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B.Tech. Electronics and Instrumentation

SUBJECT CODE	CAEGORY	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
BTEI601		**Biomedical Instrumentation**	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:

1. It gives the introductory idea about human physiology system which is very important with respect to design consideration
2. With widespread use and requirements of medical instruments, knowledge of the principle of operation of biomedical instruments.
3. It attempts to render a broad and modern account of biomedical instruments.

Course Outcome:

1. Students will have a clear knowledge about human physiology system.
2. They will have knowledge of the principle operation of biomedical instruments
3. Student will be able to understand the design and the background knowledge of biomedical instruments and specific applications of biomedical engineering.

UNIT-I **12hr**

Bioelectric Signals and Electrodes: Bio-potentials and their origin: ECG, EEG, EMG, ENG, ERG, EOG, MEG. Bio-potential electrodes, generalized medical instrumentation system-Man machine interface.

UNIT-II **8hr**

Diagnostic Equipments: ECG: normal and abnormal waveform, diagnosis interpretation, ECG leads connections, Einthoven triangle, Plethysmography, Blood pressure measurement: direct and indirect methods, Cardiac output measurements, Phonocardiography. Respiratory volume measurement, Impedance pneumograph, EEG: signal amplitudes and frequency bands, EEG machine, Blood-cell counter, Pulse oximeters.

UNIT-III **10hr**

Therapeutic Equipments: Heart lung machine, Dialyzers: basic principle of dialysis, different types of dialyzer, membranes, portable type. Cardiac pacemakers: external and Implantable pacemaker. Cardiac defibrillator: DC defibrillator, implantable defibrillator and defibrillator analyzer. Short wave diathermy, microwave diathermy, ultrasonic therapy unit.

UNIT-IV **12hr**

Imaging Instruments: Digital X-Rays: Principles and production of soft and hard x-rays, Scattered

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radiation, Image intensifier, Radiation detectors, X-ray Computerized Tomography (X-ray CT) –imaging modes and types.
Magnetic Resonance Imaging (MRI): Physics of nuclear magnetic resonance, T1and T2 relaxation time, spin-echo sequences.
Ultrasound and other Techniques: Propagation of ultrasound waves in fluids, solids and tissue. Doppler Effect, Ultrasonic transducers and instrumentation, modes of ultrasonic imaging

UNIT-V **8hr**

Patient Safety: Electric shock hazards, leakage currents, electrical safety analyzer, testing of biomedical equipments. Calibration and testing of biomedical equipments.

List of Experiment

1. Study of various types of electrodes.
2. Measure blood pressure using sphygmomanometer.
3. Measure respiration rate using respiration rate-meter
4. Measure body temperature using analog and digital thermometer.
5. Identify various leads selector network of ECG machine.
6. Obtain Lead –I, II, III, aVr , aVl , V1 … v6 type of ECG.
7. Demonstrate the Performance of EMG.
8. Demonstration of Phono-cardiograph machine.
9. EEG Alpha RMS Derivation – **(VIRTUAL Lab IIT Roorkee)**
10. EEG Entropy Calculation -**(VIRTUAL Lab IIT Roorkee)**

Text Books:

1. R.S.Khandpur, "Handbook of Biomedical Instrumentation", TMH Third Edition 2014.
2. Cromwell, "Biomedical Instrumentation and Measurements", Prentice Hall of India, New Delhi, 2007

Reference Books:

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education India, Delhi, 2004.
2. Webster, "Medical Instrumentation – Application & Design," John Wiley and sons Inc, Netherlands, 2009.
3. Arumugam.M. "Biomedical Instrumentation", Anuradha Agencies Publishers, Kumbakonam, 2006.

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
BTEI602		Advanced Microcontrollers & Embedded 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 Educational Objectives (CEOs):

1. To gain knowledge of Advanced microcontrollers.
2. To learn the programming skills of Advanced microcontrollers & development of assembly level programs.
3. To learn the concepts of Embedded system and RTOS.

Course Outcomes (COs):

The students will be able to

1. Apply the concept of buses, microcontroller architecture and interrupts.
2. Implement assembly language programming/ C programming.
4. Design microcontroller based small system
5. Use concepts of RTOS.

Syllabus

UNIT – 1 **8hr**

ARM

Introduction, RISC architecture ,ARM architecture, Registers set ,Processor modes, Addressing modes, Instruction set ,The thumb instruction set, Salient features of ARM processor family-ARM7 /ARM9/ ARM9E/ ARM10/ ARM11,Basic ARM Assembly language program.

