JAWAHARLAL NEHRU TECHNLOGICAL UNIVERSITY HYDERABAD
M.TECH. (MECHATRONICS)

EFFECTIVE FROM ACADEMIC YEAR 2019- 20 ADMITTED BATCH

R19 COURSE STRUCTURE AND SYLLABUS

I Year I Semester

Course Code	Course Title	L	T	P	Credits
Professional Core - I	Applied Industrial Pneumatics	3	0	0	3
Professional Core - II	Applied Industrial Hydraulics	3	0	0	3
Professional Elective - I	1. Industrial Electrical & Electronics 2. Programmable Logic Controller & Applications 3. Artificial Intelligence	3	0	0	3
Professional Elective - II	1. Instrumentation & Sensor Technology 2. Control Systems 3. Micro-controller & Applications	3	0	0	3
MC	Research Methodology & IPR	2	0	0	2
Lab - I	Pneumatics Lab	0	0	4	2
Lab - II	Hydraulics Lab	0	0	4	2
Audit - I	Audit Course- I	2	0	0	0
	Total Credits	**16**	**0**	**8**	**18**

I Year II Semester

Course Code	Course Title	L	T	P	Credits
Professional Core - III	Advanced CNC Technologies	3	0	0	3
Professional Core - IV	Industrial Robotics	3	0	0	3
Professional Elective - III	1. Fuzzy Logic & Neural Networks 2. Manufacturing Systems: Simulation Modelling & Analysis 3. Additive Manufacturing Technologies	3	0	0	3
Professional Elective - IV	1. Automation in Manufacturing 2. MEMS 3. Design for Manufacturing & Assembly	3	0	0	3
	Mini Project with Seminar	0	0	4	2
Lab - III	CNC Lab	0	0	4	2
Lab - IV	Robotics Lab	0	0	4	2
Audit - II	Audit Course- II	2	0	0	0
	Total Credits	**14**	**0**	**12**	**18**

Audit Course I & II:

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (MECHATRONICS)

APPLIED INDUSTRIAL PNEUMATICS (Professional Core- I)

UNIT-I:
Merits of Fluid power & its utility for increasing productivity through Low Cost Automation, Transmission of Fluid Power through various types of Cylinders), Symbolic representation of Pneumatic elements (CETOP), Compressors and Air supply system including airline installations, signaling & control system.

UNIT-II:
Pneumatic control elements (control valves & remote control system), Basic pneumatic circuits for controlling single & double acting cylinder, Basic pneumatic circuits, Advanced pneumatic circuits for controlling multi-cylinders (operable).

UNIT-III:
Advanced pneumatic circuits for controlling multi-cylinders (inoperable circuits), Electro pneumatics with relay logic, Pneumatics system with PID controls, Application of fluidics a non-moving part logic.

UNIT-IV:
Programmable sequential control using pneumatic modular elements, Stepper controls.

UNIT-V:
Programmable logic controllers-introduction, architecture hardware. Components-basics of PLC programming – Programming timers counters-master and jump controls- data manipulations and instructions.

REFERENCES:
1. Pneumatic Hand Book by Trade and technical press ltd.
2. Pneumatics Circuits and Low Cost Automation by Fawcett, Trade and technical press.
3. Pneumatic Systems by Majumdar. S.R, Tata McGraw-Hill
4. Hydraulics & Pneumatics Power for Production by Stewart, Industrial press.
5. Fluid Power Logic Circuit Design by Peter Rohner, The Macmillan press 1979.
6. Pneumatics- Jagadeesha T, Universities press

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (MECHATRONICS)

APPLIED INDUSTRIAL HYDRAULICS (Professional Core-II)

Prerequisites: Fluid Mechanics, fluid power Engineering, Mathematics,

Course Objectives:

- To provide fundamentals of Hydraulic System
- To design simple Hydraulic circuits
- To propose and design special circuits for low cost automation.

