNIT–V

Transport Layer: Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management .Session layer: Authentication, Authorisation, Session layer protocol. Presentation layer: Data conversion, Encryption and Decryption, Presentation layer protocol (LPP, Telnet, X.25 packet Assembler/Disassembler).Application Layer: WWW and HTTP, FTP, SSH, Email (SMTP, MIME, IMAP), DNS, Network Management (SNMP).

TEXT BOOKS:

1. "Computer Networks" Andrew S. Tanenbaum, David J. Wetherall ,Pearson Education.

REFERENCES:

1. "Networking Fundamentals", Kaveh Pahlavan, Prashant Krishnamurthy,Wiley Publication.
2. "Data communication and networking", Forouzan, TMH 4th edition
3. "Computer Communications & Networking Technologies" Michael A. Gallo & William M. Hancock Cengage pearsen publications

LIST OF EXPERIMENTS

1. Study of Different Types of Network Equipment"s.
2. Color coding standard of CAT 5, 6, 7 and crimping of cable in RJ-45.
3. LAN installations and Configurations.

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SEMESTER V

4. Study of basic network command and Network configuration commands.
5. Study of network IP.
6. Write a program to implement various types of error correcting techniques.
7. Write a program to implement various types of farming methods.
8. Study of Tool Command Language (TCL).
9. Study and Installation of Standard Network Simulator: N.S-2.
10. Implement & simulate various types of routing algorithm.
11. Study & Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.
12. Simulate STOP AND WAIT Protocols on NS-2.
13. Simulate various Routing Protocol on NS-2.
14. Simulate various Network Topologies on NS-2.
15. Configuring routers, bridges and switches and gateway on NS-2.

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B.Tech (Mechatronics)

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTMT611		Robotics and Automation	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objective: To impart knowledge of:

1. The Area of Robotics & Automation Engineering.
2. Basic concepts of robotics and automation.
3. Ethical implications of the field of robotics.
4.

Course Outcomes:

Upon completion of the course, Students will be able to understand:

1. The basic concepts of robotics and automation.
2. The history and direction of the field of robotics.
3. The ethical implications of the field of robotics.
4. The basic components in most robots.
5. About the field of Robotics and Automation.

SYLLABUS

UNIT-I **10hr**

Introduction of Robotics: Definition, Classification of Robots, Geometric classification and control classification. Robot Elements: Drive systems, Control systems, sensors, End effectors, Gripper actuators and gripper design. Robot drives and power transmission system, Robot drive mechanisms.

UNIT -II **12hr**

Robot Coordinate Systems and Manipulator Kinematics: Representation, Transformation, Homogeneous transforms and its inverse. Manipulators Kinematics, Parameters of links and joints, Kinematic Chain, Dynamics of kinematic chains, Trajectory planning and control, Advanced techniques of kinematics.

UNIT -III **12hr**

Robot Control: Fundamental principles, Classification, Robot Programming: Level of robot programming, Language based programming, task level programming, robot programming for foundry, press work and heat treatment, welding, machine tools, material handling, warehousing assembly, etc., Collision free motion planning.

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UNIT -IV **09hr**

Introduction: Automated Manufacturing System, Reasons of Automation, levels of automations, Types of Automations.
Industrial Robotics and Mechatronics System: Introduction, Robot Anatomy and Related Attributes, Robot Control Systems, End Effectors, Sensors in Robotics, Industrial Robot Applications, Robot Programming overview.

UNIT -V **10hr**

Pneumatic System Design: Introduction, pneumatics system components, pneumatics actuators, application of pneumatics system in automation. Hydraulics System Design: Introduction, Hydraulic system components, hydraulic actuators, application of hydraulic system in automation.

Text Books:

1. Deb, Sankha "Robotics Technology and Flexible Automation", Tata McGraw Hill,2010
2. John J.Craig , "Introduction to Robotics", Pearson, 2009.
3. Mikell P.Groover et. al., "Industrial Robots -Technology, Programming and Applications",
4. McGraw Hill, New York, 2008.

Reference Books:

1. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P. groover, P.H.I. Learning Private Limited 2007.
2. Hydraulics and Pneumatics by Andrew Parr, JAICO Publishing Home, Ahmedabad 2010. Industrial Automation and Robotics by Er. A. K. Gupta and S. K. Arora, University Science Press, Laxmi Publishing Pvt. Ltd.2007
3. Robotics and Control by R. K. Mittal and I. J. Nagrath, McGraw Hill Education (India) 2009.
4. Robotic Technology (Vol. I-V) Phillipe Collet Prentice Hall India,2005.
5. Robotics K.S. Fu, R.C. Gonzalez & CSG Lee New york McGraw Hill International,1987.

