Chhattisgarh Swami Vivekanand Technical University, Bhilai

SCHEME OF TEACHING AND EXAMINATION

BE (MECHATRONICS ENGINEERING) IV Semester

S. No.	Board of Study	Sub. Code	SUBJECT	PERIODS PER WEEK			SCHEME OF EXAM Theory/Practical			TOTAL MARKS	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1.	Mech. Engg.	367451(37)	Kinematics of Machines	4	1	-	80	20	20	120	5
2.	Mech. Engg.	367452(37)	Fluid Mechanics	4	1	-	80	20	20	120	5
3.	Mechatronics	367453(67)	Thermal Engg.	4	1	-	80	20	20	120	5
4.	Mechatronics	367454(67)	Integrated Circuits and Applications	4	1	-	80	20	20	120	5
5.	Electronics and Telecom.	367455(28)	Microprocessor and Interfaces	4	1	-	80	20	20	120	5
6.	Electronics and Telecom	367456(28)	Signals and Systems	3	1	-	80	20	20	120	4
7.	Mechatronics	367461(67)	Integrated Circuits Lab	-	-	2	40	-	20	60	1
8.	Mech. Engg.	367462(37)	Fluid Mechanics Lab	-	-	2	40	-	20	60	1
9.	Mech. Engg.	367463(37)	Kinematics of Machines Lab	-	-	2	40	-	20	60	1
10.	Electronics and Telecom.	367464(28)	Microprocessor and Interfaces Lab	-	-	2	40	-	20	60	1
11.	Humanities	367465(46)	Health,Hygiene and Yoga	-	-	2	-	-	40	40	1
12.			Library	-	-	1	-	-	-	-	-
			Total	**23**	**6**	**11**	**640**	**120**	**240**	**1000**	**34**

L: Lecture, T: Tutorial, P: Practical, ESE: End Semester Exam, CT: Class Test, TA: Teachers Assessment

Note (1): Duration of all theory papers will be of Three Hours.
Note (2): Industrial Training of six weeks is mandatory for B.E. students. It is to be completed in two parts. The first part will be in summer after IV semester after which students have to submit a training report which will be evaluated by the college teachers during V Semester.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechatronics Engineering**	Semester:	**IV**
Subject:	**Kinematics of Machines**	Code:	**367451(37)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Three Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:

- To synthesis, both graphically and analytically, multilink mechanisms.
- To perform mechanism analyses to find the position, velocity, acceleration, and dynamics of multi-bar mechanisms.
- To synthesis mechanism to perform certain prescribed task/motion
- To analyze gear trains.
- To analyze thrust bearings, Brakes and dynamometers.

UNIT- I **Relative velocity:** Elements, pairs, Mechanism, Four bar chain and its inversion, Velocity diagrams, Relative velocity method, Instantaneous centre method.

UNIT-II **Relative Acceleration:** Synthesis of mechanism, Pantograph, Lower pair mechanism, Relative acceleration diagram, Kliens construction, Coroillis component of acceleration.

UNIT- III **Cams:** Classification of cams and followers, Nomenclature of a radial cam, Description of follower movement, Displacement diagrams, Uniform and modified uniform motion, Simple harmonic motion, Uniform acceleration motion and its modifications, Cycloidal motion, Synthesis of cam profile by graphical approach, Considerations of pressure angle. Cams with specified contours: Circular arc cam & tangent cam.

UNIT-IV **Gear:** Types of gears, Gear terminology, Law of gearing, Gear tooth forms, Involute and Cycloid tooth profile, Interference and Undercutting of Involutes teeth, Minimum number of teeth on pinion to avoid interference.
Gear trains: Simple, Compound, Reverted, and Epicyclical gear trains, computation of velocity ratio in gear trains by different methods.

UNIT-V **(a) Friction:** Applications of friction, Pivot and collar friction, Thrust bearing.
(b) Belt-Drives: Ratio of tensions for flat belt & V-belt, Centrifugal tension, condition for maximum power transmission.
(c) Brakes and dynamometer: Simple block and shoe brake, Band brake, Band and block brake, and internal expanding shoe brake, Absorption dynamometer, Transmission dynamometer.

