UNIVERSITY OF KOTA

SCHEME OF EXAMINATION

AND

COURSES OF STUDY

Department of Pure & Applied Physics
Faculty of Science

B.Sc. (Hons.) III & IV Semester

Third Semester (July-December, 2019 / 2020)
Fourth Semester (January-June, 2020 / 2021)

UNIVERSITY OF KOTA
MBS Marg, Near Kabir Circle, KOTA (Rajasthan)-324 005
INDIA

Edition: 2019

Course Structure with Distribution of Marks

Year / Sem.	Serial Number, Code & Nomenclature of Paper		Duration of Exam.	Teaching Hrs/Week & Credit			Distribution of Marks			Min. Pass Marks	
	Number	Nomenclature		L	P	C	Conti. Assess.	Sem. Assess.	Total Marks	Conti. Assess.	Sem. Assess.
II Year III Sem	3.1	Mathematics-I	3 Hrs	3	--	3	15	60	75	06	24
	3.2	Mathematics-II	3 Hrs	3	--	3	15	60	75	06	24
	3.3	Mathematics Practical	6 Hrs	--	4	2	--	50	50	--	25
	3.4	Physics (Hons)-I : Thermal Physics	3 Hrs	3	--	3	15	60	75	06	24
	3.5	Physics (Hons)-II: Electronics	3 Hrs	3	--	3	15	60	75	06	24
	3.6	Physics (Hons)-III: Bio-Physics	3 Hrs	3	--	3	15	60	75	06	24
	3.7	Physics (Hons)-IV: Electrical Technology	3 Hrs	3	--	3	15	60	75	06	24
	3.8	Physics Practical (Hons)	6 Hrs	--	8	4	--	100	100	--	50
	Total			**18**	**12**	**24**	**--**	**--**	**600**	**--**	
II Year IV Sem	4.1	Mathematics-I	3 Hrs	3	--	3	15	60	75	06	24
	4.2	Mathematics-II	3 Hrs	3	--	3	15	60	75	06	24
	4.3	Mathematics Practical	6 Hrs	--	4	2	--	50	50	--	25
	4.4	Physics (Hons)-I : Statistical Physics	3 Hrs	3	--	3	15	60	75	06	24
	4.5	Physics (Hons)-II: Mathematical Physics-I	3 Hrs	3	--	3	15	60	75	06	24
	4.6	Physics (Hons)-III: Digital Electronics	3 Hrs	3	--	3	15	60	75	06	24
	4.7	Physics (Hons)-IV: Heat Transfer	3 Hrs	3	--	3	15	60	75	06	24
	4.8	Physics Practical (Hons)	6 Hrs	--	8	4	--	100	100	--	50
				18	**12**	**24**	**--**	**--**	**600**	**--**	

Note: The syllabi of the compulsory / subsidiary papers are same as prescribed for the B.Sc. Pass Course.

Objectives of the Course:

Innovation and Employability-Physics is concerned with the study of the universe from the smallest to the largest scale, why it is the way it is and how it works. Such knowledge is basic to scientific progress. Although physics is a fundamental science it is a very practical subject. Physicists have to be able to design and build new instruments, from satellites to measure the properties of planetary atmospheres to record-breaking intense magnetic fields for the study of condensed matter. Many of the conveniences of modern life are based very directly on the understanding provided by physics. Many techniques used in medical imaging are derived directly from physics instrumentation. Even the internet was a spin-off from the information processing and communications requirement of high-energy particle physics.

The Department of Pure and Applied Physics has been started the Hons. course from July, 2013. Our current programme involves the students in a holistic experience of Physics education and instills the spirit of research in the formative years of their careers. This flagship programme of University is a pioneering model in Indian science and education, imparting education in Physics while simultaneously encouraging a participation in research. This course shall provide the thorough knowledge of Pure and Applied branches of Physics with extensive theoretical and experimental knowledge in major areas of Physics such as Material science, Plasma science, Advanced Electronics, Energy Studies etc. at Masters' level. This course also emphasizes on the Communication & Presentation skills of the students. The students after completing the course shall be placed in premier research institutes and companies in India and abroad, qualify NET/GATE/JEST examinations and eligible for M.Tech., PhD and teaching.

