BHARATHIDASAN UNIVERSITY TIRUCHIRAPPALLI - 620 024.
CENTRE FOR DISTANCE AND ONLINE EDUCATION
ALLIED PHYSICS FOR B.Sc. PROGRAMMES

(For the candidates admitted from the academic year 2026-27 onwards)

ALLIED COURSE I
PHYSICS I
(Theory)

COURSE OBJECTIVES:

- To know the elastic nature of materials, analyze the expression for Young's modulus and comprehend about viscosity and surface tension of fluids.
- To acquire knowledge of the centre of gravity, states of equilibrium of rigid bodies and stability of floating bodies.
- To understand the laws of thermodynamics, thermal conductivity and blackbody radiation.
- To familiarize the concepts of interference and diffraction.
- To know the formation, characteristics and applications of diodes and transistors.

UNIT - I PROPERTIES OF MATTER:

Elasticity: Stress – Strain – Hooke's law – Young's modulus - Behaviour of wire under progressive tension – Bending of beams – Expression for the bending moment – Measurement of Young's modulus by bending of beams – Non-uniform bending and Uniform bending.

Viscosity: Streamline flow and Turbulent flow – critical velocity - Poiseuille's formula – Determination of coefficient of viscosity of a liquid (Variable pressure head).

Surface Tension: Drop weight method of determining the surface tension of a Liquid – Experiment to determine the interfacial tension.

UNIT - II MECHANICS:

Centre of Gravity – Centre of Gravity of a solid hemisphere – Hollow hemisphere – Solid cone.
States of Equilibrium: Equilibrium of a rigid body –Stable, unstable and neutral equilibrium – Example.
Stability of Floating bodies – Metacentre – Determination of Metacentric height of a ship.

UNIT - III THERMAL PHYSICS:

Thermodynamics: Laws of thermodynamics – Reversible and irreversible process – Heat engine – Carnot's theorem.

Radiation: Black body – Stefan's law – Newton's law of cooling – Newton's law of cooling from Stefan's law – Experimental determination of Stefan's constant –Wien's displacement law – Rayleigh - Jean's law – Planck's law.

Heat Conduction: Coefficient of Thermal Conductivity –Determination of Thermal Conductivity of a bad Conductor by Lee's disc method.

UNIT - IV OPTICS:

Interference: Superposition of waves –Principle of interference – Air wedge – Newton's rings.

Diffraction: Introduction –Plane diffraction Grating – Theory of plane transmission Grating.

Fiber Optic communication: Introduction – Optic Fiber – Numerical Aperture – Coherent bundle – Fiber optic communication System and its advantages.

UNIT – V ELECTRONICS:

Intrinsic and extrinsic semiconductor – PN Junction diode – Biasing of PN junction – V-I characteristics of junction diode – Rectifiers – Half wave – Full wave and Bridge rectifiers – Zener diode – Characteristics of Zener diode – Voltage regulator – Transistor – Characteristics of transistor – CB and CE mode –Transistor as an amplifier.

UNIT – VI CURRENT CONTOURS (For internal continuous assessment only):

Reinforced concrete–Advanced Nano photonics–Surface tension of thermal fluids–Nano fluids–Low Viscous silicon liquid immersed transformers – Bio diesel – fueled diesel engines –Electronic transformers.

REFERENCES:

1. R.Murugeshan, *Properties of matter,* S.Chand & Co. Pvt. Ltd., Revised Edition, 2017.
2. Narayanamoorthy and N.Nagarathinam, *Mechanics Part II*, The National Publishing Company, Chennai, 2005.
3. Dr.N.Subramaniyam, Brijlal and Dr.M.N.Avathanulu*, Optics*, S.Chand & Co. Pvt. Ltd. - 5 Edition, New Delhi, 2015.
4. BrijLal, N.Subrahmanyam, P.S.Hemne, *Heat and Thermodynamics and Statistical Physics,* S.Chand & Co. Pvt. Ltd., Revised edition, 2021.
5. V.Vijayendran, S.Viswanathan, *Digital Fundamentals,* Printers & Publishers Private Ltd, Chennai, 2004.
6. Brijlal and Subramaniyan, *Properties of Matter*, S.Chand & Co. Pvt. Ltd, 2005.