Text Books:

1. Theory of Machine – S. S. Ratan-Tata McGraw Hill.
2. The Theory of Machine – Thomas Beven – CBS Publishers.

Reference Books:

1. Theory of mechanism and machine – A. Ghosh, A.K. Mallik –EWP Press.
2. Theory of Machine – Shigley, JE
3. Theory of Machine Jagdish Lal
4. Theory of machine – J.E. Singh – McGraw Hill.

Course Outcomes:

- Apply knowledge of Kinematics of machine for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts kinematics of machine in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechatronics Engineering**	Semester:	**IV**
Subject:	**Fluid Mechanics**	Code:	**367452(37)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Three Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:

- Obtaining a solid understanding of the fundamentals of Fluid Mechanics
- The ability to formulate basic equations for Fluid Engineering problems
- The ability to use tables and figures to determine the friction energy loss for various pipes/ducts geometries and Fluid engineering applications
- The ability to perform dimensional analysis and identify important parameters

UNIT- I **Properties of fluid:** Fluid, ideal and real fluid, properties of fluid : mass density, weight density, specific volume, specific gravity, viscosity, surface tension, capillarity, vapour pressure, compressibility and bulk modulus. Newtonian and non-Newtonian fluids
Fluid Statics: Pressure, Pascal's law, Hydrostatic law, Manometry, Hydrostatic force on submerged plane and curved surface, Buoyancy and Flotation.

UNIT-II **Fluid Kinematics:** Description of fluid motion, Langragian and Eulerian approach, Type of fluid flow, Type of flow lines-path line, streak line, stream line, stream tube. Continuity equation, acceleration of a fluid particle, motion of fluid particle along curved path, Normal and tangential acceleration, Rotational flow, Rotation and Vorticity, circulation, stream and potential function, flow net ,its characteristics and utilities. Liquid in relative equilibrium.

UNIT- III **Fluid Dynamics:** Euler's Equation, Bernoulli's equation and its practical application, Venturimeter, Orifice meter, Nozzle, Pitot tube. Impulse momentum equation, Momentum of Momentum equation, Kinetic energy and Momentum correction factor, Vortex motion, Radial flow.

UNIT-IV **Laminar Flow:** Reynold's experiment, flow of viscous fluids in circular pipe, shear stress and pressure gradient relationship, Velocity distribution, Hagen-Poiseuille Equation, flow of viscous fluids between two parallel plates (Coutte flow) shear stress and pressure gradient relationship, Velocity distribution, Drop of pressure head.
Turbulent flow: Effect of turbulence, Expression for loss of head due to friction in pipes (Darcy-Weisbach equation), Expression for co-efficient of friction in terms of shear stress.
Flow through pipe: Loss of energy in pipes, Hydraulic gradient and total energy line, pipe in series and parallel, equivalent pipe power transmission through pipe, water hammer in pipes.

UNIT-V **Dimensional Analysis:** Methods of dimensional analysis, Rayleigh's method, Buckingham's theorem, Limitations.
Model analysis: Dimensionless number and their significance, model laws, Reynolod's model law, Fraude's model law, Euler's model law, Weber's model law, Mach's model law, Type of models, scale effect in model, limitation of hydraulic similitude.

Text Books:

1. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar– Kataria & Sons – New Delhi
2. A text of Fluid Mechanics – R. K. Rajput – S. Chand & Company Ltd., Delhi

Reference Books:

1. Fluid Mechanics & Hydraulics Machines-R.K.Bansal-Laxmi Publications.,Delhi
2. Engineering Fluid Mechanics –K.L. Kumar, Eurasia Publication House, Delhi
3. Mechanics of Fluid – B.S. Massey – English Language Book Society (U.K.)
4. Fluid Mechanics- Yunush A. Cengel, John M. Cimbala- TMH,Delhi
5. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas- TMH ,Delhi
6. Hydraulics and Fluid Mechanics Including Hydraulic Machine- PN Modi,& SM Seth-Standard, Delhi
7. Theory and Application of Fluid Mechanics- K.Subramanya-TMH Delhi

Course Outcomes:

- Apply knowledge of Fluid Mechanics formulating and solving engineering problems.
- Acquire knowledge of fluid mechanics for the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.
- Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.
- Develop fundamentals to continue the study of the advance subject fluid machinery, Heat and mass transfer etc.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechatronics Engineering**	Semester:	**IV**
Subject:	**Thermal Engineering**	Code:	**367453(67)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Three Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:

- To understand the analysis of second law.
- To understand the thermodynamic relationships and equation of gases.
- To understand the vapour and vapour power cycle and steam condenser.
- To understand refrigeration cycle and reciprocating air compressors .
- To gain knowledge of thermodynamics of compressible Fluids

UNIT- I **Vapour and Vapour Power Cycle:**
(a) Vapour: Properties and processes in ideal vapour, use of steam tables and Mollier's diagram in determination of steam properties, energy and entropy calculations.
(b) Vapour Power Cycle: Carnot and Rankine cycle as applied to steam power plants, Reheat cycle, ideal regenerative cycle, practical regenerative cycle, characteristics of ideal working fluids, binary vapour cycle.

UNIT-II **Steam Turbines:** Steam turbine – Principal of operation of steam turbine, types, impulse turbine compounding of steam turbine, pressure compounded, velocity compounded and pressure – velocity compounded impulse turbine.
Velocity diagram for impulse turbine, force on the blade and work done.

UNIT- III **Internal Combustion (I.C.) Engines:** Introduction of Internal and external combustion engine and their comparison, four stroke cycle S.I. and C.I. engine, two stroke engine, comparison of four stroke and two stroke engines, comparison of S.I. and C.I. engine, classification of I.C. Engine, Valve timing diagram for S.I. and C.I. engines, Performance parameters and their calculations.

UNIT-IV **Gas Turbine cycles:** Classification of gas turbine. Simple open cycle gas turbine Ideal and actual cycle (Brayton Cycle) for gas turbine Optimum pressure ratio for maximum specific output in actual gas turbine Regeneration, reheat and inter cooling and effect of these modification on efficiency and output, closed cycle gas turbine.

UNIT-V **Solar Energy Conversion:** Classical sources of energy crisis and search for alternative sources of energy. Solar energy, earth sun angles, resolution, solar measurement, collection of solar energy, flat plate and focusing collector analysis, calculations and same design parameters. Applications of solar energy.
Introduction to Photovoltaic cell energy conversion techniques.

Text Books:

1. Steam and Gas turbine – By R. Yadav - Central Publishing House, Allahabad
2. Non-Conventional Energy Sources - G.D. Rai – Khanna Publishers
3. Engineering Thermodynamics – P.K. Nag – TMH Publishers
4. A Course in Internal Combustion Engines – M.L. Mathur & R.P. Sharma – Dhanpat Rai & Sons

Reference Books:

1. Turbine compressors and Fans – S.M. Yahya - TMH
2. Gas Turbine – V. Ganeshan – TMH
3. Thermal Science & Engineering – D.S. Kumar – S.K. Kataria & Sons

Course Outcomes:

- The student will be able to understand the analysis of second law.
- The student will be able to understand the thermodynamic relationships and equation of gases.
- The student will be able to understand the vapour and vapour power cycle and steam condenser.
- The student will be able to understand refrigeration cycle and reciprocating air compressors .
- The student will be able to gain knowledge of thermodynamics of compressible Fluids

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechatronics Engineering**	Semester:	**IV**
Subject:	**Integrated Circuits & Applications**	Code:	**367454(67)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Three Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:

- To provide concepts of transistor operation.
- To study transistor as feedback amplifier & oscillator.
- To do analysis of transistor in low frequency & high frequency signal.
- To design a multistage transistor circuit for amplifier.

UNIT- I **LOW FREQUENCY TRANSISTOR AMPLIFIER**: Graphical Analysis of CE amplifier; h-parameter Models for CB, CE, CC configurations and their Analysis and Comparison of the three Configurations, Linear analysis of Transistor Circuits, Miller's Theorem and its Dual Simplified Hybrid Models and Calculation of CE and CC Amplifiers; Effect of emitter Resistance in CE amplifiers, Effect of coupling and bypass capacitors.FET amplifiers (only basics),FET as VVR.

