FLUID MECHANICS AND MACHINES
[As per Choice Based Credit System (CBCS) scheme] SEMESTER – IV

Subject Code	15MT42	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives:

To introduce the students to the fundamentals of fluid mechanics and analytical formulation of fluid mechanics and turbomachine problems using first principles and principles of energy transfer.

Modules	**Hours Teaching**	**RevisedBloom'sTaxonomy(RBT) Level**
Module -1		
Physical properties of fluids: Introduction, Types of fluids, Properties of fluids, viscosity, surface tension, vapor pressure and cavitation. **Fluid pressure and its Measurement**: Intensity of pressure, Pascal's law, Hydrostatic law,atmospheric, gauge and vacuum pressures, Piezometer, U-tube and differential manometers. **Fluid Statics**: Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined plane surfaces submerged in liquid.	**10 Hours**	
Module -2		
Fluid Kinematics: Types of fluid flow, continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration, velocity potential function and stream function, problems. **Fluid Dynamics**: Introduction, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation, problems.	**10 Hours**	
Module -3		

Dimensional Analysis: Introduction, derived quantities, dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham's **π**-theorem, dimensionless numbers, similitude, types of similitudes. **Fluid Flow Measurements:** Venturimeter, orificemeter, pitot-tube, V-Notch and rectangular notches (Derivations Venturimeter and V-Notch only), Problems.	**10 Hours**	
Module -4		
Turbomachines: Definition of a Turbomachine, parts of a Turbomachine, Comparison with positive displacement machine; Classification. **Energy transfer in turbo machine:** Euler Turbine equation, alternate form of Euler turbine equation, components of energy transfer, Degree of reaction, general analysis of a Turbo machine – effect of blade discharge angle on energy transfer and degree of reaction.	**10 Hours**	
Module -5		
Hydraulic Turbines: Classification; Constructional features, Velocity triangles and Efficiencies of Pelton Turbine, Francis Turbine and Kaplan Turbine, and simple problems. Function of a Draft tube, types of draft tubes. **Steam Turbines:** Classification, Single stage impulse turbine - Condition for maximum blade efficiency, stage efficiency, Compounding, need for compounding, methods of compounding. Reaction turbine - Parson's reaction turbine, condition for maximum blade efficiency, reaction staging, simple problems.	**10 Hours**	

Course outcomes:

At the end of the course, the student will be able to:

- Appreciate the fluid mechanics fundamentals, including concepts of mass and energy conservation.
- Apply the fundamentals to flow measurement problems.
- Perform dimensional analysis for problems in fluid mechanics.
- Appreciate the understanding of turbomachines and principles of energy transfer in turbomachines.
- Apply the fundamentals for energy transfer problems in various turbomachines.

Graduate Attributes (as per NBA):

Question paper pattern:

- The question paper will have TEN questions.
- Each full question consists of 16 marks.

- There will be 2 full questions (with maximum of FOUR sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module

Text Books:

1. Fluid Mechanics, Oijush.K.Kundu, IRAM COCHEN, ELSEVIER, 3rd Ed. 2005.
2. Fluid Mechanics and Fluid Machines, Dr. Bansal, R.K.Lakshmi Publications, 2004.
3. Textbook of Turbomachines, M S Govinde Gowda, M M Publishers, 2011

Reference Books:

1. Fluid Mechanics and hydraulics, Dr.Jagadishlal: MetropolitanBook Co-Ltd., 1997.
2. Fluid Mechanics (SI Units), Yunus A. Cengel John M.Oimbala, 2ndEd., Tata McGraw Hill, 2006.
3. Fluid Mechanics, John F.Douglas, Janul and M.Gasiosek and john A.Swaffield, Pearson Education Asia, 5th ed., 2006
4. Fluid Mechanics and Fluid Power Engineering, Kumar.D.S, Kataria and Sons., 2004
5. Fluid Mechanics -. Merle C. Potter, Elaine P.Scott. Cengage learning.

MICROCONTROLLER
[As per Choice Based Credit System (CBCS) scheme] SEMESTER – IV

Subject Code	15MT43	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives:
This course trains the students to understand an in-depth operation of 8051 microcontrollers, machine language programming & interfacing techniques. The emphasis is on interfacing the controller to real-world devices such as switches, displays, motors, and A/D converters, through assembly language and C language programming.