7. D S Mathur, *Mechanics*, S.Chand & Co. Reprint Edition, 2006
8. Brijlal and Subramaniyan, *Thermal Physics*, S.Chand & Co., 2001.
9. R.Murugeshan and Kiruthiga Sivaprasath, *A Text Book of Optics*, S.Chand & Co. Pvt. Ltd.- 9 threvised edition Ramnagar, New Delhi, 2014.
10. V.K.Mehta and Rohit Mehta, *Principles of Electronics*, S.Chandand company Ltd., 2015.
11. https://byjus.com
12. https://digitalcommons.unl.edu/cgi/viewcontent.
13. https://sciencing.com

COURSE OUTCOME:

Upon completion of this course, the students would be able to

- Apply the concepts of elasticity, viscosity and surface tension to solve problems encountered in everyday life.
- Understand the centre of gravity, states of equilibrium of rigid bodies and also stability of floating bodies.
- Understand the laws of thermodynamics, thermal conductivity and black body radiation.
- Understand the theories and experiments on interference and diffraction using air wedge, Newton's ring and grating.
- Know the formation, characteristics and applications of diodes and transistor.

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ALLIED PRACTICAL

PHYSICS PRACTICAL I

(Practical)

COURSE OBJECTIVES:

- To educate and motivate the students in the field of Physics.
- To acquire the skill of handling instrument.
- To develop the observation and circuit drawing skills.
- To enhance the process-oriented performance skills.
- To inculcate the skill of experimental verification of laws in Physics.

(ANY12 EXPERIMENTS)

EXPERIMENTS:

1. Determination of Young's modulus by Non-Uniform bending using Pin and Microscope.
2. Determination of Young's modulus by Uniform bending using Scale and Telescope.
3. Surface tension and Interfacial Surface tension by Drop weight Method.
4. Coefficient of viscosity of a liquid –Variable Pressure head Method.
5. Specific heat capacity of a liquid by Newton's law of cooling Method.
6. Thermal conductivity of a bad conductor by Lee's disc Method.
7. Spectrometer–Refractive index of a solid prism.
8. Spectrometer–Finding the wavelength of spectral lines using Grating–Normal incidence method.
9. Newton's Rings–Determination of radius of curvature of a long focus lens.
10. Air wedge –Thickness of the given thin wire.
11. Meter bridge–Determination specific resistance of a coil.
12. Carry Foster's Bridge – Determination of specific resistance of a coil.
13. Potentiometer – Calibration of a Low range voltmeter.
14. Characteristics of a Junction diode–Forward resistance and knee voltage.
15. Characteristics of a Zenerdiode – Break down voltage.
16. Basic logic gates – AND, OR and NOT gates using discrete components.
17. Basic logic gates – AND, OR and NOT gates using ICs.
18. Realizing NAN Dasa Universal gate.
19. Realizing NOR as a Universal gate.
20. Verification of De-Morgan's theorem.

REFERENCES:

1. Department of Physics, *Practical Physics*, (B.Sc. Physics Main), St. Joseph's College, Tiruchirapalli - 2009.
2. Dr.S.Somasundaram, *Practical Physics,* Apsara publications, Tiruchirapalli, 2012.
3. M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, *A text*

book of Practical Physics, S.Sultanch and publications, New Delhi, 2013.
4. Dr.R.K. Shukla, Dr.Anchal Srinivastava, *Practical Physics*, New Age International (P) Ltd, India, 2022.
5. P. R.Sasikumar, *Practical Physics*, PHI Learning Pvt. Ltd, New Delhi, 2011.
6. C.L.Arora, *A Text Book of Practical Physics*, S.Sultanch and publications, New Delhi, 2019.
7. InduPrakash, Ram Krishna, A.K. Jha, *A text book of Practical Physics*, Kitab Mahal Publications, Delhi, 2011.
8. N.N.Ghosh, *B.Sc Practical Physics*, Bharath Bhawan Publications, India, 2nd Edition 2017.
9. https://www.kanchiuni.ac.in/maths
10. https://nptel.ac.in/courses

Course Outcome:

Upon completion of this course, the student would be able to :

- Understand the Laboratory techniques.
- Evaluate a process based on the results obtained from the experiments quantitatively and qualitatively.
- Extend the scope of investigation as expected.
- Communicate a process with help of the outcomes of an experiment.
- Develop the skill of conducting an experiment collaboratively and ethically.