UNIT-II **HIGH FREQUENCY TRANSISTOR AMPLIFIERS:** CE hybrid-π model: Validity and parameter Variation, Current Gain with Resistive load, frequency response of a single stage CE Amplifier: Gain- Bandwidth product, CC stage High frequencies, sources of Noise in Transistor Circuits; Noise Figure.(only basics of High frequency analysis of amplifier)

UNIT- III **CASCADING:** Cascading of amplifier: CE-CC, CE-CE, CE-CB(cascoding), CC-CC (Darlington pair), Bootstrap darlington pair,Bootstrap emitter follower
MULTISTAGE AMPLIFIERS: Classification, Distortion in Ampli1iers, Frequency Response, Response of a Two-stage RC Coupled Amplifier,Sources of Noise in Transistor Circuits, Noise Figure.

UNIT-IV **FEEDBACK AMPLIFIERS and OSCILLATORS:** Classification, Feedback concept, deal Feedback amplifier: Properties of Negative Feedback Amplifier Topologies, Classification of Feedback amplifiers(only basics of this part),Effect of feedback on amplifier Bandwidth and stability.
OSCILLATOR: Sinusoidal oscillator: phase shift oscillators, Wien Bridge oscillator: Resonant circuit oscillators: LC Collpit & LC Hartley, Amplitude Frequency and phase stability analysis of all Oscillators, General form of Oscillator Configuration; Crystal oscillator.

UNIT-V **OPERATIONAL AMPLIFIERS:** OAMP Symbol and terminal characteristics, Block Schematic of OPAMP, Basics of Differential Amplifier, Ideal OP-AMP Characteristics, Practical OPAMP Characteristics, Open Loop Configuration of OP-AMP, Closed Loop Configuration of OPAMP.. Input Bias and Offset Currents, IC 741
APPLICATION: Adder, Subtracter, Integrator Differentiator, Inverting Amplifier,, Inverting Amplifier, Square Wave Generator, Triangular Wave Generator, Sawtooth Wave Generator, Clipper Circuits, Clamper Circuits, Sample And Hold Circuits, Logarithmic Amplifier.

Text Books:

1. Integrated Electronics – Millman & Halkias, TMH.
2. Microelectronics – Millman and Grabel TMH
3. Integrated Circuits by K R Botkar, Khanna Publications
4. Operational Amplifiers by R. Gayakwad, 4th Ed., Pearson Education

Reference Books:

1. Electronic Device and Circuits – David A. Bell, PHI
2. Integrated Electronics by Millman and Halkias, TMH Publishing Co.
3. Operational Amplifier and Linear Integrated circuits, Lal Kishor, PHI
4. Design and Applications of Analog Integrated Circuits, Soclof , PHI

Course Outcomes:

- The student will able to solve the single stage transistor as an amplifier circuit.
- The student will able to calculate various parameters of transistor under application of low & high frequency signal.
- The student will able to understand feedback circuit of transistor amplifier.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechatronics Engineering**	Semester:	**IV**
Subject:	**Microprocessor & Interfaces**	Code:	**367455(28)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Three Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:
To introduce the architecture, interfacing and programming of 8085 microprocessor and various peripheral interfacing devices.

UNIT- I **MICROPROCESSOR ARCHITECTURE:** Introduction to Microprocessors, Architecture of 8085, Pin Configuration and Function, internal register & flag register, Generation of Control Signals: Bus Timings: Demultiplexing of address / data bus; Fetch Cycle, Execute Cycle, Instruction Cycle, Instruction Timings and Operation Status, Timing Diagram.

UNIT-II **INSTRUCTION SET AND PROGRAMMING WITH 8085:** Instruction for Data Transfer, Arithmetic and Logical Operations, Branching Operation, Machine Cycle Concept, Addressing Modes, Instructions Format, Stacks, Subroutine and Related Instructions, Elementary Concepts of Assemblers, Assembler Directives, Looping and Counting, Software Counters with Time Delays, Simple Programs using Instruction Set of 8085, Debugging, Programs Involving Subroutines, Programs for Code Conversion e.g. BCD to Binary, Binary to BCD, Binary to Seven-Segment LED Display. Binary to ASCII, ASCII to Binary, Program for Addition Subtraction, Programs for Multiplication and Division of Unsigned Binary Numbers.