Duration of the Course:

The course B.Sc. (Hons.- Phsyics) shall consist of three academic years divided in to six semesters.

Eligibility for Admission:

The basic eligibility for admission to the course is XII with Physics, Chemistry and Mathematics with minimum marks for GEN category candidates of Rajasthan-55%; Other state-60%; SC/STOBC/SOBC- Minimum Pass Marks. The admission in the course is based on merit of XII class.

Structure of the Programme:

The B.Sc. (Hons.-Physics) consists of:

(i) Core and applied courses of theory as well as practical papers which are compulsory for all students.

(ii) Dissertation / Project Work / Practical training / Field work, which can be done in an organization (Government, Industry, Firm, Public Enterprise, *etc.*) approved by the Department.

Attendance:

Every teaching faculty handling a course shall be responsible for the maintenance of attendance Register for candidates who have registered for the course. The teacher of the course must intimate the Head of the Department at least seven calendar days before the last instruction day in the semester about the attendance particulars of all students. Each student should earn 75% attendance in the courses of a particular semester failing which he or she will not be permitted to appear in the End-Semester Examinations. However, it shall be open to the authorities to grant exemption to a candidate who has failed to obtain the prescribed

75% attendance for valid reasons and such exemptions should not under any circumstance be granted for attendance below 65%.

Teaching Methodologies:

The classroom teaching would be through conventional lectures or power point presentations (PPT). The lecture would be such that the student should participate actively in the discussion. Student seminars would be conducted and scientific discussions would be arranged to improve their communicative skills. In the laboratory, instructions would be given for the experiments followed by demonstration and finally the students have to do the experiments individually.

Maximum Marks:

Maximum marks of a theory and practical paper shall be decided on the basis of their contact hours/credit per week. One teaching hour per week shall equal to one credit and carry 25 maximum marks and therefore, four teaching hours/credit per week shall carry 100 maximum marks for each theory paper/course. Each four contact hours per week for laboratory or practical work shall be equal to two credits per week and carry 50 marks and therefore, eight teaching hours per week shall carry 100 maximum marks for laboratory or practical work.

Scheme of Examinations:

The examination shall be divided into two parts in which first part is continuous assessment or internal assessment and second part is semester assessment or external assessment. The schemes for the internal and external examinations shall be as under:

a) The internal assessment for each theory paper shall be taken by the teacher concerned in the Department during each semester. There will be two components of internal assessment; one by test having 2/3 weightage (10 marks) and another by seminar / assignment / presentation / quiz / group discussion / vivo of 1/3 weightage (05 marks), for theory papers in each semester. Internal assessment test shall be of one hour duration for each paper and shall be taken according to academic calendar notified by the University / Departments. There will be no internal examination in the practical paper.

b) A student who remains absent (defaulter) or fails or wants to improve the marks in the internal assessment may be permitted to appear in the desired paper(s) (only one time) in the same semester with the permission of the concerned Head of the Department. A defaulter / improvement fee of Rupees 250/- per paper shall be charged from such candidates. Duly forwarded application of such candidates by the teacher concerned shall be submitted to HOD who may permit the candidate to appear in the internal assessment after depositing the defaulter/ improvement fee. A record of such candidates shall be kept in the Department.

c) The external assessment shall be of three hours duration for each theory paper and six hours duration for practical paper. The practical examination shall be taken by the panel of at least one external and one internal examiner at the end of each semester.

d) The syllabus for each theory paper is divided into five independent units and each theory question paper will have the format as mentioned below:

There will be ten long answer type questions covering all units with two questions from each unit, descriptive type, answer in about 400 words. *Students have to attempt* 5 questions by taking one question from each unit. *Paper setter shall be instructed to design question paper covering from all five units.*

e) The pattern of question paper of external shall be as follows:

Duration of Examination: 3 Hours **Max. Marks: 60**

There will be ten long answer type questions covering all units with two questions from each unit, descriptive type, answer in about 400 words. *Students have to attempt* 5 questions by taking one question from each unit. *Paper setter shall be instructed to design question paper covering from all five units.*