Course Outcome: Upon completion of this course the student shall be able to

- Have fundamental of fluid power control
- Design special circuits for low cost automation

UNIT-I:
Introduction to Industrial Hydraulics Power System elements and standard symbolic representation (CETOP symbols)

UNIT-II:
Various control valves used in Hydraulics System, Hydraulics accessories, advantages of Hydro-Pneumatics and its applications, different types of Hydraulics pumps and their applications, Hydraulics system and their classification.

UNIT-III:
Hydraulics circuits Hydraulic motors, Hydraulic fluids and effective contamination control.

UNIT-IV:
Electro hydraulics system, Servo valves and proportional valves, Design of Cartridge Valves,

UNIT-V:
Hydraulics systems with PID controls Trouble shooting and remedial measures in Hydraulic system

REFERENCES:

1. Hydraulic Hand Book by Trade and technical press ltd.
2. Hydraulic Circuits by Fawcelt, Trade and technical press.
3. Oil Hydraulic Systems BY Majumdar. S.R. Tata MC Graw-Hill
4. Fluid Mechanics and Hydraulics by Jagdish Lal, Metropolitan Book company
5. Hydraulic Systems Hand Book, Utility publications limited.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (MECHATRONICS)

INDUSTRIAL ELECTRICAL & ELECTRONICS (Professional Elective - I)

UNIT-I:

Basic Electrical Engineering, AC & DC Motor characteristics, Speed controls, Starting principles, Selection of proper motors for various applications.

Special Purpose Electrical Machines: - Induction generators self-excitation requirements, steady state analysis, voltage regulation, different methods of voltage control, application to mini and micro hydel systems.

UNIT-II:

Doubly fed induction machines: control via static converter, power flow, voltage/frequency control (generation mode), application to grid connected wind and mini/micro hydel systems.

Switched Reluctance Motor: Construction, operating performance, control and applications.

Brushless DC Machines: construction operation, performance, control and applications.

UNIT-III:

Linear Machines: Linear Induction Machines and Linear Synchronous Machines. Construction, operation, performance, control and applications. Application of permanent magnets in electrical machine:- structure, magnetic materials used, types of motors e.g. PMDC and PM Synchronous Machine, control and applications. Recent developments in electrical machines.

UNIT-IV:

Basic Electronics, Diodes, Transistor configurations, SCR Controls, FET, UJT, A/D Conversion, D/A Conversion, Optoelectronic devices: photo diode/transistor, LDR, LED and LCD and PLASMA displays, opto-coupler, opto-interrupter, high speed detectors – PIN and avalanche photo diodes, DC Power Supplies, AC Power Supplies, Special operational amplifiers, Timing and counting circuits

UNIT-V:

Digital Control Theory: Basic Digital concepts, Structure of a computer-controlled system. Review of Z-transform. Computation of time response of Discrete Data system. Bilinear Transformation. W-plane, prewar ping, inverse transformation. Design of discrete controllers. Z-domain compensation, w-plane compensation, state variable feedback, deadbeat controller sampled data version of PID controllers. Effect of Data. Digitization. Effect of finite word size, limit cycle determination. Programmable logic devices: PLA, PLD, CPLD, FPGA and its application.

REFERENCE BOOKS:

1. Electrical Machines by P. S. Bimbra
2. Power Plant Management by Z. Aghoni
3. Power Electronics by P. S. Bimbra
4. Low Power Electronics by Allen Helberg
5. Micro Electronics by Sedra Smith

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (MECHATRONICS)

PROGRAMMABLE LOGIC CONTROLLER & APPLICATIONS (Professional Elective - I)

UNIT-I:
PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT-II:
PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation.
Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT-III:
PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT-IV:
Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT-V:
Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

REFERENCE BOOKS:
1. Programmable Logic Controllers – Principle and Applications by John W Webb and Ronald A Reiss Fifth edition, PHI
2. Programmable Logic Controllers – Programming Method and Applications by JR Hackworth and F.D Hackworth – Jr- Pearson, 2004.
3. Tilak Thakur “Mechatronics” Oxford University Press 2016.
4. Fundamentals of programmable logic controllers a practical approach by Vijay Singh, new age publication.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (MECHATRONICS)

ARTIFICIAL INTELLIGENCE (Professional Elective - I)

Course Objectives:

- To learn the difference between optimal reasoning Vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities.
- To learn different knowledge representation techniques
- To understand the applications of AI: namely game playing, theorem proving, expert systems, machine learning and natural language processing.