UNIT- III **DATA TRANSFER & DEVICE SELECTION:** Format of Data Transfer: Modes of Data Transfer: Type of I/O Addressing: Condition of Data Transfer: Microprocessor Controlled Data Transfer: Peripheral Controlled Data Transfer: Absolute and Linear Select Decoding.
Semiconductor Memories: Static & Dynamic RAM Cell, ROM, PROM, EPROM, EEPROM, UVPROM, Flash Memory and I/O Interfacing: Use of Decoders Selection, Memory organization and Mapping.

UNIT-IV **INTERRUPTS:** Restart Instruction, Hardware Implementation, Interrupt Processing, Multiple Interrupts and Priority Concepts, Interrupt Structure of 8085, Instructions related to interrupts, Pending Interrupts, Use of Interrupt and Handshaking Signals in Interfacing, Application of Interrupts and Illustrative Programs.

UNIT-V **ARCHITECTURE OF PERIPHERAL INTERFACING DEVICES:** Architecture, Pin Diagram and functioning of 8155/8156 (RAM), 8355/8755 (ROM), 8255 (PPI). Simple programs like Initialization and I/O operations of the ports, Timer operation of 8155. Programmable Internal Timer 8253/8254: Block Diagram, Pin Configuration, Modes, Initialization Instruction, Interfacing and Simple Programs to generate various types of signals. Architecture, Pin diagram, description and initialization of Keyboard and display interface (8279), USART (8251), 8259A Programmable interrupt Controller, Direct Memory Access(DMA), 8237 DMA Controller.

Text Books:

1. Microprocessor Architecture, Programming and Application - R. S. Gaonkar, Wiley Eastern
2. Digital Systems – From Gates to Microprocessors - Sanjay K. Bose, New Age International Publishers.
3. Digital Integrated Electronics – Taub and Schilling, Tata McGraw Hill.

Reference Books:

1. 8085 Microprocessor Programming & Interfacing – N.K. Srinath, PHI.
2. Digital Computer Electronics – Malvino, Tata McGraw Hill.
3. Microprocessors: Theory and Applications – Intel and Motorolla, Rafiquuzzaman, PHI.
4. 0000 to 8085: Introduction to Microprocessor for Engineers and Scientists, Ghosh & Sridhar, PHI.

Course outcomes:

- Gain knowledge about architecture of general purpose microprocessor.
- Students will be able to describe physical and logical configuration of memory.
- Demonstrate the ability to program the 8085 microprocessor.
- Interface the 8085 microprocessor to the outside world.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechatronics Engineering**	Semester:	**IV**
Subject:	**Signals and Systems**	Code:	**367456(28)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Three Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:

1. To describe continuous time and discrete-time signals and systems.
2. Proficiently use various methods and approaches to solve problems with signals and systems prepared for upper-level courses in communication systems, control systems, and digital signal processing.

UNIT- I **Classification of Signals and Systems:** Representation of Discrete time signals, Elementary signals, Basic Operation on Signals, Classification of Signals: Deterministic and random, periodic and non-periodic, Energy and power, Causal and non-causal, Even and odd Signals, Classification of Systems: lumped and distributed parameter, static and dynamic, causal and non-causal, linear and no- linear, time variant and time invariant, stable and unstable , invertible and non-invertible , FIR and IIR systems.

UNIT-II **Fourier analysis of Continuous time signals:** Representation of Continuous time Fourier series(CTFS), Existence, Trigonometric form, Cosine representation, wave symmetry, Exponential Fourier series, Fourier spectrum, Power representation using Fourier series, Properties of CTFS.Fourier transform(CTFT) of non-periodic functions, Magnitude and phase representation of Fourier transform, existence, Fourier transform of standard signals, Properties of CTFT, Fourier transform of periodic signals.

UNIT- III **Analysis of discrete time signals and systems:** Sampling and aliasing ,Linear convolution, Circular convolution, correlation, cross correlation, autocorrelation, circular correlation, Fourier transform of Discrete time signals (DTFT), Properties of DTFT, Analysis of LTI Discrete time systems,.

UNIT-IV **Z Transform:** Relation between z transform and DTFT Region of convergence, Properties, Poles and Zeros of rational function of Z, Inverse Z transform, Analysis of LTI Discrete time systems using Z transform.