Unit – I

Q. No. 1 12 Marks

or

Q. No. 2 12 Marks

Unit – II

Q. No. 3 12 Marks

or

Q. No. 4 12 Marks

Unit – III

Q. No. 5 12 Marks

or

Q. No. 6 12 Marks

Unit – IV

Q. No. 7 12 Marks

or

Q. No. 8 12 Marks

Unit – V

Q. No. 9 12 Marks

or

Q. No. 10 12 Marks

Distribution of Marks for Practical Examinations (For Hons. subject):
Duration of Exam: 06 Hours **Maximum Marks: 100**

S. No.	Name of Exercise	Marks
1.	Exercise No. 1	35
2.	Exercise No. 2	35
3.	Viva-voce	15
4.	Practical Record	15
	Total Marks	**100**

Rules regarding Determination of Results:

Each semester shall be regarded as a unit for working out the result of the candidates. The result of the each semester examination shall be worked out separately (even if he/she has appeared at the paper of the lower semester along with the papers of higher semester) in accordance with the following conditions:

a) The candidate shall be declared as pass in a semester examination, if he/she secures at least 40% marks in each theory paper separately in external & internal examination and 50% marks in each practical paper/project/dissertation with 40% aggregate marks in that semester.

b) A candidate declared as fail/absent in one or more papers at any odd semester examination shall be permitted to take admission in the next higher semester (even semester) of the same academic session.

c) A candidate may be promoted in the next academic session (odd semester) if he/she has cleared collectively at least 50% of the papers of both semesters of previous academic session. The candidate who does not fulfill the above condition will remain as an ex-student and will reappear in the due papers along with next odd/even semester exams.

d) If any student who is provisionally admitted in higher odd semester but could not secure prescribed minimum marks in previous semesters will be treated as ex-student and his/her admission fee will be carry forwarded to the next odd semester of forthcoming academic session.

e) If a candidate, who is declared as pass, wishes to improve his/her performance in the theory papers of previous semester, he/she may re-appear only one time in these papers in next odd/even semester examinations.

f) Candidate shall not be permitted to re-appear or improve the marks obtained in the external examination of practical / dissertation in any condition.

g) If the number of papers prescribed in a semester examination is an odd number, it shall be increased by one for the purpose of reckoning 50% of the papers for considering the student pass/fail.

h) A candidate may be given only two additional chances for passing the semester thus maximum tenure for completing for three years under-graduate programme up to five years and so on.

i) The marks secured in the Gen Hindi, Gen English, Elementary Computer applications and Environment studies shall not be counted in awarding the division to a candidate. The candidate shall have to clear the compulsory subjects in the additional three chances and non-appearance or absence in the examination of compulsory subjects shall be counted as chance and shall be declared fail in that examination.

j) The grace marks scheme shall be applicable as per University norms.

Classification of Successful Candidates:

The classification of successful candidates after last semester examination shall be as under:

Description of Marks Obtained	**Division / Result**
• 75% and above marks in a paper.	Distinction in that paper.
• A candidate who has secured aggregate 60% and above marks	First Division
• A candidate who has secured aggregate 50% and above but less than 60% marks	Second Division
• A candidate who has secured aggregate 40% and above but less than 50% marks	Pass

III SEMESTER

3.4-Thermal Physics

Unit 1

General Thermodynamical interaction, Dependence of the number of states of external parameters, General relations in equilibrium, infinitesimal quasistatic process, Entropy of an ideal gas, Equilibrium of an isolated system, Equilibrium of a system in contact with reservoir (Gibb's free energy).

Unit 2

Equilibrium between phases, Clausius-Clapeyron equation, Triple point, Vapour in equilibrium with liquid or solid, equilibrium conditions for a system of fixed volume in contact with heat reservoir (Helmholtz free energy), for a system at constant pressure in contact with a heat reservoir (Enthalpy), Maxwell's relations.

Unit 3

Thermal interactions of macroscopic systems, first law of thermodynamics and infinitesimal general interaction, Concept of temperature and quantitative idea of temperature scale (thermodynamical parameter), Distribution of energy.