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ALLIED COURSE II
PHYSICS II
(Theory)

COURSE OBJECTIVES:

- To understand the Coulomb's law and Gauss theorem and to gain a brief knowledge of capacitors.
- To acquire the knowledge on properties, types of magnetic materials and hysteresis of ferromagnetic material.
- To know atom models and understand the properties, types of x-rays and Crystal structure.
- To study the basics of nucleus and their properties, nuclear reaction, nuclear models and elementary particles.
- To learn the binary number system, binary arithmetic operations, logic gates and De-Morgan's theorem.

UNIT - I ELECTROSTATICS:

Coulomb's inverse square law – Gauss theorem and its applications - Intensity at a point due to a charged sphere and cylinder – Principle of a capacitor – Capacity of a spherical and cylindrical capacitors–Energy stored in a capacitor–Loss of energy due to sharing of charges – Capacitors in series and parallel–Types of capacitors.

UNIT – II MAGNETISM:

Intensity of magnetization – Susceptibility – Types of magnetic materials – Properties of para, dia and ferromagnetic materials–Cycle of magnetization – Hysteresis – B-H curve –Applications of B-Hcurve–Magnetic energy per unit volume–Ferro magnets and their applications.

UNIT - III ATOMIC PHYSICS:

Atom Models: Summerfield's and Vector atom Models – Pauli's exclusion principle –Various quantum number sand quantization of orbits.

X- rays: Continuous and Characteristic X-rays – Mosley's Law and its importance –Bragg's law – Miller indices – Determination of Crystal Structure by Laue's Powder photo graph method.

UNIT - IV NUCLEAR PHYSICS:

Introduction–Nucleus–Classification of Nuclei – Nuclear Size – Charge – Mass and Spin – Liquid drop model –Nuclear Radiations and their properties- Particle accelerators – Betatron – Proton Synchrotron – Four types of reactions –Elementary particles and their classifications.

UNIT - V DIGITAL ELECTRONICS:

Decimal–Binary Octal and Hexa Decimal number systems and their Mutual Conversions – 1's and 2's complement of a Binary number and Binary arithmetic (Addition, Subtraction, Multiplication and Division) – Binary Subtraction by 1's and2's complement method – Basic logic gates –AND, OR, NOT – NAND, NOR and EX-OR gates – NAND and NOR as universal gates – De-Morgan's Theorems.

UNIT – VI CURRENT CONTOURS (For internal continuous assessment only):

Magnetic and electromagnetic components- Atom interferometer- Nuclear reactor simulations – Cold fusion – Artificial intelligence – Electronic School books.

REFERENCES:

1. R.Murugeshan, Er.Kiruthiga Sivaprasath, *Modern Physics*, S.Chand & Co, New Delhi, First edition, 2004
2. R.Murugeshan, *Electricity and Magnetism*, S.Chand & Co, New Delhi,Third Revised Edition, 2008.
3. Brijlal & Subramanian, *Electricity and Magnetism,* Ratan Prakashan Mandir, 1995.
4. R.S.Sedha, *A text book of Digital Electronics*, S.Chand & Co, New Delhi, First Edition, 2008.
5. R.Murugesan, *Allied Physics Paper I and II*, S.Chand & Co, New Delhi, Revised Edition, 2010.
6. Arthur Beiser, Mahajan, Choudhury, *Concepts of Modern Physics*, Pustakkosh Pubications, India, 2015
7. GurbinderKaur, Gary R Pickrell, *Modern Physics*, Tata Mcgraw Hill Educational (P) Ltd, India, 2014.
8. Narayanamurthi, *Electricity and Magnetism*, The National Publishing Co, First Edition, 1988.
9. J.B.Rajam, *Atomic Physics*, S.Chand & Company Limited, New Delhi, First Edition, 1990.
10. B.N.Srivastava, *Basic Nuclear Physic*, Pragati Prakashan, Meerut, 005.
11. Donald P.Leach, Albert Paul Malvino, Goutam Saha, *Digital principle and Applications,* Mc Graw-Hill Publishing Company, 6th Editions, New York, 2008.
12. https://wepdf.com/al/allied-physics
13. https://archive.nptel.ac.in/courses
14. https://nptel.ac.in/courses

COURSE OUTCOME:

Upon completion of this course, the student would be able to

- Understand Coulomb's law, Gauss theorem and gain a brief knowledge of capacitors.
- Understand the properties, types of magnetic materials and hysteresis of ferromagnetic material.
- Acquire the knowledge of atom models and X rays.
- Know the basics of nucleus and their properties, nuclear reaction, nuclear models and elementary particles.
- Learn the binary number system, binary arithmetic operations, logic gates and De-Morgan's Theorem.