UNIT-V **Structures for Realization of IIR and FIR Systems:** Discrete time IIR and FIR systems, structures for realization of IIR systems, Structures for realization FIR systems: Direct form-I, Direct form-II, Cascade and parallel form. State model of discrete time systems, state model from direct form –II, transfer function using state model, solution of state equation and response of discrete time systems

Text Books:

1. Signals & Systems: A Anand Kumar, 2nd Ed, PHI
2. Signals & Systems: A Nagoor Kani , TMH Publication
3. Signals & Systems: Alan Oppenheim & Alan Wilsky, S Nawab, PHI

Reference Books:

1. Signals, Systems and Communications: B.P. Lathi, BS Publications

Course outcomes:

1. The student will be able to understand the classification of signals and systems.
2. Gain knowledge about the frequency domain analysis of continuous time and discrete time signals.
3. Use the Z-transform techniques to solve the system equations.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechatronics Engineering**	Semester:	**IV**
Subject:	**Integrated Circuits & Applications Laboratory**	Code:	**367461(67)**
Total Lab Periods:	**24**	Batch Size:	**30**
Maximum Marks:	**40**	Minimum Marks:	**20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

1. Static input characteristics curves of CE transistor.
2. Static output characteristic curve CE transistor.
3. Static input characteristic curve of CB transistor.
4. Static output characteristic curve of CB transistor.
5. To design and study the frequency response of single stage CE transistor amplifier.
6. To study the frequency response of RC coupled double stage CE transistor amplifier.
7. To study the frequency response of RC coupled double stage CE transistor amplifier with voltage feedback.
8. To study the frequency response of RC coupled double stage CE transistor amplifier with current feedback.
9. To plot the voltage gain vs. load characteristics of common collector (emitter follower) n- p-n-p transistor.
10. To study Wein Bridge Oscillator.
11. Experiment with emitter follower a voltage series feed back amplifier.
12. General study of pushpull audio power amplifier.
13. To study RC phase shift oscillator.
14. Study of various topologies of feedback amplifier.
15. Experiment with Darlington pair amplifier.
16. To design an inverting amplifier using OPAMP (741) and study its frequency response.
17. To design a non-inverting amplifier using OPAMP (741) and study its frequency response.
18. To design a summing amplifier using opamp (741)
19. To design an astable multivirator using 555 timer
20. To design a monostable multivibrator using 555 timer.
21. To design and study a diode clamper circuit.

List of Equipment/Instruments/Machines/Software Required:

Circuit components, Power supply, CRO, Function generator, Multimeter, Breadboard

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechatronics Engineering**	Semester:	**IV**
Subject:	**Fluid Mechanics Laboratory**	Code:	**367462(37)**
Total Lab Periods:	**24**	Batch Size:	**30**
Maximum Marks:	**40**	Minimum Marks:	**20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

1. To determine the meta-centric height of a ship model.
2. To verify Bernoulli's Theorem.
3. To verify Impulse Momentum Principle.
4. To calibrate a Venturimeter and study the variation of coefficient of discharge.
5. To calibrate an orifice-meter.
6. Experimental determination of critical velocity in pipe.
7. To determine of head loss in various pipe fittings.
8. Flow measurement using Pitot tube.
9. To study the transition from laminar to turbulent flow and to determine the lower critical Reynold's number.
10. To determine the hydraulic coefficients (Cc, Cd and Cv) of an orifice.
11. To determine the coefficient of discharge of a mouth piece.
12. To obtain the surface profile and the total head distribution of a forced vortex.
13. To study the velocity distribution in pipe and to compute the discharge by integrating velocity profile.
14. To study the variation of friction factor for pipe flow.
15. To determine the roughness coefficient of an open channel.

List of Equipment/Instruments/Machines/Software Required:

- Apparatus for determination of metacentric height
- Bernoulli's apparatus
- Impact of jet apparatus
- Venturimeter
- Orificemeter
- Pipe friction apparatus
- Orifice apparatus
- Mouth Piece apparatus with the provision for determination of hydraulic coefficient Cc, Cd & Cv
- Vortex flow apparatus
- Apparatus of head loss in various pipe fittings.
- Reynold's apparatus
- Complete setup for flow measurement using Pitot tube
- Complete set for open channel apparatus

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechatronics Engineering**	Semester:	**IV**
Subject:	**Kinematics of Machines Laboratory**	Code:	**367463(37)**
Total Lab Periods:	**24**	Batch Size:	**30**
Maximum Marks:	**40**	Minimum Marks:	**20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