Unit 4

Second law of thermodynamics, Claussius and Kelvin's statements, partition function (Z), mean energy of an ideal gas and mean pressure, Heat engine and efficiency of the engine, Carnots cycle, thermodynamical scale as an absolute scale.

Unit 5

Production of Low Temperatures and Application, Joule Thomson expansion and J.T.coefficients for ideal as well as Van-der Waal's gas, Temperature inversions, Regenerative cooling and cooling by adiabatic expansion and demagnetization, Liquid He, He –I and He-II, superfluidity, quest for absolute zero, Nernst heat theorem.

Text/Reference Books:

1. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
2. A Treatise on Heat, Meghnad Saha, and B.N.Srivastava, 1958, Indian Press
3. Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill
4. Modern Thermodynamics with Statistical Mechanics, Carl S. Helrich, 2009, Springer.
5. Thermodynamics, Kinetic Theory & Statistical Thermodynamics, Sears & Salinger.
6. 1988, Narosa.
7. Concepts in Thermal Physics, S.J. Blundell and K.M. Blundell, 2nd Ed., 2012, Oxford
8. University Press.
9. Thermal Physics, A. Kumar and S.P. Taneja, 2014, R. Chand Publications.

3.5-Electronics

Unit 1

Recapitulation of semiconductor, intrinsic and extrinsic semiconductor, charge density of semiconductors generation and recombination of charges, diffusion, the continuity equation, Injected minority carrier charges, potential variation with in a graded, p-n junction, current component volt Ampere characteristic-temperature dependency, space charge, diffusion capacitance.

Unit 2
Rectification and Power Supply, Half-wave, full wave and bridge rectifiers, Ripple factor, efficiency and regulation, Filters-Shunt capacitor, LC and RC filters regulation and stabilization, Zener diode, Voltage multiplier.

Unit 3
Transistor and Transistor Amplifiers:Notations and Volt-ampere relations for bipolar junction transistor, Concept of load line and operating point, Hybrid parameters, Field effect Transistor and their circuit characteristics, Configurations and their equivalent circuits, Analysis of Transistor amplifiers using hybrid parameters and its frequency response, Fixed and emitter bias, bias stability.

Unit 4
Concept of feedback, stabilization of gain by negative feedback, Effect of feedback on output and input resistance, Reduction of nonlinear distortion by negative feedback, Voltage and current feedback circuits, Frequency resonance, Feedback requirements for oscillators, circuit requirement for oscillation, basic oscillators, Colpitt, Hartley, R-C oscillators, Piezo-electric frequency control.

Unit 5
Operational Amplifier: Differential amplifier, DC level shifter, Input and output impedances, Input offset current, Applications : Unit gain buffer, Adder, Subtractor, Integrator and differentiator, Comparator, Idea of wave form generator, Voltage regulator using integrated amplifiers.

Text/Reference Books:

1. Principles of Electronics by V.K. Mehta, S. Chand, 2002.
2. Integrated Electronics: Analog and Digital Circuits and Systems by J. Millman and C.C. Halkias.

3.6-Bio-Physics

Unit 1
Basic principle of modern biophysical methods to study macromolecules from the atomic to cellular levels; Basic introduction to molecular spectroscopy, fluorescence, Mass spectrometric technique, NMR spectroscopy, X-ray crystallography, cryo electron microscopy; High resolution light microscopy, Atomic Force Microscopy, Single molecule manipulation.

Unit 2
Introduction to Statistical Mechanics; Statistical thermodynamics, lattice statistics, molecular distribution and correlation functions, molecular dynamics simulation; The problem of protein folding.

Unit 3
Theoretical and experimental approaches to study protein folding; Introduction to Membrane Biophysics. Structure and function of membranes, experimental and theoretical tools for studying biological membrane.

Unit 4
Structure of Proteins and Nucleic Acids**:** Primary and secondary structure, Ramachandran plot, conformational analysis, tertiary structure, structure of a nucleotide chain, the DNA double helix model, polymorphism.

