Syllabus of Courses offered to B.Tech. (Mechatronics) II year

UTTARAKHAND TECHNICAL UNIVERSITY

Program: B. Tech- MECHATRONICS

Year : 2, Semester: III, **Scheme and Evaluation Pattern**

S.No	Course No.	Subject	Periods			Evaluation				Total Marks
			L	T	P	Sessional			External Exam	
						CT	TA	Total		
Theory										
1.	TMA-301	Engineering Mathematics- III	3	1	0	30	20	50	100	150
2.	TME-303	Solid Mechanics	3	1	0	30	20	50	100	150
3.	TME-301	Material Science	3	1	0	30	20	50	100	150
4.	TEC-302	Digital Electronics & Design Aspects	3	1	0	30	20	50	100	150
5.	TMTE-301	Networks & Signals	2	1	0	15	10	25	50	75
6.	THU-301	Engineering Economics	2	1	0	15	10	25	50	75
Practical/Design										
1.	PME-351	Material Science Lab	0	0	2	0	0	25	25	50
2.	PEC-352	Digital Electronics Lab	0	0	2	0	0	25	25	50
3.	PMTE-353	Networks & Signals Lab	0	0	2	0	0	25	25	50
4.		Discipline	0	0	0	0	0	50	0	50
5.		General Proficiency	0	0	0	0	0	50	0	50
Total										**1000**

Semester: IV

Theory

S.No	Course No.	Subject	Periods			Evaluation				Total Marks
			L	T	P	Sessional			External Exam	
						CT	TA	Total		
1.	TMTE-401	Production Technology	3	1	0	30	20	50	100	150
2.	TMTE-402	Kinematics &Dynamics of Machines	3	1	0	30	20	50	100	150
3.	TMTE-403	Thermodynamics & Heat Transfer	3	1	0	30	20	50	100	150
4.	TMTE-404	Electrical Machines	3	1	0	30	20	50	100	150
5.	TMTE-405	Advanced Programming in C	2	1	0	15	10	25	50	75
6.	TEE-405	Control System	2	1	0	15	10	25	50	75
Practical/Design										
1.	PMTE-451	Adv.Programming in C Lab	0	0	2	0	0	25	25	50
2	PEE-454	Control System Lab	0	0	2	0	0	25	25	50
3.	PMTE-452	Electrical Machine Lab	0	0	2	0	0	25	25	50
4.		Discipline	0	0	0	0	0	50	0	50
5.		General Proficiency	0	0	0	0	0	50	0	50
Total										**1000**

Uttarakhand Technical University

Subject Code: TMA - 301 **Course Title: Mathematics - III**
Contact Hours: L:3 T:1 P:0 **Examination Duration: 3 Hours**
Course Contents:

Unit – I: Function of Complex variable **10**
Analytic function, C-R equations, Cauchy‟s integral theorem, Cauchy‟s integral formula for derivatives of analytic function, Taylor‟s and Laurent‟s series, singularities, Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(cos\theta, sin\theta)d\theta$ and $\int_{-\pi}^{+\pi} f(x)dx$

Unit – II: Statistical Techniques – I **08**
Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non – linear and multiple regression analysis, Probability theory.

Unit – III: Statistical Techniques – II **08**
Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tests of significations: Chi-square test, t-test, Analysis of variance (one way), Application to engineering, medicine, agriculture etc. Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, X, R, p, np, and c charts.

Unit – IV: Numerical Techniques – I **08**
Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, difference tables, Newton‟s forward and backward interpolation , Lagrange‟s and Newton‟s divided difference formula for unequal intervals.

Unit – V: Numerical Techniques –II **08**
Solution of system of linear equations, Gauss-Seidal method, Crout method. Numerical differentiation, Numerical integration , Trapezoidal , Simpson‟s one third and three-eight rules, Solution of ordinary differential (first order, second order and simultaneous) equations by Euler‟s, Picard‟s and forth-order Runge- Kutta methods.