Modules	**Hours Teaching**	**RevisedBloom'sTaxonomy(RBT) Level**
Module -1		
Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, A Microprocessors survey. RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture. The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input / Output Pins, Ports and Circuits External Memory, Counter and Timers, Serial Data Input / Output, Interrupts.	**10 Hours**	
Module -2		
Addressing Modes and Operations: Introduction, Addressing modes, External data Moves, Code Memory, Read Only Data Moves / Indexed Addressing mode, PUSH and POP Opcodes, Data exchanges, Byte level logical Operations, Bit level Logical Operations, Rotate and Swap Operations, Arithmetic Operations: Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic. **Jump and Call Instructions:** The JUMP and CALL Program range, Jumps, calls and Subroutines, Interrupts and Returns.	**10 Hours**	
Module -3		
8051 programming in C and Timers: Data types and time delays in 8051C, I/O programming, logic operations, data conversion programs, data serialization. **Timer / Counter Programming in 8051**: Programming 8051 Timers, Counter Programming, programming timers 0 and 1 in 8051 C.	**10 Hours**	
Module -4		
8051 Serial Communication and Interrupts: Basics of Serial Communication, 8051 connections to RS-232, 8051 Serial communication Programming, Programming the second serial port, Serial port programming in C. Interrupts	**10 Hours**	

Programming,8051 Interrupts, Programming Timer Interrupts, Interrupt Priority in the 8051/52.		
Module -5		
UNIT 5: 8051 Interfacing and Applications: Hardware & Software (Assembly code / C code) Interfacing of 8051 to simple switches and LEDs, LCD, ADC, Stepper motor, DC motor, Temperature sensor, Wave form generation.	**10 Hours**	

Course outcomes: Student will be able to

1. Understand the difference between microprocessor and microcontroller, operation of Peripherals of controller, and be able to program a microcontroller system in assembly code and C.
2. Design and Develop a microcontroller based system.
3. Interface the system to switches, keypads, displays, A/D and D/A converters and build a microcontroller based Robot.

Graduate Attributes (as per NBA):

Question paper pattern:

- The question paper will have TEN questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with maximum of FOUR sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. "The 8051 Microcontroller Architecture, Programm ing & Applications", 2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005
2. "The 8051 Microcontroller and Embedded Systems – using assembly and C "-, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006

Reference Books:

1. "Programming and Customizing the 8051 Microcontr oller" Predko ;–, TMH
2. Microcontrollers: Architecture, Programming, Interfacing and System Design",Raj Kamal, "Pearson Education, 2005
3. "Microcontrollers- Theory and Applications", Aja y V.Deshmukh; TMH,2005
4. "Microcontroller and its applications", Dr.Raman i Kalpathi and Ganesh Raja; Sanguine Technical publishers, Bangalore-2005.

MANUFACTURING TECHNOLOGY
[As per Choice Based Credit System (CBCS) scheme] SEMESTER – IV

Subject Code	15MT44	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives:

To introduce students to the fundamentals of modern manufacturing operations.

Modules	**Hours Teaching**	**RevisedBloom'sTaxonomy(RBT) Level**
Module -1		
Introduction to Manufacturing Process: Concept of Manufacturing process, its importance. Classification of Manufacturing processes. **Casting:**Introduction to Casting process &steps involved. Various components produced by casting process, Advantages & Limitations. **Patterns:** Definition and types. **Sand Moulding:** Binders and Additives: Definition, Need and Types.Types of base sand, requirements of base sand.Types of Sand Moulding.Cores: Definition, Need and Types. Concept of Gating & Risers**:** Principle and types. Introduction to Die Casting and injection moulding. .	**10 Hours**	
Module -2		
Introduction to metal working: Classification of metal working processes, characteristics of wrought products, advantages and limitations of metalworking processes. **Forging:** Classification, Forging machines & equipment. Die-design parameters. Forgingdefects, Residual stresses in forging, Applications of forging. **Rolling:** Classification, Types of rolling mills, Defects in rolled products. Rolling variables, Applications of Rolling. **Drawing:** Drawing equipment & dies,drawing variables, Tube drawing,classification of tube drawing, Applications	**10 Hours**	