Unit 5
Molecular Forces in Biological Structures: Electrostatic interactions, hydrophobic and hydrophilic forces, hydrogen bonding interactions, ionic interactions, stabilizing forces in proteins and nucleic acids, steric interactions.

Text/Reference Books:

1. Spectroscopy for the Biological Sciences: Gordon G; Wiley-Interscience; 1st edition; 2005.
2. Biophysical Chemistry: Part II: Techniques For The Study Of Biological Structure and Function by Charles R. Cantor and Paul Reinhart Schimmel; pp 503. W H Freeman and Co, Oxford. 1980.
3. Cantor, C. R., and Schimmel, P., Biophysical Chemistry (parts I, II and III), W. H. Freeman, 1980.
4. Serdyuk, I. N., Zaccai, N. R.,and Zaccai, J.,Methods in Molecular Biophysics: Structure, Dynamics, Function, Cambridge, 2007.

3.7-Electrical Technology

Unit 1
DC Networks: Node Voltage and Mesh Current Analysis; Source Conversion. Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum power Transform, Laplace transforms and inverse Laplace transforms: Basic Theorem and Circuit analysis using Laplace transformations, Initial and final value theorem.

Unit 2
Single Phase AC Circuits:, EMF Equation, Average, RMS and Effective Values. RLC Series, Parallel and Series, Parallel Circuits, Complex Representation of Impedances. Phasor Diagram, Power and Power Factor.

Unit 3
Three Phase A.C. Circuits: Delta-Star and Star-Delta Transformation, Line & Phase Quantities, 3-Phase Balanced Circuits, Phasor diagram, Measurement of Power in Three Phase Balanced Circuits.

Unit 4
Transformer: Magnetic coupled circuits, Dot convention for coupled circuits, coefficient of coupling, mutual inductance, EMF Equation, Voltage & Current, Relationship and Phasor Diagram of Ideal Transformer.

Unit 5
Introduction to principle of DC Machines, synchronous machines and induction motors, single phase and three phase induction motor, dynamo, alternator, inverter.

Text/Reference Books:

1. Valkenburg Van M.E.: Networks and Analysis: PHI Pvt. Ltd. New Delhi, 3rd Edition 1998.
2. Choudhary D Roy: Network and system: New Age International (P) Ltd. 1st Edition 1991.
3. Edminister Joseph A. : Theory and problem of Electrical Circuits in SI Units:

3.8-Laboratory Practices

1. Determine the thermodynamic constant (r=Cp/Cv) using Clement's and Desormes methods.
2. Using platinum resistance thermometer to find the melting point of a given substance.
3. Determine Thermal conductivity of a bad conductor by Lee's method.
4. Study the variation of total thermal radiation with temperature.
5. Determine the resistance per unit length of Carey fosters bridge and find the resistance of a given wire.
6. Determine the self-inductance of a coil using Anderson's bridge.
7. Determine the capacity of a gang condenser by Desauty's bridge and find the dielectric constant of liquid.
8. Determine the self-inductance of a coil using Rayleigh's method.
9. Study Maximum power transfer theorem.
10. Study of power supply using two diodes/ bridge rectifier using various filter circuits.
11. Study of half wave rectifier using L and pi section filters.
12. Characteristics of given transistor PNP/ NPN (common emitter, common base and common collector configurations).
13. Determination of band gap using a junction diode.
14. Determination of power factor of a given coil using CRO.
15. Study of single stage transistor audio amplifier (variation of gain with frequency)
16. Study of diode as integrator with different voltage wave forms.
17. Any other experiments of the equivalent standard can be set.

IV SEMESTER

4.4- Statistical Physics

Unit 1

Kinetic theory of gases: Distribution of molecular velocities, Energy distribution function, most probable, average & r.m.s. velocities, principle of equipartition of energy, specific heat of gases, classical theory of specific heat capacity, Specific heat of Solids, Einstein's and Debye's Model (No Derivation).