Recommended Books :-

1. T. Veerajan & T. Ramchandran, Theory & Problems in Numerical Methods, TMH, New Delhi,2004.
2. Kreyszig, Advanced Engineering Mathematics, 8ed, Wiley India
3. Devore, Probability and Statistics, Thomson(Cengage) Learning, 2007.
4. Walpole, Myers, Myers & Ye, Probability and Statistics for Engineers & Scientists, PearsonEducation, 2003.
5. Peter V. O‟Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007

Uttarakhand Technical University

Subject Code: TME- 303 **Course Title: Solid Mechanics**
Contact Hours: L:3 T:1 P:0 **Examination Duration: 3 Hours**
Course Contents:

Unit-I

Introduction; Stress and strain: stress at point, Cauchy stress tensor, equilibrium equations, analysis of deformation and definition of strain components, compatibility relations, 8

Principal stresses and strains;stress and strain invariants,Mohr's circlerepresentation. 3

Unit-II

Constitutive relations: true and engineering stress-strain curves, Material properties for isotropic materials and their relations; theories of failures for isotropic materials. 7

Unit-III

Shear Force and Bending Moment diagrams; axially loaded members. Torsion of circular shafts

Stresses due to bending; pure bending theory, combined stresses. 7

Unit-IV

Deflections due to bending: moment-curvature relation, load-defection differential equation, area moment method, and superposition theorem; stresses and deflections due to transverse shear. 8

Unit-V

Torsion of circular shaft; Energy methods: Strain energy due to axial, torsion, bending and transverse shear; Castigliano's theorem, reciprocity theorem etc. 7

Recommended Books:

1. S. C. Crandall, N. C. Dahl, and T. J. Lardner, *An Introduction to the Mechanics of Solids*, 2e, McGraw Hill,1978.
2. Fundamentals of Strength of Materials, Nag, Wiley India
3. E. P. Popov, *Engineering Mechanics of Solids*, Prentice Hall, 1990
4. Mechanics of Materials by Bear Jhonson
5. Advanced Mechanics of Materials, 6ed, Boresi, Wiley

Uttarakhand Technical University

Subject Code: TMTE: 301 **Course Title: Networks and Signals**
Contact Hours: L: 2 T: 1 P: 0 **Examination Duration: 2 Hours**
Course Contents:

Unit – 1

Basic continuous time signals, unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics. Introduction to various types of systems

Network Theorems (Application to ac networks): Superposition theorem, Thevenine's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem, Millman's theorem, compensation theorem, Tellegen's theorem.

Unit- 2

Sampling and Laplace Transform: Signal representation by samples, sampling theorem, impulse train sampling, sampling of discrete time signals, discrete time processing of continuous time signals. Laplace Transform, region of convergence, inverse Laplace Transform, Analysis and characterization of LTI system, Block diagram representation, Unilateral Laplace transform.

Unit – 3

Signals and Systems: Continuous time and discrete time signals, transformation of the independent variable, exponential and sinusoidal signals, continuous time and discrete time LTI systems and their properties, convolution sum and convolution integrals, LTI system described by differential and difference equation.

Unit – 4

Fourier series and Fourier Transform: The response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-time Periodic Signals and their Properties.

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Recommended Books:

1. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India
2. Network Analysis with Applications, 4/e (with CD), Stanley. Pearson Edu.
3. N C Jagan, Network Analysis & Synthesis, B S Publication
4. Simon Haykin, Signals & Systems, Wiley India
5. Lathi, B P , Signals & Systems, B S Publication

Uttarakhand Technical University

Subject Code: TEC-302 Course Title: Digital Electronics and Design Aspects
Contact Hours: L:3 T:1 P:0 Examination Duration: 3 Hours
Course Contents:

Unit-I (8L)
Introduction: Characteristics of digital system, Types of Digital circuits, Number system: Direct conversion between bases Negative numbers & BCD and their arithmetic's, Boolean algebra, Minimization of Boolean Functions: K Map up to 6 variable and multiple output circuits, Quine McClusky method, error detection & correcting codes, Hamming & cyclic codes

Unit-II (7L)
Combinational Logic Circuits: Design Procedure, adders, subtractors & code conversion, Multiplexers/Demultiplexers, encoder/decoders, decimal adders & amplitude comparators, ROM as decoder, PLA & PAL

Unit-II (8L)
Sequential Logic Circuits: Flip-Flops and their conversions, analysis and synthesis of synchronous sequential circuit, excitation table, state table & diagram. Design of synchronous counters, shift registers and their applications, Finite State Machine

Unit-IV (6L)
Logic Families: Diode, BJT & MOS as a switching element concept of transfer characteristics, Input characteristics and output characteristics of logic gates, TTL, Tri-state logic, open collector output, IIL,ECL,NMOS,CMOS, Pass Transistor Logic Interfacing between logic families, packing density, power consumption & gate delay.