Module -3		
Extrusion: Types of extrusion processes, extrusion equipment & dies,Extrusion ofseamless tubes, lubrication & defects in extrusion, Extrusion variables, Applications **Sheet & Metal Forming:** Forming methods dies & punches, progressivedie, compound die, combination die. Rubber forming. Open back inclinablepress (OBI press), piercing, blanking, bending, deep drawing, defects of drawn products, stretch forming, Roll bending & contouring, Applications. **Advanced Welding processes:** Classification, Advantages & limitations of welding. Metal Arc welding (MAW), Flux Shielded Metal Arc Welding (FSMAW), Inert Gas Welding (TIG & MIG) Submerged Arc Welding (SAW) and Atomic Hydrogen Welding processes (AHW), Resistance welding, Applications.	**10 Hours**	
Module -4		
Non-traditional Machining Processes: Need for non-traditional machining, Principle, equipment & operation of Laser Beam, Plasma Arc Machining, Electro Chemical Machining, Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining, Electron Beam Machining, Electron Discharge Machining and Plasma Arc Machining.	**10 Hours**	
Module -5		
Introducing to CNC machines: Basics of Turning tool Geometry, ATC, Programming methods. – Manual part programming, Milling, Turning, (Simple Programs), Computer Aided part programming (Simple problems, DNC, Types, Applications, Types of CNC Programming Software's, Over view CNC machining centers, Turning centre.	**10 Hours**	

Course outcomes:

At the end of this course students should be able to

1. Understand the principles and techniques of casting, forging, rolling & drawing.
2. Apply the knowledge of metal working process.
3. To express the different techniques of joining process for metal & non metals.
4. Understanding and applying knowledge to execute CNC machining programs.

Graduate Attributes (as per NBA):

Question paper pattern:

- The question paper will have TEN questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with maximum of FOUR sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. **Manufacturing Technology,** Serope Kalpakjain, Steuen.R.Sechmid, Pearson Education Asia, 5th Ed. 2006**.**
2. **Manufacturing Technology Vol 1&2,** PN Rao, Tata McGraw Hill, 2001
   NC Machine Programming and Software Design, ChnoHwachang**,** Michel. A. Melkanoff, Prentice Hall, 1989

Reference Books:

1. **Process and Materials of Manufacturing,** Roy A Lindberg, 4th Ed. Pearson Ed. 2006.
2. **Workshop technology,** Hazara Choudhry, Vol-I &II, Media Promoters & Publishers Pvt Ltd. 2004.
3. **Production technology,** HMT, Tata McGraw Hill, 2001.
4. **Manufacturing Science,** AmitabhGhosh and Mallik, affiliated East West press, 2003.
5. **Fundamentals of metal Machining and machine Tools,** G. Boothroyd, McGraw Hill. 2000.
6. **Automation Production system and Computer Integrated Manufacturing** Mikell. O. Grover, PHI, New Delhi, 2002.

THEORY OF MACHINES
[As per Choice Based Credit System (CBCS) scheme] SEMESTER – IV

Subject Code	15MT45	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives:

The course has been designed to introduce the basic concepts of kinematics and dynamics associated with machine elements. The students will understand the constructional and working features of mechanisms and machines.

Modules	**Hours Teaching**	**RevisedBloom'sTaxonomy(RBT) Level**
Module -1		
Introduction: Definitions Link or element, Kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanisms (with problems), Inversion, Machine. Inversion of single slider and four bar mechanisms. Intermittent Motion - Geneva wheel mechanism and Ratchet and Pawl mechanism. **Velocity and Acceleration Analysis of Mechanisms:** Velocity and acceleration analysis of four bar mechanism and slider crank mechanism by Graphical method (Relative velocity and acceleration method), Simple Problems. Introduction to Instantaneous centres method (no numericals).	**10 Hours**	
Module -2		
Gears and Gear Trains: Gear terminology, law of gearing, Path of contact Arc of contact, Contact ratio of spur gears. Simple gear trains, Compound gear trains for large speed. Reduction, Epicyclic gear trains. Tabular methods of finding velocity ratio of epicyclic gear trains.	**10 Hours**	
Module -3		
Cams: Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curve for cam profiles. Disc cam with reciprocating follower having knife-edge, roller follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform acceleration and retardation and Cycloidal motion.	**10 Hours**	

Module -4		
Balancing of Rotating Masses: Static and dynamic balancing. Balancing of single rotating mass by balancing masses in same plane and in different planes.Balancing of several rotating masses by balancing masses in same plane and in different planes. **Belt Drivers: Belt Drives:** Flat Belt Drives, Ratio of Belt Tensions, Centrifugal Tension, power Transmitted.	**10 Hours**	
Module -5		
Gyroscope: Vectorial Representation of Angular Motion, Gyroscopic Couple. Effect of Gyroscopic Couple on Ship, Plane Disc, Aircraft, Stability of Two Wheelers. **Governors:** Types of governors; force analysis of Porter and Hartnell governors. Controlling force, stability, sensitiveness, isochronism, effort and power.		