List Of Experiments

1. Study of different types of robots based on configuration and application.
2. Study of different type of links and joints used in robots.
3. Study of components of robots with drive system and end effectors.
4. Determination of maximum and minimum position of links.
5. Verification of transformation (Position and orientation) with respect to gripper and world
6. Estimation of accuracy, repeatability and resolution.
7. Various Robot programming exercises.
8. Control of speed, direction and number of revolutions of a stepper motor using PC/PLC.
9. Development of an obstacle avoidance robot using servo motors, ultrasonic and touch

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Sensors.

10. Controlling a variable speed drive through PLC/SCADA.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEI603		Process Control Engineering	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;

***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

Student should understand and analyze process control & Instrumentation engineering problems.

Course Outcomes (COs):

Student will be able to

1. Describe dynamics of various processes.
2. Learn and analyze the effect of various control actions.
3. Impart knowledge on the final control elements.
4. Know evaluation criteria and tuning techniques of controllers.
5. Understand and explain the concept of ladder logics on PLC.

Syllabus

UNIT-I **8hr**

Basic concept and objectives of process control, types of control & their application. Concept of automatic control & its classification, Degree of freedom, Classification of variables, Process characteristics, Process lag, load disturbance and its effects - Self regulating, interacting and non-interacting process.

UNIT-II **10hr**

Control Modes: Definition, Characteristics and comparison of on-off, proportional, integral, Derivative, PI, PD, PID, Methods of controller tuning, Ziegler-Nichols continuous cycling, Cohen-Coon Method.

UNIT-III **8hr**

Realization of PID controllers: Electronic controllers, Hydraulic controllers & Pneumatic controllers.

Unit-4 **10hr**

Actuators: Hydraulic, Pneumatic actuators, Solenoid, E-P converters, control valves, Types, Functions, Quick opening, Linear and equal percentage valve, valve application and selection, Control valve sizing.

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Unit-5 **8hr**

Introduction to advanced control system like Cascade, Feed forward, Ratio, Selective, Override, Split range and Auctioneering control, Introduction to PLC and its basic ladder logic.

Text Books:-

1. Curtis.D. Johnson, "Process control Instrumentation Technology "Prentice Hall Inc., 2007.
2. Bella G. Liptak,"Process control and Optimization", Instrument Engineers Handbook, volume 2,CRC Press and ISA,2005
3. D.E.Seborg, T.F.Edger, and D.A.Millichamp, 'Process Dynamics and Control', John Wiley and Sons, II Edition, 2004.

Reference Books:

1. D.R. Coughanour,., "Process system analysis and control", McGraw-Hill International, 2nd Edition 2004.
2. D.P. Eckman,"Automatic Process controls "John Willey, 7th Edition, and newYork1990.
3. D.M Consedine," Process Instruments and control Handbook", Second Edition, McGraw Hills, 1999.
4. Peter Harriott, "Process Control", Tata McGraw Hill, New Delhi, 1985.
5. Shinskey, "Process Control Systems", 4th Edition, McGraw Hill, Singapore, 1996.
6. C.A.Smith and A.B.Corripio, 'Principle and Practice of Automatic Process Control', John Wiley and Sons, 1985.

List of Experiments:

1. Experimental analysis of PID controller response on a level loop.
2. Controlling of Temperature of water by continuous controllers (P, I, D, PI, PD, PI D).
3. Designing of continuous electronics controllers, (P, I, D, PI, PD, PI D).
4. Performance of Electro - Pneumatic Trainer kit and Pneumatic control valves.
5. Performance of P to I converter and it's Interfacing to electro-pneumatic kit.
6. Performance of I to P converter and it's Interfacing to electro-pneumatic kit.
7. Design of PLC and ladder diagram programming.
8. Controlling of Bottling plant through PLC.
9. Perform Controlling of Water level through PLC.
10. Implementation of traffic light control through PLC.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHERS ASSESSMENT	END SEM UNIVERSITY EXAM	TEACHERS ASSESSMENT				
BTEC606		Technical Communication and Soft Skills	0	0	50	0	0	1	0	0	1

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A – Quiz/Assignment/Attendance, MST Mid Sem. Test.

***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To give students introduction of Information design and development.
2. To provide students understanding of Technical writing.
3. To introduce students to carrier planning.
4. To make student aware of Ethics in Industries.

Course Outcomes (COs):

The students will be able to:

1. Design different technical documents.
2. To set goals for carrier planning.
3. To correlate Ethics with Industrial environment.

SYLLABUS

UNIT I **3hr**

Information Design and Development: Different kinds of technical documents, Information development life cycle, Organization structures, Information design and writing for print and for online media.

UNIT II **4hr**

Technical Writing, Grammar and Editing: Technical writing process, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language, study of advanced grammar

UNIT III **3hr**

Self Development and Assessment: Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning.

UNIT IV **3hr**

Communication and Technical Writing: Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, official notes, business letters.

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UNIT V **3hr**

Ethics: Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs.