Unit-V (10L)
Hazard and Fault Detection: Static and dynamic Hazard: Gate delay, Generation of spikes, Determination of hazard in combinational circuits, Fault detection methods: Fault Table & Path sensitizing methods.
Memories: Sequential, Random Access, NMOS & CMOS Static and Dynamic Memory elements, one and multi-dimensional selection arrangement, Read-only memories, Formation of memory banks, internal & External address decoding

Recommended Books:
1. Maini, Digital Electronics: Principles and Integrated Circuits, Wiley India
2. Digital Systems: Principles and Design, Raj Kamal, Pearson
3. M. Morris Mano and M. D. Ciletti, Digital Design, M. Morris Mano and M. D. Ciletti, 4th Edition, Pearson Education

Uttarakhand Technical University

Subject Code: TME - 301 **Course Title: Material Science**
Contact Hours: L: 3 T: 1 P: 0 **Examination Duration: 3 Hours**
Course Contents:

Unit-I
Introduction: Historical perspective, importance of materials; Brief review of modern & atomic concepts in Physics and Chemistry. Atomic models, Periodic table, Chemical bondings.
Crystallography and Imperfections: Concept of unit cell space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density; Miller indices; X-ray crystallography techniques; Imperfections, Defects & Dislocations in solids.

Unit-II
Mechanical properties and Testing: Stress strain diagram, Ductile & brittle material, Stress vs. strength; Toughness, Hardness, Fracture, Fatigue and Creep. Tastings such as Strength tastings, Hardness testing, Impact tastings, Fatigue testing Creep testing, Non-destructive testing (NDT)
Micro structural Exam: Microscope principle and methods; Preparation of samples and Microstructure exam and grain size determination; Comparative study of microstructure of various metals & alloys such as Mild steel, CI, Brass.
Phase Diagram and Equilibrium Diagram: Uniary and Binary diagrams, Phase rules. Types of equilibrium diagrams: Solid solution type, eutectic type and combination type. Iron-carbon equilibrium diagram.

Unit-III
Ferrous materials: Brief introduction of iron and steel making furnaces. Various types of carbon steels, alloy steels and cast irons, its properties and uses
Heat Treatment: Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams.
Non-Ferrous metals and alloys: Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various type Brass, Bronze, bearing materials, its properties and uses. Aluminium alloys such as Duralumin. Other advanced materials/alloys.

Unit-IV
Magnetic properties: Concept of magnetism - Dia, para, Ferro Hysteresis; Soft and hard magnetic materials, Magnetic storages.
Electric properties: Energy band concept of conductor, insulator and semi-conductor; Intrinsic & extrinsic semi-conductors; P-n junction and transistors; Basic devices and its application; Diffusion of Solid; Super conductivity and its applications; Messier effect. Type I & II superconductors; High Tc superconductors.

Unit – V

Ceramics: Structure types and properties and applications of ceramics; Mechanical/Electrical behaviour and processing of Ceramics.

Plastics: Various types of polymers/plastics and its applications; Mechanical behaviour and processing of plastics; Future of plastics.

Other materials: Brief description of other material such as optical and thermal materials concrete, Composite Materials and its uses. Brief introduction to Smart & Nano materials and their potential applications

Performance of materials in service: Brief theoretical consideration of Fracture, Fatigue, and Corrosion and its control.

Recommended Books:

1.Callister/Balasubramaniam – Callister‟s Material Science & Engineering Wiley India
2. Van Vlack - Elements of Material Science & Engineering John Wiley & Sons.
3. V. Raghvan - Material Science, Prentice Hall.
4. Chawla, Composite Materials, T & F

Uttarakhand Technical University

Subject Code: THU - 301 **Course Title: Engineering Economics**
Contact Hours: L: 2 T: 1 P: 0 **Examination Duration: 2 Hours**
Course Contents:

Unit-I
Time value of money : Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.

Unit-II
Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions.