Course Outcomes:

- Possess the ability to formulate an efficient problem space for a problem expressed in English
- Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique.
- Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing.

UNIT-I:

Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

Searching: Searching for solutions, uniformed search strategies-breadth first search, depth first search, depth limited search, iterative deepening depth first search bi-direction search comparison. Search with partial information greedy best first search, A* search, Memory bounded heuristic search, Heuristic functions.

UNIT-II:

Local search Algorithms, Hill climbing, simulated, annealing search, local beam search, genetical algorithms. Constrain satisfaction problems: Backtracking search for CSPs local search for constraint satisfaction problems.

Game Playing: Adversial search, games, minimax, algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions and cutting of search.

UNIT-III:

Knowledge Representation & reasons logical agents, knowledge- Based agents, the wumpus world, logic, propositional logic, resolution patterns in proposional logic, resolution, forward & backward, chaining. First order logic. Inference in first order logic, propositional Vs first order inference, unification & lifts forward chaining, backward chaining, resolution.

UNIT-IV:

Planing- Classical planning problem, Language of planning problems, expressiveness and extension, planning with state-space search, forward states spare search, backward states space search, Heuristics for stats space search, planning search, planning with state space search, partial order planning graphs.

UNIT-V:

Learning-Forms of learning, induction leaning, learning decision tree, statistical learning methods, learning with complex data, learning with hidden variables- the EM algorithm. Instance based learning, neural networks.

TEXT BOOKS:

1. Artificial Intelligence- A Modern a[[roach, second edition, Stuart ressel, peter nerving, PHI/Pearson Education.
2. Artificial Intelligence, 3rd Edition, Patrick Henry Winston., Pearson Edition.

REFERENCE BOOKS:

1. Artificial Intelligence, 2nd Edition, E.Rich and K. Knight (TMH).
2. Artificial Intelligence and Expert Systems-Patterson PHI
3. Expert Systems: Principles and Programming-Fourth Edition, Giarrantana /Riley, Thomson
4. PROLOG Programming for Artificial Intelligence. Ivan Bratka-Third Edition-Pearson Education.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (MECHATRONICS)

INSTRUMENTATION & SENSOR TECHNOLOGY (Professional Elective - II)

UNIT-I:

Measurement and Characteristics: Elements of a Measurement System; Classification of Instruments; Static Performance Parameters; Loading and Impedance Matching; Errors and Uncertainties in Measurement; Process and Standards of Calibration; Dynamic Characteristics-Transfer Function Representation of a Measurement System, Impulse and Step Responses of First and Second Order Systems, Frequency Response of First and Second Order Systems.

UNIT-II:

Mechanical Transducers: Temperature- Bimetallic Element and Fluid Expansion type Thermometers; Pressure- Manometers and Bourdon Gauges; Force- Balances, Helical Spiral Springs, Load Cells and Elastic Force Devices; Torque- Torsion Bars and Flat Spiral Springs; Liquid Level- Float Systems and Level to Pressure Converters; Flow- Pitot Static Tubes and Turbine type Flow Meters. Hot Wire Anemometer

Proximity Sensors- Reed Sensors, Inductive proximity sensor, capacitive proximity sensor, Optical sensor with through beam, Ultrasonic sensors.