1. To determine the jump phenomena of cam follower apparatus.
2. To draw displacement, velocity and acceleration curve of cam motion.
3. To find out the load carrying capacity of bearing.
4. To find out the Coefficient of friction of bearing.
5. To find out the frictional horse power of bearing.
6. To find out the Pressure around the bearing by journal bearing apparatus.
7. To measure co-efficient of friction, power transmitted with varied belt tension by slip & creep apparatus.
8. To find out the percentage slip at fixed belt tension by varying load with slip & creep apparatus.
9. To find out belt slip and creep by slip and creep measurement apparatus.
10. To verify the coriolli's component of acceleration with theoretical and practical results.
11. To find the speed and torque of different gear in an epicyclic gear train.
12. To find the speed and torque of different gear in a simple, compound and reverted gear train.
13. To Study and analysis of Pantograph.
14. To study Four-bar mechanism and its inversions.
15. To study internal expanding and external contracting shoe brakes.
16. To study rope brake dynamometer and calculation of torque and power.

List of Equipment/Instruments/Machines/Software Required:

- Cam analysis apparatus
- Journal bearing apparatus.
- Coriolli's component of acceleration apparatus
- Slip & Creep Measurement Apparatus in Belt Drive
- Simple, compound, reverted and epicyclic gear train apparatus.
- Pantograph apparatus (with all accessories)
- Internal / external shoe brake (complete set with accessories)
- Four bar mechanism and its inversions.
- Rope brake dynamometer apparatus (with all accessories)
- Mechanoset.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechatronics Engineering**	Semester:	**IV**
Subject:	**Microprocessor & Interfaces Laboratory**	Code:	**367464(28)**
Total Lab Periods:	**36**	Batch Size:	**30**
Maximum Marks:	**40**	Minimum Marks:	**20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

1. **Reversing an Array:** A Block of 16 bytes are residing at locations starting from BLOCK : WAP to transfer the block in reverse order at locations starting from BLOCK 2.
2. **Sorting in Ascending Order:** A block (16 bytes are residing at locations starting from DATA : Write a program to arrange the word in the same location in ascending order.
3. **Binary Addition:** 16 bytes are residing at location starting from DATA WAP : to add all bytes and store the result location SUM and SUM + 1.
4. **BCD Addition:** 16 BCD NUMBER are residing at location starting from DATA WAP to add all bytes and store the result location SUM and SUM + 1.
5. **Multiplication:** Two bytes are residing at location DATA 1 and DATA 2 Write a program to multiply the two bytes and store the result at location PROD 1 and PROD 2.
6. **Binary to BCD:** A binary number is residing at location BIN > WAP to convert the binary number in to its equivalent BCD and store the result at BCD and BCD + 1.
7. **BCD to Binary:** A BCD number is residing at location BCD; Write a program to convert the BCD number into its equivalent binary and store the result at BIN.
8. **Multibyte Addition:** Two 10 bytes are residing at location starting from DATA 1 and DATA 2 respectively ,Write a program two add them up and store the result at location starting from RESULT (result space 11 bytes).
9. **Multibyte BCD Addtion:** Two 6 digits BCD numbers are residing at location starting from DATA 1 and DATA 2 respectively. Write a program to add them up and store the result at locations starting from RESULT (Result space 7 bytes).
10. **RST 6.5:** A block of 16 bytes is residing at location starting from ; DATA Reverse the block and store the bytes at REVERSE whenever the RST 6.5 key is pressed.
11. **Editing of ASCII String:** A string of ASCII characters is residing at locations starting from READ which contain "I $ WILL $ BE $ AN $ ENGINEER ". Edit string in such a way that it should contain "I $ will $ be $ Engineer ". Keep the edited string in the same locations. Product the string from further editing. ($ stands for a blank).
12. **Signed Binary Addition:** A block of 16 signed binary numbers is residing at locations NUMBERS. Add them up and store the result (in signed binary) at locations from RESULT.
13. **ASCII Code Conversion:** A string of 16 ASCII characters are residing at locations starting from DATA .The string consists of codes for capital letters, small letters and BCD digits (0-9). Convert the ASCII characters. In such a way that the codes for capital letters be converted into corresponding codes for small letters, codes for small letters into that of capital letters and codes for BCD digits into that of BCD numbers and store them at the same locations.
14. **Parity Check:** A block of 32 bytes is residing at DATA count the number (BCD) of times even and odd parity bytes are appearing consecutive memory locations. Keep the count at MATCH.
15. **Series Generation:** Two BCD numbers a and b are residing at locations DATA 1 and DATA 2 respectively. Write a program to form a series in BCD with the elements of a. a + 2b, a + 4b, a + 6b ……. Stop the generation of the series whenever any element of the series in BCD with the elements of the series exceeds (99). Store the result at locations starting from RESULT. Count the number (BCD) of elements in the series and store it at NUMBER.