Unit-III
Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

Unit-IV
Depreciation, computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Product and Process Costing, Standard Costing, cost estimation, Relevant Cost for decision making, Cost control and Cost reduction techniques.

Recommended Books:
1. Horn gren, C.T., Cost Accounting, Prentice Hall of India
2. White, Engineering Economics, Wiley India
3. Riggs, J.L., Dedworth, Bedworth, D.B, Randhawa, S.U. Engineering Economics, McGraw Hill, International Edition, 1996

Uttarakhand Technical University

Subject Code: PME - 351 **Course Title: Material Science Lab**
Contact Hours: L: 0 T: 0 P: 2
Course Contents:

Material Science Lab Experiments:

1. Making a plastic mould for small metallic specimen.
2. Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.
3. Grain size determination of a given specimen.
4. Comparative study of microstructures of different given specimens (mild steel, gray cast iron, brass, copper etc.)
5. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.
6. Material identification of, say, 50 common items kept in a box.
7. Faradays law of electrolysis experiment.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro and Micro Examination.
10. Suitable experiment on Magnetic/ Electrical/ Electronic materials.

Uttarakhand Technical University

Subject Code: PEC - 352 **Course Title: Digital Electronics Lab**
Contact Hours: L: 0 T: 0 P: 2
Course Contents:

List of experiments:

1. Bread-board implementation of various flip-flops.
2. Bread-board implementation of counters & shift registers.
3. Determination of Delay time and NAND, NOR, Ex-OR, AND & OR Gates.
4. Experiments with clocked Flip-Flop.
5. Design of Counters.
6. Implementation of Arithmetic algorithms.
7. Bread Board implementation of Adder/Subtractor (Half, Full)
8. Transfer characteristics of TTL inverters & TTL Schmitt Trigger inverter.
9. Transfer characteristics of CMOS inverters series and CD40 series and
10. Estimation of Gate delay of CD40 series CMOS inverter.
11. Monoshot multivibrators using 74121 and 74123.
12. Clock circuit realization using 555 and CMOS inverter and quartz crystal.
13. Demultiplexer / Decoder operation using IC-74138.

Uttarakhand Technical University

Subject Code: PMTE-353 **Course Title: Networks and Signals Lab**
Contact Hours: L: 0 T: 0 P: 2
Course Contents:

List of experiments for Network and Signals Lab

1. Verification of principle of superposition with dc and ac sources.
2. Verification of Thevenin's, Norton's and Maximum power transfer theorems in ac circuits.
3. Verification of Tellegin's theorem for two network of the same topology.
4. Determination of transient response of current in RL and RC circuits with step voltage input.
5. Determination of transient response of current in RLC circuit with step voltage input for under damp, critically damp and over damp cases.
6. Determination of frequency response of a twin- T notch filter.
7. To determine attenuation characteristics of a low pass/high pass active filters.

Note: College may add extra three experiments in this list. Minimum eight experiments are to be performed

Uttarakhand Technical University

Subject Code: TMTE-401 **Course Title: Production Technology**
Contact Hours: L:3 T:1 P:0 **Examination Duration: 3 Hours**
Course Contents:

Unit-1

Foundry: Fluidity and factors effecting fluidity, Design of gating system, gas porosity and shrinkage phenomena in casting, direction solidification, risering of casting, riser design, mechanism of feeding, method of risering, feeding distance and feeder heads, casting defects and their elimination.

Unit-2

Welding: plasma arc welding; electro slag and electro gas welding; residual stress and weld ability test, TIG, MIG, ultrasonic and laser welding; underwater welding; friction welding, electron beam welding; explosive welding.

Unit-3

Forging; classification, equipments, forging defects; rolling; classification, rolling equipments, hot and cold rolling, rolling of bars and shapes, camber in rolling defects.

Unit -4

Extrusion: Classification, extrusion equipment, load displacement, characteristics; different extrusion dies, extrusion defects, tube extrusion Hydrostatic extension, formality limit diagram. sheet metal forming; formability of sheets, formability principles of deep drawing, redrawing ironing and sinking, stretch forming, hydro-forming, spinning, bending, forming defects.

Unit-5

Metal Cutting Principles: Classification of the manufacturing processes, Cutting parameters, Cutting tool geometry; Tool signature, Tool materials and cutting fluids, Power required for machining; Smoothness and accuracy of machined surfaces.