UNIT-III:

Electrical Transducers: Resistance Thermometers; Interfacing Resistive Transducers to Electronic Circuits; Thermistors- Measurement of Temperature and Thermal Conductivity, Temperature Control; Resistance Strain Gauges- Gauge Factor, Bonded and Un-bonded Strain Gauges; Self Generating and Non Self Generating Inductive Transducers; Linear Variable Differential Transformers; Capacitive Transducers - Potentiometric Transducers; Thermoelectric Transducers and Sources of Errors in Thermocouples; Piezoelectric Transducers;

UNIT-IV:

Basic Signal Conditioning Elements: Amplifiers- Non-Electrical and Electrical types; Op Amps-Inverting, Non-Inverting, Summing, Differential, and Charge Amplifiers; Differentiating and Integrating Elements; Filters; Data Transmission Elements- Electrical, Pneumatic, Position and Radio Frequency Transmission types; Compensation Elements for First and Second Order Systems - Basic Indicating, Recording, and Display Elements.

UNIT-V:

Feedback in Instruments- Principles of Feedback and Advantages & Disadvantages of Feedback; Digital Voltmeters-Ramp and Dual Slope types; Servo type Potentiometric and Magnetic Tape Recorders; Digital Recorders of Memory type; Data Displays-Analog and Digital types.

REFERENCE BOOKS:

1. Electronic Measurements and Instrumentation, K. Lal Kishore, Pearson Education Publications
2. Electronic Instrumentation, H. S. Kalsi-TMH Publications
3. Albert D Helfrick and William D Cooper; Modern Electronic Instrumentation and Measurement Techniques; 2004, PHI
4. BC Nakra, and Chaudhry; Instrumentation, Measurement and Analysis; 2004, Tata McGraw-Hill.
5. DVS Murthy; Transducers and Instrumentation; 2003, PHI.
6. CS Rangan, GR Sarma, and VSV Mani; Instrumentation Devices and Systems; Tata McGraw-Hill

7. Doeblin and Ernest; Measurement Systems Application and Design; 2004, Tata McGraw-Hill.
8. Tilak Thakur “Mechatronics” Oxford University Press 2016.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (MECHATRONICS)

CONTROL SYSTEMS (Professional Elective - II)

UNIT-I:
Mathematical Model for Physical Systems - Open loop – closed loop control – Differential equations of physical systems – Transfer functions – Block diagram algebra – Signal flow graphs - Reduction using Mason's gain formula.
Industrial Automatic Controls - Classification – Proportional derivative and integral control actions – Liquid level control systems with proportional and integral control – Pneumatic, hydraulic and electronic controllers

UNIT-II:
Transient Response Analysis - Standard signals – transient response of first and second order systems – Steady state errors and error constants.

UNIT-III:
Transfer Function Representation: Transfer function of DC servomotor – AC servomotor – Synchronous transmitter and receiver. Block diagram representation of systems – Representation by signal flow graph.

UNIT-IV:
Stability Analysis: Concepts of Stability - Necessary conditions for stability – Hurwitz stability criterion – Routh's stability criterion – Relative stability. Frequency Response Analysis - The root locus concept – Frequency response, polar plot, Bode plot – Nyquist stability criterion.

UNIT-V:
State Variable Model and Analysis - Concepts of state & state variables – Derivation of state models from Block diagrams - State space representation of systems – Transfer matrix - Solution of state equation – State transition matrix – Concepts of controllability and observability.

TEXT BOOKS:
1. Control systems, Principles and Design / M Gopal / TMH
2. Modern Control Engineering/ K.Ogata / Prentice Hall
3. Control Systems /Anand Kumar / Prentice Hall

REFERENCE BOOKS:
1. Control Systems Engineering /Nagrath & M. Gopal/ Wiley Eastern
2. Automatic control systems/ B.C.Kuo/John Wiley & Sons\ Modern Control Systems/ Richard C.Dorf and Robert H. Bishop

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (MECHATRONICS)

MICRO-CONTROLLER & APPLICATIONS (Professional Elective - II)

UNIT – I:
Overview of 8-bit Microcontrollers- Intel, Motorola, and overview of the 8051 family- 8051 Architecture.

UNIT – II:
8051 Assembly languages programming – addressing modes Instruction set- Jump, Loop+ CALL instructions & programs- Arithmetic instructions, Logic Instructions & Programs – Single bit instructions & Programming- I/o- Port programming.

UNIT – III:
Timer/ Counter, programming of 8051 serial communication, interrupts.