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UNIT - 2

MOTOROLA 68HC11 MICRO CONTROLLERS **8hr**

Architecture, Instructions and addressing modes, Interrupt system, Parallel I/O ports ,Real time clock ,Programmable timer, Input capture, Out compare, Assembly Language programming

UNIT - 3

PIC MICRO CONTROLLER **9hr**

CPU Architecture, Harvard Architecture and Pipelining, Registers, Addressing modes ,Instruction set ,Interrupts ,Timers , I/O port expansion , Assembly Language programming

UNIT - 4

EMBEDDED SYSTEM **10hr**

Introduction, Classification of Embedded system, Survey of software architectures- Round-Robin, Round Robin with Interrupts, Function- Queue- Scheduling Architecture, Assembler ,Compiler ,Cross compilers and Integrated Development Environment (IDE), Debugging strategies, Simulators.

UNIT – 5

RTOS **10hr**

Introduction ,Task and Task States, tasks and data, semaphores and shared Data Operating system Services, Message queues, Mailboxes & Pipes ,Timer Function ,Events, Memory Management, Interrupt Routines in an RTOS environment, basic design Using RTOS.

Text Books:

1. ARM System Developer's Guide Designing and Optimizing System Software by by Andrew Sloss , Dominic Symes , Chris Wright , Morgan Kaufmann ,2004

2.Design with PIC Micro controller by John B Peat man, Pearson education 2008

3.An Embedded Software Primer by David E.Simon, Pearson Education, 2004.(Reprint 2010)

Reference Books:

1. Microcontrollers Architecture, programming, interfacing and system design by Rajkamal Pearson education,2007
2. ARM system–on–chip architecture by Steave Furber, Addison Wesley, 2000.

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List of Experiment:

1. Introduction to IDE and Assembler directives.
2. Develop Assembly language programs for Arithmetic and Logical Instructions.
3. Assembly language programming for block data transfer between internal and external memory including overlapping blocks.
4. Implement Assembly language programs for code conversions
5. I/O port programming in embedded C.
6. Timers and Counters programming in embedded C for time delay and frequency measurement.
7. Digital clock programming using 7-segment display in embedded C.
8. Programming of LCD in embedded C.
9. Programming of keyboard in embedded C.
10. Controlling of DC motor using controller..

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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-1 **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-2 **10hr.**

Control Modes: Definition, Characteristics and comparison of on-off, proportional, integral,

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Derivative, PI, PD, PID, Methods of controller tuning, Ziegler-Nichols continuous cycling, Cohen-Coon Method.

Unit-3 **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.

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.

Process Control Laboratory

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.

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.

REFERENCES:-

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,

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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.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Term Two Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEI604		Digital Image Processing	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. To understand the fundamentals of digital image processing.
2. To create awareness about various types of Image transform used in digital image processing.
3. To give knowledge about the different types of Image enhancement techniques used in digital image processing.
4. Aware of the Image compression and Segmentation used in digital image processing.

COURSE OUTCOMES

Student will be able to:

1. Understand origin and use of digital image processing.
2. Explain the image fundamentals and mathematical transforms necessary for image processing.
3. Apply the image enhancement, compression, and restoration techniques.
4. Implement the image segmentation and representation techniques.

Unit I **8hr**

Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Relationships between pixels. Image Transforms: 2-D FFT, Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, K-L Transform.

Unit II **11hr**

Gray level transformations, Histogram processing, Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filtering. Frequency Domain: Introduction to Fourier Transform, Smoothing and Sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters.

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Unit III **10hr**

Image Restoration: Model of Image Degradation/restoration process, Noise models, Inverse filtering, Least mean square filtering, Constrained least mean square filtering, Blind image restoration, Pseudo inverse, Singular value decomposition.

Unit IV **12hr**

Image Segmentation: Edge detection, Edge linking via Hough transform, Thresholding, Region based segmentation, Region growing, Region splitting and Merging, Segmentation by morphological watersheds basic concepts, Dam construction, Watershed segmentation algorithm.

UNIT V **10hr**

Need for data compression, Huffman coding, Run Length Encoding, JPEG standard, MPEG. Variable length coding, LZW coding, Bit plane coding, predictive coding.

Color Imaging: Color fundamentals, Color models, Color transformation, Smoothing and Sharpening, Color segmentation

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", 4th Edition, Pearson, 2018.
2. Wilhelm Burger, "Principles of Digital Image Processing: Advanced Methods", 2012.

References:

1. Rafael C. Gonzalez, Richard E. Woods & Steven L. Eddins, "Digital Image Processing using MATLAB", 2nd Edition, 2010.
2. Munesh Chandra Trivedi, "Digital Image Processing", 1st Edition, 2014.
3. Ikvinderpal Singh, "Digital Image Processing", 1st Edition, 2015.
4. Ashish Jain, "Digital Image Processing (Implementation Using MATLAB)", 2012.