Text Books:

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey.New
2. York, 2004
3. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN0312406843)
4. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
5. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.

References:

1. Dale Jungk, Applied Writing for Technicians, McGraw Hill,New York, 2004. (ISBN:07828357-4)
2. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
3. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
BTME -512	DCS	CAD MODELING & MECHANISM LAB	-	-	-	30	20	0	0	2	1

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
Q/A – Quiz/Assignment/Attendance, MST Mid Sem Test.

Course Objectives:-

- ✓ The primary objective of the course is to Describe the Design concepts With the help of computer Application .
- ✓ This course Provides comprehensive Knowledge of computer applications including geometric, Modeling , Assemblies of parts and Mechanism concepts.

Course Outcomes:-

- ✓ Student will be able to understand the various Design concepts with the help of computer application.
- ✓ Students would be able to get familiarized with the computer graphics application in design and understand the basic 2D & 3D commands of CAD and distinguish the CAD from manual paper drafting, in current industrial & product development scenarios.
- ✓ Students would be able to understand the Solid and Assembly modeling tools to develop virtual product for manufacturing in various experiments & real life.
- ✓ On completion of this course the students will be able to acquire knowledge of the applications of computers in design, parts creation & assembling, mechanism and manufacturing activity.

Course Contents:-

Unit-I Introduction to Design Concepts

Introduction to CAD , Why CAD Software ,Scope, objective, benefit , limitation & evaluation Engineering design, Engineering Design process, Types of designs, Considerations of a good design, Formulation of the design problem, Importance, Conceptual Design, Product Design Cycle, Total life cycle, Digital Prototyping, Product development today.

Unit-II GRAPHICS FUNDAMENTALS

Definition, Software configuration of a Graphic system, Functions of a Graphics package, CAD Interface , Coordinate system , Creating Basic Drawings, Creating Additional Drawing Objects, Altering Objects, Drawing Organization and Inquiry Commands, Modify and Manipulating Objects, Construction and Reference Geometry, Hatching Objects, Utility Commands, Layers & Blocks, Text, Table & Dimensions , Introducing Printing, Plotting, and Layouts. Mechanical tolerance: Tolerance concepts, Geometric tolerance, Types of geometric tolerances, Location tolerances, Drafting practices in dimensioning and Tolerance.

Unit-III GEOMETRIC MODELING

Introduction of Geometric Modeling , Types of models, Construction of 3D Solid Primitives , Create 3D Solids from Objects, Extrude , Revolve, Sweep, Loft , Combine or Slice 3D Objects, Move Rotate & Scale 3D Objects,

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Object Sectioning , Save and Publish Section Objects Wire frame Models, Wire frame Entities.

Unit-IV PARTS ASSEMBLY , MECHANISM , VISUALIZATION & GRAPHICS STANDARDS
Mechanical Assembly: Introduction, Assembly Creation Methods , Design for Assembly (DFA)
Assembly Modeling - Parts Modeling & Representation, Generation of Assembling Sequences - Precedence Diagram, Assembly Constraints, Mechanism & Mechanism Analysis, Connections, Servo & Force Motors, Mass Properties, Creating Visual styles, Materials and Texture, Light Effect , Camera & Animation.
Data exchange standards – IGES – STEP – CALS – DXF – STL

References

1) *PTC Creo Parametric 3.0 for Designers, Author Tickoo S, Textbooks Published by BPB*
2) *SOLIDWORKS 2017 for Designers, Author Tickoo S, Textbooks Published by BPB*
3) *CATIA V5-6R2016 for Designers, Author Tickoo S, Textbooks Published by BPB*
4) *Autodesk Inventor Professional 2017 for Designers, Author Tickoo S, Textbooks Published by BPB*
5) *AutoCAD Electrical 2017 for Electrical Control Designers, Author Tickoo S, Textbooks Published by BPB*
6) *NX 11.0 for Designers, Author Tickoo S, Textbooks Published by BPB*
7) *Micheal E. Mortenson, Geometric Modeling, Wiley, 1997.*
8) *CAD/CAM Computer Aided Design and Manufacturing by Mikell P. Groover and Emory W. Zimmer, Jr.*
9) *Introduction to Engineering Design, McGraw Hill.*
10) *Learning Autodesk Alias Design 2016, Author Tickoo S, Workbooks Published by BPB*

List of Experiments

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.
2. Layout drawing of a building using different layer and line colours indicating all Building details. Name the details using text commands, Make a title Block.
3. To Draw Orthographic projection Drawings (Front, Top and side) of safety valve, knuckle joint, cotter joint & Plummer block etc.
4. Make an Isometric dimensioned drawing from orthographic drawings.
5. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion.
6. Draw 3D models by extruding, revolve, sweep, loft & other 3D Modelling commands in Auto-CAD.
7. Assembly drawing using CAD Software's.

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