UNIT – IV:
Interfacing 8051 to external memory- semiconductor memory-Memory address decoding- Interfacing with external ROM-data memory space- Interfacing to 8255 Architecture of PIC microcontrollers features, interfacing of I/O devices with PIC Controllers. PIC16c6x, 16c7x. 18x, 24x PIC memory organization.

UNIT – V:
Applications – Interfacing of LCD to 8051- Interfacing ADC, Sensors- Interfacing steeper motor- Interfacing keyboard- Interfacing DAC to 8051. ARM Controllers Introduction to ARM controllers. Comparison between RISC & CISC processor. Versions & variants of ARM processor. Register model of ARM processor. Modes of Operation. Applications of ARM processor.

REFERENCE BOOKS:

1. Muhammad Ali Mazzid, Jancie Gillispe Mazid “The Microcontroller & Embedded Systems”, Pearson Education, 2000.
2. Julio Sanchez and Maria P. Canton, Microcontroller Programming-The Microchip PIC, CRC Press
3. Myke Predko “ Programming & Customizing the 8051”, Tata McGraw Hill, 1999
4. Raj Kamal “Embedded systems, Architecture, Programming and Design, “Tata McGraw Hill, 2003.
5. Kenneth J. Ayala, The 8051 Microcontroller, CENGAGE Publisher
6. Fernando E. Valdes-Perez and Ramon Pallas-Areny, Microcontrollers-Fundamentals and Applications with PIC, CRC Press
7. KVK Prasad, Embedded Real Time Systems, Dearm Tech Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (MECHATRONICS)

RESEARCH METHODOLOGY AND IPR

Prerequisite: None

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

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

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT-I:
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II:
Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT-III:
Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT-IV:
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-V:
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

REFERENCES:

1. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
2. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
3. Mayall, “Industrial Design”, McGraw Hill, 1992.
4. Niebel, “Product Design”, McGraw Hill, 1974.
5. Asimov, “Introduction to Design”, Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
7. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (MECHATRONICS)

PNEUMATICS LAB (Lab – I)

LIST OF EXPERIMENTS

Do any TEN of the following Experiments

1. Study of pneumatic components:
   i. Air compressor along with air receiver tank
   ii. FRL unit
   iii. Control valves
2. Draw the Circuit diagram to operate a Single Acting Pneumatic Cylinder using 3/2 Push Button Direction Control Valve (Manual).
3. Draw the Circuit diagram to operate a Double Acting Pneumatic Cylinder using two 3/2 Push Button Direction Control Valves (Manual).
4. Draw the circuit diagram to operate Double Acting Pneumatic Cylinder using 5/2 Direction Control Valve (solenoid) and Push button momentary switch.
5. Draw the circuit diagram to operate Double Acting Pneumatic Cylinder using 5/2 Direction Control Valve (solenoid) and Push button Latch Switch.
6. Draw the circuit diagram for sequential operation of Single acting Pneumatic cylinder & Double acting pneumatic cylinder using sequence valve.
7. Draw the Circuit diagram to operate a Single Acting Pneumatic Cylinder using 5/2 single solenoid control valve and PLC.
8. Draw the Circuit diagram to operate a Double Acting Pneumatic Cylinder using 5/2 DCV (Double Solenoid) and PLC.
9. Draw the circuit diagram for sequential operation of Single acting Pneumatic cylinder & Double acting Pneumatic cylinder using PLC.
10. Draw the circuit diagram for speed control of single & Double Acting Pneumatic Cylinder.
11. Simulation of Single Acting Pneumatic Cylinder using 3/2 Push Button Direction Control Valve using Simulation software.
12. Simulation of Double Acting Pneumatic Cylinder using 5/2 Push Button Direction Control Valve using Simulation software.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (MECHATRONICS)

HYDRAULICS LAB (Lab - II)