Course Outcomes:

At the end of the course, the student will be able to:

1. Explain the concepts of mechanism, machines, and types of motion, and calculate the mobility of a mechanism.
2. Determine the positions, velocities and accelerations of links of simple mechanisms by using graphical approach.
3. Explain basic cam terminology, analyze various types of CAMS, and draw CAM profile diagrams.
4. Demonstrate the knowledge of various transmission mechanisms like gears and belts, and apply them for simple problems.
5. Appreciate the principles of Balancing, Governors, and Gyroscope, and their applications

Graduate Attributes (as per NBA):

Question paper pattern:

- The question paper will have TEN questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with maximum of FOUR sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Theory of Machines: Sadhu Singh, Pearson Education, 2nd edition, 2007.
2. Theory of Machines: Rattan S.S Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition, 2006.

3. Theory of Machines, R. S. Khurmi, J. K. Gupta, Eurasia Publishing House, 2008 Revised Edition**.**

Reference Books:

1. Theory of Machines and Mechanisms, John Joseph Uicker, G. R. Pennock, Joseph Edward Shigley, Oxford University Press, 2003.

2. Theory of Machines and Mechanisms, Amitabha Ghosh and Mallick, East West Press, 3rd Edition 2006.

3. Theory of Machines, Thomas Bevan, CBS Publication 1984.

INSTRUMENTATION AND MEASUREMENTS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV

Subject Code	15MT46	IA Marks	20
Number ofLecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives:

- To provide the fundamental knowledge of transducers, instrumentation and measurement systems.
- To understand the functional elements of instrumentation/measurement systems.
- To impart the knowledge of static and dynamic characteristics of instruments, and understand the factors in selection of instruments for measurement.
- To discuss the principle, design and working of transducers for the measurement of displacement, level, strain, resistance capacitance inductance, pressure, sound and speed.

Modules	Hours Teaching	RevisedBloom's Taxonomy(RBT) Level
Module -1		
Classification and Functional Elements of Instrument/ measurement system: Measurement, significance of measurement, instruments and measurement systems, mechanical, electrical and electronic instruments, Deflection & Null type instruments and their comparison, Analog and digital modes of operation, functions of instruments and measurement systems, applications of measurement systems, Elements of generalized measurement system, Input-output configuration of measuring instruments and measurement systems, methods of correction for interfering and modifying inputs. Transducers, Classifications of transducers-primary & secondary, active & passive, analog and digital transducers.	10 Hours	
Module -2		
Static and Dynamic Characteristics: Static calibration and error calibration curve, accuracy and precision, indications of precision, static error, scale range and scale span, reproducibility and drift, repeatability, signal to noise ratio, sensitivity, linearity, hysteresis, threshold, dead zone and dead time, resolution, signal to noise ratio, factors influencing the choice of transducers/instruments. Dynamic response – dynamic characteristics, time domain analysis & different types of inputs, frequency domain analysis. Time domain response – zero order system, first order electrical system, response of a first order system to step & ramp input, Second order system, response of a second order system to step input, time domain specifications, frequency response of first and second order system.	10 Hours	
Module -3		
Measurement of Displacement: Introduction, Principles of Transduction, Variable resistance devices, variable Inductance Transducer, Variable Capacitance Transducer, Hall Effect Devices, Proximity Devices, Digital Transducer Measurement of Level: Capacitance probes, conductivity probes, differential pressure level detector, float level devices, optical level switches, radiation level sensor, ultrasonic level detector, thermal level sensors	10 Hours	

Module -4		
Measurement of Strain: Introduction, Factors affecting strain measurements, Types of Strain Gauges, Theory of operation of resistance strain gauges, Types of Electrical Strain Gauges – Wire gauges, unbounded strain gauges, foil gauges, semiconductor strain gauges (principle, types & list of characteristics only), Materials for Strain Gauges, Strain gauge Circuits – Wheatstone bride circuit, Applications. Measurement of resistance, induction and capacitance: Whetstone's bridge, Kelvin Bridge; ACbridges, Capacitance Comparison Bridge, Maxwell's bridge, wein's bridge, Wagners's earth connection.	10 Hours	
Module -5		
Transducers – I: Introduction, Electrical transducers, Selecting a transducer, Resistive transducers,Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer,Differential output transducers and LVDT. Transducers – II: Piezoelectric transducer, Photoelectric transducer,Photovoltaic transducer, Semiconductor photo devices, Temperature transducers-RTD, Thermocouple(b) Display Devices: Digital display system, classification of display, Display devices, LEDs, LCD displays	10 Hours	

Course outcomes:

After studying this course, students will able to:

- Define the transducer, instrument, measurement and classify different types of transducers
- Explain the functional elements of instrumentation / measurement systems
- Discuss the input-output configuration of measurement systems
- Define, interpret and analyze the static and dynamic characteristics of instruments
- Explain the principle, design and analyze the transducers for the measurement of displacement, level, strain, force, torque, pressure, sound and speed