Recommended books:

1. Fundamentals of metal casting technology - P.C. Mukherjee, Oxford and IBH.
2. Welding technology, R. Bittle, TMH.
3. Mechanical Metallurgy, Dieter, Me Graw Hill, Kogakusha.
4. Casting properties of metals and alloys - V. Korolkove.
5. Manufacturing properties of materials - Campbell, TMH.

Uttarakhand Technical University

Subject Code: TMTE - 402 Course Title: Kinematics and Dynamics of Machines
Contact Hours: L:3 T:1 P:0 Examination Duration: 3 Hours
Course Contents:

UNIT I:
Introduction: Links-types, Kinematics pairs-classification, Constraints-types, Degree of Freedom, Grubler‟s equation, linkage mechanisms, inversions of four bar linkage, slider crank chain and double slider crank chain.
Velocity in Mechanisms: Velocity of point in mechanism, relative velocity method instantaneous point in mechanism, Kennedy‟s theorem, instantaneous center method

UNIT II:
Acceleration in Mechanisms: Acceleration diagram, Coriolis component of acceleration, Klein‟s construction for Slider Crank and Four Bar mechanism, Analytic method for slider crank mechanism.
Mechanisms with Lower Pairs: Pantograph, Exact straight line motion mechanisms-Peaucellier‟s, Hart and Scott Russell mechanisms, Approximate straight line motion mechanisms – Grass-Hopper, Watt and Tchebicheff mechanisms.

UNIT III:
Force Analysis, Turning Moment & Fly wheel:
Static force analysis of linkages, Equivalent offset inertia force, Dynamic analysis of slider crank & Bar mechanism. Piston and Crank effort, Inertia, Torque, Turning moment diagrams, Fluctuation of energy, Flywheel.

UNIT IV:
Cams:
Cams and followers; classification and terminology; cam profile for constant velocity, SHM and constant acceleration for in line knife edge and roller followers

UNIT V:
Gears: Classification & terminology, law of gearing, tooth forms, interference, under cutting, minimum number of teeth on gear and pinion to avoid interference, simple, compound and planetary gear trains.

Recommended Books:

1. Ghosh & Mallik, ’Theory of Machines and Mechanisms,’ East West Press
2. Waldron, ‘Kinematics, Dynamics and Design of Machinery,’ Wiley India
3. S. S. Ratan, ‘Theory of Machines and Mechanisms,’ Tata McGraw Hill
4. Rao & Dukkipati, ‘Theory of Machines and Mechanisms’,
5. R. S. Khurmi, ‘Theory of Machines’, S. Chand

Uttarakhand Technical University

Subject Code: TMTE-403 Course Title: Thermodynamics and Heat Transfer
Contact Hours: L:3 T:1 P:0 Examination Duration: 3 Hours
Course Contents:

Unit-I: INTRODUCTION
Review of fundamental concepts and definitions. Review of first and 2nd law of thermodynamics, entropy, properties of substances.

UNIT II: AVAILABLE ENERGY, EXERGY AND IRREVERSIBILITY
Available energy, available energy referred to a cycle, quality of energy, maximum work in a reversible process, reversible work by an open system exchanging heat only with surroundings, useful work, dead state, availability, availability in a chemical reaction, irreversibility and Gouy- Stodala Theorem, availability or exergy balance, second law efficiency, comments on exergy,Helmholtz and Gibb's function.

UNIT III: THERMODYNAMIC RELATIONS, EQUILIBRIUM AND THIRD LAW
Mathematical conditions for exact differential, Maxwell's equation, Tds equation, difference inheat capacities, ratio of heat capacities, energy equation, Joule-Kelvin effect, Clausius-Clapeyron equation, evaluation of thermodynamic properties from an equation of state, general thermodynamic considerations on an equation of state, mixtures of variable composition, conditions of equilibrium of a heterogeneous system, Gibbs phase rule, types of equilibrium, local equilibrium conditions, conditions of stability, Joule-Thompson coefficient and Inversion curve, coefficient of volume expansion, adiabatic and isothermal compressibility.