List of Experiments:

1. Study of Matlab Image processing Toolbox.
2. Analysis of Pixel distance measurement Methods
3. Implementation of Image Input Output Techniques.
4. Perform Image representation Techniques.
5. Analysis of Image Display Techniques.
6. Perform Image reshaping Techniques.
7. Implementation Image filtering Techniques.
8. Analysis of Image Compression.
9. Analysis of Image Segmentation.
10. Analysis of Image Restoration.

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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;
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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;
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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					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
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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B.Tech (Electronics and Instrumentation)

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
BTEI611	Elective	Data Acquisition System	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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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. Summarize the working and construction of sensors measuring various physical parameters.
2. Outline operations of various data acquisition and transmission systems.
3. Distinguish smart sensors from normal sensors by their operation and construction.
4. Classify various sensing methods used in condition monitoring.

SYLLABUS

UNIT-I **7hr.**

Introduction to Display System: Seven segment, Dot matrix, Multiplexed, Code converter, LCD(construction ,principle), Plasma and vapor displays. Nixie Tube and its principle, OLED , Discharge tubes, application of display systems , interfacing with LED, interfacing with LCD.

UNIT- II **10hr.**

Recorders: Galvanometric type, Null type, Potentiometer type, Strip Chart and circular charttype ,Magnetic tape recorder, principle & operation, Digital tape recorders, Optical storage disk, recorders

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applications in data acquisition system. Computer control introduction: Need of computer in a control system-Functional block diagram of a computer control system-Data loggers- Supervisory computer control.

UNIT-III **12hr.**

General Telemetric Systems: land line & RF telemetry, voltage, current and Position telemetry with feedback mechanism, RF telemetry, Amplitude modulation , Frequency modulation , Pulse modulation, pulse amplitude modulation, pulse code modulation, Microwave channels, Radio ink, Transmitting and receiving antenna, telemetry with time and frequency division multiplexing, telemetry hardware.

UNIT-IV **12hr.**

Data Acquisition System(DAS): single channel and multi channel, SuperVisory control and data acquisition system(SCADA), data acquisition system around microprocessor, micro controller & PC, Introduction to PLC: Evolution of PLC's – Sequential and programmable controllers – Architecture-Programming of PLC – Relay
logic – Ladder logic,and its IEEE standard..

UNIT-V **10hr.**

Requirement of communication networks of PLC – connecting PLC to computer – Interlocks and alarms - Case
study of Tank level control system, Data transfer techniques: DMA controller and data transfer in DMA mode, Serial data transmission methods, RS - 232C: specifications connection and timing , RS-422,RS-423 applications GPIB/IEEE-488 standard digital interface use, parallel communication applications in DAS, Local Area networks and its standard, Universal serial bus design with its application , Foundation –Fieldbus, ModBus, TCP/IP.

TEXT BOOK

1. Murty D V S, "Transducers & Instrumentation", PHI, New Delhi (2016)
2. Sawhney A K, "Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai and Sons.(2015)

REFERENCE BOOKS

1. Mathivanan N "Microprocessor PC Hardware and interfacing", PHI, New delhi
2. H S Kalsi " Electronic Instrumentation" TMH, New delhi (2012)
3. Patranabis-Principles of Industrial Instrumentation 3rd Ed., TMH(2009)
4. D.Roy Choudhury and Shail B.Jain, Linear Integrated circuits, New age International Pvt. Ltd, 2003.

LIST OF EXPERIMENT

1. To learn about basics of LabView and its HMI(Human Machine Interface).
2. To Study the Various Palettes Used in LabView to create virtual instruments.

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3. To perform and Study of Creation of Virtual Instruments, (Creation of Random Wave Analyzer.)
4. Implement Virtual Instrument (Random Wave Analyzer)& Control its Wave plot Speed by adding Time Delay.
5. Develop Virtual Instrument (Random Plot Analyzer) and Also add a function that will calculate the mean values of Plot.
6. Design a HMI of PLC using LabView.
7. Develop HMI using LabView for Fahrenheit (°F) to Celsius (°C).
8. Design a table to create data logging.
9. Write a program for table of 2 using loop.
10. Design a HMI to display sine wave

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B.Tech. (Electronics and Instrumentation)

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				
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;
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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

Information Design and Development: Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

Unit II

Technical Writing, Grammar and Editing: Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Hunan factors, Managing technical communication projects, time estimation, Single sourcing, Localization.

Unit III

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

Unit IV

Communication and Technical Writing: Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports,

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project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

Unit V

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, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

Text Books:

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

Reference Books:

Dale Jungk, Applied Writing for Technicians, McGraw Hill,New York, 2004. (ISBN:07828357-4)

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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