List of Equipments/Machine Required:
8085 based microprocessor kit, MASM assembler, 8085 simulator, PCs.

Recommended Books:
8085 Microprocessor Programming & Interfacing – N.K. Srinath, PHI

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechatronics Engineering**	Semester:	**IV**
Subject:	**Health, Hygiene & Yoga**	Code:	**367465(46)**
No. Of Periods:	**2 Periods/Week**	Total Tutorial Periods:	**NIL**
Maximum Marks:	**40**	**Minimum Marks:**	**24**

Course Objectives:

1. To provide understanding the importance of health.
2. To provide insight into the hygiene aspect & quality of life.
3. To study the concepts of various medical therapy.
4. To practice the various yogasans.
5. To provide knowledge about common diseases and its cure through yagasans and pranayam.
6. To develop concentration through various methods.

UNIT- I **HEALTH & HYGIENE:** Concept of health, Physical health and mentall health and wellbeing and how to achieve these, longevity and how to achieve it, concept and common rules of hygiene, cleanliness and its relation with hygiene; Overeating and underrating, amount of food intake required, intermittent fasting; adequate physical labour, sleep; consumption of junk fast food vs nutritious food; fruits, vegetables cereals and qualities of each of these.

UNIT-II **INTRODUCTORY KNOWLEDGE OF COMMON STREAMS OF MEDICINAL CURE:** History, development, basic concepts, modes of operation of Alopathy, Ayurved, Homoeopathy, Biochemic, Unani, Siddha, Accurpressure, Accupunture, Naturopathy, Yogic and Herbal system of medicines, Introduction of Anatomy and Physiology concerned.

UNIT- III **YOGASANS:** Meaning and concept of Yoga, Yogasans and its mode of operation, How to perform Yogasans, Common Yogasans with their benefits, such as, Padahastasan, Sarvangasan, Dhanurasan, Chakrasan, Bhujangasan, Paschimottasan, Gomukhasan, Mayurasan, Matsyasan, Matsyendrasan, Pawanmuktasan, Vajrasan, Shalabhasan, Sinhasan, Shashankasan, Surya Namaskar, Halasan, Janushirasan, Utshep Mudra.

UNIT-IV **YOGASANS FOR COMMON DISEASES:** From Yogic Materia Medica with symptoms, causes, asans and herbal treatment.

- **Modern silent killers:** High blood pressure, diabetes and cancer, causes and cure; Common health problems due to stomache disorders, such as, indigestion, acidity, dycentry, piles and fissures, artheritis, its causes, prevention and cure.
- **Asans for relaxation:** Shavasan, Makarasan, Matsyakridasan, Shashankasan.
- **Asans to increase memory and blood supply to brain:** Shirsh padasan, Shashankasan.
- **Asans for eye sight:** Tratak, Neti Kriya .
- **Pranayam:** Definition and types: Nadi Shodhan, Bhastrik, Shitakari, Bhramari useful for students.

UNIT-V **CONCENTRATION:** Concentration of mind and how to achieve it. Tratak (त्राटक). Concentration on breath, Japa (जप). Ajapajap (अजपाजप). internal silence (अन्तर्मौन). visualization in mental sky (चिदाकाश धारणा). Concentration on point of light (ज्योति ध्यान). Concentration on feeling (भाव ध्यान). Concentration on figure (मूर्त्त ध्यान).

Text Books:

Health, Hygiene & Yoga, Dr P B Deshmukh, Gyan Book Pvt Ltd. New Delhi.

Reference Books:

(1) Yogic Materia Medica
(2) Asan, Pranayam and Bandh.