UNIT-IV
Introduction to Heat Transfer:
Concepts of heat flows: conduction, convection and radiation; effect of temperature on thermal conductivity of materials; introduction to combined heat transfer mechanism.
Conduction:
One-dimensional general differential heat conduction equation;, initial and boundary conditions.
Steady State one-dimensional Heat conduction :
Composite Systems in rectangular, cylindrical and spherical coordinates with and without Energy generation; thermal resistance concept; Analogy between heat and electricity flow; thermal contact resistance; Overall Heat Transfer Coefficient, critical thickness of insulation.

UNIT-V
Forced Convection:
Basic concepts; hydrodynamic boundary layer; thermal boundary layer, flow over a flat plate;
Natural Convection:
Physical mechanism of natural convection; buoyant force; empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and Cylinders, and sphere.
Thermal Radiation :
Basic radiation concepts; radiation properties of surfaces; black body radiation laws; shape factor;

Recommended Books:

1. P. K. Nag, 'Engineering Thermodynamics', TMH Pub.
2. Jones & Dugans, PHI Learning Pvt. Ltd.
3. J.P.Holman, 'Heat and Mass Transfer', TMH Pub.
4. Rajput, 'Heat and Mass Transfer', S. Chand Pub.
5. D.S. Kumar, 'Heat and Mass Transfer', Katson Pub.

Uttarakhand Technical University

Subject Code: TMTE-404 **Course Title: Electrical Machines**
Contact Hours: L:3 T:1 P:0 **Examination Duration: 3 Hours**
Course Contents:

Unit I

Principle of Electro-mechanical Energy Conversion:- Introduction, Flow of Energy in Electromechanical Devices, Generated emf in machines, torque in machines with cylindrical air gap.

Unit II

D.C. Machines:- Construction of DC Machines, Emf and torque equation, armature reaction, commutation, performance characteristics of D.C. generators.

Unit III

D.C. Machines (contd.):- Performance characteristics of D.C. motors, starting of D.C motors, 3-point and 4-point starters

Unit IV

Speed Control of D.C. Motors: Field control, armature control, and voltage control (semiconductor device control method)

Unit V

Universal Motor, single phase a.c. series compensated motor, stepper motors (working & principal), gear motor, Principal of operation of 2-phase & 3-phase induction motor

Recommended Books:

1. El Hawary, 'Principles of Electric Machines and Power Electronics', Wiley India
2. I.J. Nagrath & D.P. Kothari, "Electrical Machines", TMH
3. Charles Gross, "Electrical Machines", T&F Delhi
4. Srivastava, R.C., "Electric Machines", Cengage Learning
5. P. S. Bhibhra, 'Electrical Machines', Khanna Publishers

Uttarakhand Technical University

Subject Code: TMTE-405 **Course Title: Advance Programming in C**
Contact Hours: L: 2 T:1 P:0 **Examination Duration:** 2 Hours
Course Contents:

Unit I

Pointers and Memory Representation: Basics of pointers, pointers operators, pointer arithmetic, pointers and function, array of pointers, pointer and strings, pointer to structure, pointers with structure.

Introduction- Static and dynamic memory allocation, the process of dynamic memory allocation, DMA functions, Malloc() function, sizeof() operators, function free(), function realloc().

Unit II

File Handling: Introduction- File Handling, File Structure, File handling function, File types, streams, Text, binary, File system basics. The file pointer, Operating a file, Closing a file, Writing a character, reading a character, Using fopen(), getc(), putc() and fclose(), using feof(), working with strings fputs() and fgets(), standard streams in C, flushing a stream, using fread() and fwrite(), direct access file, fseek() and random access I/O, fprintf() and fscan(), getting file name as Command line arguments.

Unit III

Preprocessor and Error Handling: The preprocessor, #define, defining functions like macros, #errors, #include, creating header files, include user defined header files, conditional compilation directives i.e., #if, #else, #elif and #ifdef &undef, using defined, #line, #pragma, the # & ## preprocessor operator.

Error handling in C: types of errors, handling errors, debugging tools.

Unit IV

Graphics Programming: Graphics on your PC: Graphics and text mode, video adapter, initialize graphics mode and resolution, header file graphics.h, Functions used in Graphics, drawing a point on screen, drawing lines, rectangle, circles, arcs, polygon. Functions to fill colors, display text in graphics mode, outtext(), outtextxy(), justifying text.