LIST OF EXPERIMENTS

Do Any TEN of the Following Experiments

1. Study of Pressure relief valve and Directional Control valves in Hydraulic System.
2. Draw the Circuit diagram to operate Double Acting Hydraulic Cylinder using 4/2 Direction Control Valve (Manual type).
3. Draw the Circuit diagram to operate Double Acting Hydraulic Cylinder using 4/3 Direction Control Valve (Manual type).
4. Draw the Circuit diagram to operate Double Acting Hydraulic Cylinder using 4/2 Direction Control Valve (Single Solenoid) using Push button momentary switch.
5. Draw the Circuit diagram to operate Double Acting Hydraulic Cylinder using 4/2 Direction Control Valve (Single Solenoid) using Latch Switch.
6. Circuit for measurement of oil pressure in a hydraulic system.
7. Draw the Circuit diagram to operate Double Acting Hydraulic Cylinder using 4/2 Direction Control Valve (Solenoid Control) using Push button switch for varying flow rate using flow control valve.
8. Draw the Circuit diagram to operate Double Acting Hydraulic Cylinder using 4/2 Direction Control Valve (Solenoid Control) using Latch for varying flow rate using flow control valve.
9. Simulation of Double Acting Hydraulic Cylinder using 4/2 Direction Control Valve (manual control) using simulation software.
10. Simulation of Double Acting Hydraulic Cylinder using 4/3 Direction Control Valve (manual control) using simulation software.
11. Simulation of Double Acting Hydraulic Cylinder using 4/2 Direction Control Valve using Push button with spring return valve.
12. Simulation of Double Acting Hydraulic Cylinder using 4/2 Direction Control Valve Using Electrical control with spring return valve.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (Mechatronics)

ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)

Prerequisite: None

Course objectives: Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

UNIT-I:
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III:
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:
key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:
skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TEXT BOOKS/ REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (Mechatronics)

DISASTER MANAGEMENT (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- planning and programming in different countries, particularly their home country or the countries they work in

UNIT-I:
Introduction:
Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.
Disaster Prone Areas in India:
Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-II:
Repercussions of Disasters and Hazards:
Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:
Disaster Preparedness and Management:
Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:
Risk Assessment Disaster Risk:
Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-V:
Disaster Mitigation:
Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

TEXT BOOKS/ REFERENCES:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “’New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.),” Disaster Mitigation Experiences and Reflections”, Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies”, Deep &Deep Publication Pvt. Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (Mechatronics)

SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes: Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

UNIT-I:
Alphabets in Sanskrit,

UNIT-II:
Past/Present/Future Tense, Simple Sentences

UNIT-III:
Order, Introduction of roots,

UNIT-IV:
Technical information about Sanskrit Literature

UNIT-V:
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TEXT BOOKS/ REFERENCES:

1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (Mechatronics)

VALUE EDUCATION (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Course outcomes: Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

UNIT-I:
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT-II:
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT-III:
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:
Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT-V:
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

TEXT BOOKS/ REFERENCES:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (Mechatronics)

CONSTITUTION OF INDIA (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I:
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble**,** Salient Features.

UNIT-II:
Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality**,** Right to Freedom**,** Right against Exploitation**,** Right to Freedom of Religion**,** Cultural and Educational Rights**,** Right to Constitutional Remedies, Directive Principles of State Policy**,** Fundamental Duties.

UNIT-III:
Organs of Governance: Parliament**,** Composition**,** Qualifications and Disqualifications**,** Powers and Functions**,** Executive**,** President**,** Governor**,** Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

UNIT-IV:
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V:
Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS/ REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (Mechatronics)

PEDAGOGY STUDIES (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes: Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT-I:
Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

UNIT-II:
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT-III:
Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT-IV:
Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V:
Research gaps and future directions: Research design**,** Contexts**,** Pedagogy**,** Teacher education**,** Curriculum and assessment**,** Dissemination and research impact.

TEXT BOOKS/ REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.

4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (Mechatronics)

STRESS MANAGEMENT BY YOGA (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To achieve overall health of body and mind
- To overcome stress

Course Outcomes: Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT-I:
Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:
Yam and Niyam.

UNIT-III:
Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:
Asan and Pranayam

UNIT-V:
i) Various yog poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:

1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (Mechatronics)

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes: Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.