Unit 2

Classical Statistics: Phase space, Micro and Macro states, Thermodynamic probability, Entropy and probability, The Monoatomic ideal gas, Entropy of mixing, Gibb's paradox, Ensembles: canonical, micro canonical and grand canonical,

Unit 3

Quantum Statistics: Failures of Classical statistics (black body radiation and various laws of distribution of radiation, qualitative discussion of Wien's and Rayleigh Jean's (No derivation) laws, postulates of quantum statistics, indistinguishability of wave function and exchange degeneracy, apriorprobability,

Unit 4

Bose-Einstein Statistics: B-E distribution law, Thermodynamic functions of a strongly Degenerate Bose Gas, Bose Einstein condensation, properties of liquid He (qualitative description), Radiation as a photon gas and Thermodynamic functions of photon gas, Bose derivation of Planck's law.

Unit 5

Fermi-Dirac Statistics: Fermi-Dirac Distribution Law, Thermodynamic functions of a Completely and strongly Degenerate Fermi Gas, Fermi Energy, Electron gas in a Metal, Specific Heat of Metals, Relativistic Fermi gas, Chandrasekhar Mass Limit.

Text/ Reference Books:

1. Statistical Mechanics, R.K. Pathria, Butterworth Heinemann: 2nd Ed., 1996, Oxford
2. University Press.
3. Statistical Physics, Berkeley Physics Course, F. Reif, 2008, Tata McGraw-Hill
4. Statistical and Thermal Physics, S. Lokanathan and R.S. Gambhir. 1991, Prentice Hall
5. Thermodynamics, Kinetic Theory and Statistical Thermodynamics, Francis W. Sears and Gerhard L. Salinger, 1986, Narosa.
6. Modern Thermodynamics with Statistical Mechanics, Carl S. Helrich, 2009, Springer
7. An Introduction to Statistical Mechanics & Thermodynamics, R.H. Swendsen, 2012, Oxford Univ. Press

4.5-Mathematical Physics-I

Unit 1

Dirac-Delta Function and its properties, Fourier series, computation of Fourier coefficients, applications to simple periodic functions like square wave, saw tooth wave and rectifier out put.

Unit 2
Transformation of covariant, contravariant and mixed tensor, Addition, Multiplication and contraction of tensors, Quotient law, pseudo tensor, Metric tensor, transformation of Tensors.

Unit 3
Four vector formulation, energy-momentum four vectors, relativistic equation of motion, Orthogonality of four forces and four velocities, transformation of four wave vector, longitudinal and transverse Doppler's effect.

Unit 4
Transformation between laboratory and center of mass systems, four momentum conservation, Kinematics of decay products of an unstable particle and reaction thresholds, pair production, inelastic collision of two particles, Compton effect.

Unit 5
Electromagnetic field tensor, transformation of four potentials, four currents, electric and magnetic field between two inertial frames of reference, Lorentz force, equation of continuity, conservation of charge, tensor description of Maxwell's equations.

Text/ Reference Books:

1. Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris, 2013,7th Edn., Elsevier.
2. Mathematical Tools for Physics, James Nearing, 2010, Dover Publications.
3. Mathematical methods for Scientists and Engineers, D.A. McQuarrie, 2003, Viva Book
4. Mathematical Physics, Goswami, 1st edition, Cengage Learning
5. Engineering Mathematics, S.Pal and S.C. Bhunia, 2015, Oxford University Press
6. Essential Mathematical Methods, K.F.Riley & M.P.Hobson, 2011, Cambridge Univ. Press

4.6- Digital Electronics

Unit 1
Logic Gates : Logic Gates and Boolean Algebra Representation and Simplification of functions by Karnaugh Maps. Combinational Circuits design. Combinational circuits - adder, subtractor, decoder, demultiplexer, encoder, multiplexer, comparator.

Unit 2
Sequential Logic Circuit & Design-flip flop, shift register, asynchronous and synchronous counters, Digital Logic Families and Their Charactersistic : RTL, DTL, TTL, Schotlky TTL, ECL, MOS and CMOS, Fan in, Fan out.

Unit 3
Semiconductor Memories : RAM, ROM, PROM, EPROM, BJTRAM Cell, MOS RAM Cell, Organization of RAM, Charge Coupled devices (CCD), storage of charge and transfer of charge in CCD.

Unit 4
D/A Converter : Weighted resistance D/A, R-2R Ladder Converter. DAC 0800 D/A Chip, D/A Converter specification.