Recommended Books:

1. Herbert Shield, “Complete References C”
2. Y.Kanetkar, “pointers through C”
3. Y. Kanetkar, “TSR through C”
4. R.S. Salaria, “Application programming in C”

Uttarakhand Technical University

Subject Code: TEE: 405 **Course Title:** Control System
Contact Hours: L: 2 T: 1 P: 0 **Examination Duration:** 2 Hours

Unit-I
Introduction: Laplace Transform and its applications, Transfer function and its determination, Modeling of mechanical system: Linear mechanical elements, force-voltage and force current analogy, Electrical analog of simple mechanical system,

Unit-II
Time Response analysis: Standard test signals, time response of second order systems and their specifications, steady state errors and error constants, Controllers and its applications: P, PI, PD, PID.

Unit-III
Stability Analysis: Concept of stability, Routh-Hurwitz criteria and its limitations**,** Root locus concepts, construction of root loci.

Unit-IV
Frequency response Analysis I: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots.

Unit-V
Frequency response Analysis II:
Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant.

Recommended Books:

1. Nagrath & Gopal, “Control System Engineering”, 4th Edition, New age International.
2. B.C. Kuo , “Automatic Control System” Wiley India.
3. N.C. Jagan, “ Control Systems”, B.S. Publications, 2007.
4. K. Ogata, “Modern Control Engineering”, Prentice Hall of India.
5. Norman S. Nise, Control System Engineering 4th edition, Wiley India

Uttrakhand Technical University

Subject Code: PMTE-451 **Course Title: Adv. Programming in C lab**

Contact Hours: L: 0 T: 0 P: 2

List of experiments:

1. Write a program to find the maximum and minimum element of a matrix using array of pointers.
2. Write a program to delete an element from a particular position (given by the user) in an array.
3. Write a program to sort a list of elements (use dynamic memory allocation to create the array).
4. Write three functions, using pointers, to concatenate two strings, to compare two strings and to reverse a string, respective ly without using any string library functions. Test these functions in a complete program.
5. Write a C function to reverse a substring within the main string. Pointers to the main string and the sub-string are passed as arguments to this function.
6. Define a self-referential structure for representing a simple linked list of integers.
7. Write a program to split the list into two sub-lists so that the first sub-list contains odd numbered elements and the second one contains the even numbered elements. For example, if the original list is {2, 8, 1, 14, 6, 18, 0, 17}, then the first sub-list is {2, 1, 6, 0} and the second is {8, 14, 18, 17}.
8. Write a program to copy a file to another file such that blank lines are not written to the new file.
9. Create a structure to store information of an Employee- Name, Age, Salary. Write a program to store 10 records of this structure in the file and sort them on the basis of salary.
10. Write macro definitions to calculate area and perimeter of circle, square and rectangle. Store these definitions in a file <myheader.h>. Include this header file in a separate program to perform various calculations.
    Write a program to draw circle and rectangle and fill them with different color

Uttrakhand Technical University

Subject Code: PEE 454 **Course Title: Control System Lab**
Contact Hours: L: 0 T:0 P:2

List of Experiments:

1. To determine response of second order systems for step input for various values of constant ‟K‟ using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To study DC position control system
5. To study synchro-transmitter and receiver and obtain output V/S input characteristics
6. To determine speed-torque characteristics of an ac servomotor.
7. To study performance of servo voltage stabilizer at various loads using load bank.
8. To study behavior of separately excited dc motor in open loop at various loads.

Software based experiments (Use MATLAB, LABVIEW software etc.)

9. To determine time domain response of a second order system for step input and obtain performance parameters.
10. To plot root locus diagram of an open loop transfer function and determine range of gain „k‟ for stability.
11. To plot a Bode diagram of an open loop transfer function.
12. To draw a Nyquist plot of an open loop transfer functions and examine the stability of the closed loop system.

Uttarakhand Technical University

Subject Code: PMTE-452 **Course Title: Electrical Machine Lab**
Contact Hours: L: 0 T: 0 P: 2
Course Contents:

List of experiments:

1. To obtain load characteristics of a d.c. shunt generator and compound generator (a) cumulatively.
2. (b) Differentially compounded.
3. To perform Hopkinson's test and determine losses and efficiency of DC machine.
4. To obtain speed-torque characteristics of a dc shunt motor.
5. To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control.