Graduate Attributes (as per NBA):

Question paper pattern:

- The question paper will have TEN questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with maximum of FOUR sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Electrical and Electronic Measurements and Instrumentation – A. K. Sawhney, 17th Edition (Reprint 2004), DhanpatRai& Co. Pvt. Ltd., 2004. (Module 1 & 2)

2. Instrumentation: Devices and Systems- C. S. Rangan, G. R. Sarma, V. S. V. Mani, 2nd Edition (32nd Reprint), McGraw Hill Education (India), 2014. (Module 3-Displacement measurement, Module 4,

3. Process Measurement Instrument Engineers Handbook- Bela G. Liptak, Revised Edition, Chilton Book Company, 1982. (Module 3 – Level measurement,)

4."Electronics Instrumentation", H.S. Kalsi, TMH, 2004-Module 5

Reference Books:

1. Transducers and Instrumentation – D.V.S.Murty, 2nd Edition, PHI, 2009.

2. Introduction to Measurements and Instrumentation - A. K. Ghosh, 2nd Edition, PHI, 2007.

3. Instrumentation Measurement and Analysis- B.C.Nakra and K.K.Choudhry, 3rd Edition, McGraw Hill Education (India) Pvt.Ltd. 2009.

4. Measurement Systems Application and Design- Ernest O.Doeblin and Dhanesh N Manik, 5th Edition, McGraw Hill, 2007

MECHANICAL LAB - II

[As per Choice Based Credit System (CBCS) scheme] SEMESTER – IV

Subject Code	15MTL47	IA Marks	20
Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	-	Exam Hours	03

CREDITS – 02

Course objectives:

- To understand the flow measurement in a pipe flow.
- To Measure the discharge in a open channel flow.
- To study the characteristic of turbins.
- To understand the working principle of hydraulic components & hydraulic circuit.

Laboratory Experiments:	Revised Bloom'sTaxonomy (RBT)Level
Part-A	
1. Calibration of flow measuring devices: a. Orifice Plate meter, b. Venturimeter, c. V-notch 2. Performance testing of Turbines a. Pelton wheel b. Francis Turbine c. Kaplan Turbine	
Part-B	
1. Speed Control Circuit on Hydraulic/Pneumatic Trainer 2. Sequencing Circuit on Hydraulic/Pneumatic Trainer 3. Regenerative Circuit on Hydraulic/Pneumatic Trainer 4. Synchronizing Circuit on Hydraulic/Pneumatic Trainer	

Course outcomes:

By the end of the course the student will be able to:

- Determine the co-efficient of discharge of flow measuring devices.
- Select the type of turbine required with reference to available head of water and discharge.
- Apply the working principle of impulse and reaction turbine.
- Design hydraulic circuit for various industrial applications.

Graduate Attributes (as per NBA):

Scheme of Examination:

One Question From Part – A : **35marks**
One Question From Part - B : **35 Marks**
Viva- Voice : **10 Marks**
Total : **80 Marks**

MICRO CONTROLLER LAB

[As per Choice Based Credit System (CBCS) scheme] SEMESTER – IV

Subject Code	15MTL48	IA Marks	20
Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	-	Exam Hours	03

CREDITS – 02

Course objectives:

- To study assembly language programming in 8051
- To study interfacing of various peripherals using 8051
- To design and develop applications using 8051

Laboratory Experiments:	Revised Bloom'sTaxonomy (RBT)Level
Part-A	
1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array. 2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube (16 bits Arithmetic operations – bit addressable). 3. Counters. 4. Boolean & Logical Instructions (Bit manipulations). 5. Conditional CALL & RETURN. 6. Code conversion: BCD – ASCII; ASCII – BCD, ASCII -Decimal; Decimal - ASCII; HEX - Decimal and decimal - HEX. 7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.	
Part-B	
1. Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions. 2. Simple Calculator using 6 digit seven segment display and Hex Keyboard interface to 8051. 3. Interfacing of 8051 to LCD . 4. External ADC and Temperature control interface to 8051. 5. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.	

6. Stepper and DC motor control interface to 8051.	

Course outcomes:

By the end of the course the student will be able to:

1. Build application on 8051 using assembly / C language.
2. Interface between external peripherals to 8051 using C programming.

Graduate Attributes (as per NBA):

Scheme of Examination:

One Question From Part – A : **35marks**
One Question From Part - B : **35 Marks**
Viva- Voice : **10 Marks**
Total : **80 Marks**