Unit 5
A/D Converter : Analog to Digital Converter, Parallel Comparator Converter, Counting Converter, Successive Approximation Converter, Dual Slop converter A/D converter specification, sampling and hold circuit, ADC 0804 Converter chip.

Text/Reference Books:

1. Digital Principles and Applications by C. P. Malvino and D. P. Leach, Mc-Graw Hill, 1985.
2. Digital logic and computer design by M. M. Mano, Tata Mc-Graw Hill.
3. Digital Integrated Circuits by Taub and Shilling, Tata Mc-Graw Hill
4. Computer Architecture and Organization by J. P. Hayes, Mc-Graw Hill 1988.
5. Digital Fundamentals by Floyd, Mc-Graw Hill.
6. Digital Ic by K. R. Botkar, Mc-Graw Hill.

4.7- Heat transfer

Unit 1
Modes of heat transfer- conduction, convection and radiation, steady and unsteady heat transfer, Fourier equation, thermal resistance, thermal conductivity, thermal diffusivity, heat diffusion equation – cartesian, cylindrical, spherical coordinates, initial and boundary conditions

Unit 2
One dimensional steady state conduction, heat conduction through a plane wall, composite wall, cylindrical wall, sphere. Heat flow through surface and surroundings. Shape factor, plane wall with uniform heat generation, heat transfer from extended surface, fin performance, introduction to transient heat conduction, periodic variation.

Unit 3
Radiation fundamentals-processes and properties, Planck's law, Stefan Boltzman law, Wien's displacement law, Kirchoff's law, Gray bodies, selective emitters, Lambert's cosine law, radiation exchange between surfaces, configuration factor, shape factor, view factor, interchange factor, shape factor algebra, electrical network analogy, radiation shields.

Unit 4
Free and forced convection, laminar and turbulent flow, convection rate equation, estimation of convection heat transfer coefficient, dimensional analysis, physical significance of the dimensionless parameters, laminar boundary layer, turbulent boundary layer, empirical relations for free and forced convection heat transfer.

Unit 5
Combined natural and forced convection, boiling and condensation, laminar film condensation on a vertical plate and tube, dropwise condensation. boiling regimes, bubble growth and nucleate boiling, introduction to heat exchangers.

Text/Reference Books:

1. Heat transfer : A practical approach – Yunus A. Cengel
2. Heat transfer – J P Holman, Tata McGraw Hill
3. Heat and Mass transfer- D.S. Kumar, S. K. Kataria & Sons
4. Heat and Mass Transfer – Frank P. Incropera, David P. DeWitt, Wiley
5. Heat Transfer-YVC Rao, Universities Press

4.8- Laboratory Practices

1. Verify certain laws of probability distribution.
2. To verify the truth table of various logic gates (AND,OR,NOT,NOR,NAND,XOR)
3. Verify the various theorems of Boolean algebra and D'morgans theorem.
4. Implement the Boolean expression and verify the truth table.
5. Study the various combinational circuits-Half Adder, Half subtractor, Full Adder, Full subtractor, Parity Generator'Parity Checker.
6. Study the advanced combination circuits-Multiplexer, Demultiplexer, Encoder, Decoder.
7. Study the various code converters & verify the truth table-Binary to BCD converter, Binary to Gray codes and Binary to EX-3.
8. Study the flip flops and verify the truth table-R-S,D,J-K, T, Master slave, flip-flop-Serial in Serial out, Serial in Parallel out, Parallel in Parallel out, Parallel in Serial out.
9. Study the various asynchronous /synchronous counters using flip-flop-Binary up, Binary down, Mod-10 .
10. Study the special counters-Ring counter and Twisted ring counter (Johnson counter).
11. To study the A/D converter and also calculate resolution & error percentage.
12. To study the D/A converter and also calculate resolution & error percentage.
13. To Study an Astable Multivibrator using 555 Timer.
14. To Study the Bistable Multivibrator using 555 Timer.
15. To Study the Monostable Multivibrator using 555 Timer.
16. Any other experiments of the equivalent standard can be set.