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024

APPLIED PHYSICS FOR B.Sc. COMPUTER SCIENCE PROGRAMME ONLY

(For the candidates admitted from the academic year 2022-23 onwards)

ALLIED COURSE I
APPLIED PHYSICS I
(Theory)

COURSE OBJECTIVES:

- To bring out the subjects related with the computer field which help students to keep pace with these topics.
- To make the students understand the basic concepts of current electricity alternating current and the related laws.
- To enable the learners to acquire knowledge about four different number systems, conversion, Boolean algebra, Logic gates and semiconductor memories.

UNIT – I CURRENT ELECTRICITY:

Ohm's Law- Verification of Ohm's Law-Kirchhoff's law- Applications of Kirchhoff's law Wheat stone's bridge - Metre bridge- Carey Foster's bridge- Potentiometer Measurement of Current and Resistance- Calibration of low range Voltmeter.

UNIT – II ALTERNATING CURRENT:

AC circuits with double components – measurement of current and voltage – power in an AC Circuit-Power Factor (derivation)- Wattless current – Choke - series and parallel resonant circuits - Impedance-Q factor- Sharpness of resonance.

UNIT - III NUMBER SYSTEMS CODES AND LOGIC GATES:

Number Systems - Conversions - Binary: Addition, Subtraction, Multiplication, Division- 8421 Code - BCD Code - Excess 3 code - Gray code - Binary to Gray and Gray to Binary Conversion - ASCII code – Basic and Derivative Gates: AND, OR, NOT, NAND, NOR, EX-OR - NAND & NOR as Universal Gates.

UNIT – IV BOOLEAN ALGEBRA, ARITHMETIC AND COMBINATIONAL LOGIC CIRCUITS:

Basic laws of Boolean algebra - De Morgan's theorem - Verification of Boolean expression using Boolean laws - Half-adder - Full adder - Half-Sub tractor- Full sub tractor (using basic gates) – Encoder - Decimal to BCD encoder- Decoder -BCD to decimal decoder.

UNIT – V SEMICONDUCTOR MEMORIES:

Introduction – ROM using diodes and transistors – ROM in terms of digital circuits – Building memory of larger capacity – PROM – EPROM – EEPROM – ROM as a unit in microcomputers – RAM – Static RAM – Dynamic RAM – Memory Parameters.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Solar electricity- Hydroelectricity -Digital camera-Digital television-CRO-Digital computer

REFERENCES:

1. BrijLal and N. Subrahmanyam, *A Text Book of Electricity and Magnetism*, S. Chand & Company Pvt. Ltd, New Deihi-2020.
2. Puri V.K., *Digital Electronics circuits and systems*, TATA Mcgraw hill publications, New Delhi, 2011.
3. Vijayendran. V & Subramanian. V, *Introduction to Integrated Electronics*, S. Viswanath PVT Ltd., Chennai 2012.
4. Murugeshan. R, *Electricity and Magnetism,* S. Chand & Company Ltd., Tenth edition, 2017.
5. Sundaravelusamy, A, *Applied Physics Paper-I B.Sc Computer Science,* Karur:Priya Publications, 2011.
6. Narayanamurthi and Nagarathinam, *Electricity and Magnetism,* The National Publishing Company, Madras, 1994.
7. Murugeshan. R, *Electricity and Magnetism,* S. Chand & Company Ltd., 2015.
8. Gothaman W.H., *Digital Electronics,* Prentice Hall of India PVT., New Delhi, 1996.
9. Sanjay D Jain, *Applied Physics*, Universities Press, Hyderabad, Telengana. 2013
10. Tewari K K , *Electricity and Magnetism,* S. Chand & Company Ltd.,3rdedition,2007.
11. Sathya Prakash, *Electricity and Magnetism,* Pragati prakashan, 2016.
12. ArthurBeiser, *Concepts of Modern Physics* 2009, McGraw-Hill
13. J.R. Taylor, C.D. Zafiratos, M.A. Dubson*, Modern Physics*, 2009, PHI Learning.
14. Albert Paul, Malvino, *Digital Principles and Applications*, Delhi: Tata Mcgrawhill Publishing, 2012.
15. Tewari K K , *Electricity and Magnetism,* S. Chand & Company Ltd.,3rdedition,2007.
16. 1.https://archive.nptel.ac.in/courses/115/106/115106122/
17. 2.https://pages.uoregon.edu/rayfrey/DigitalNotes.pdf
18. 3.https://nptel.ac.in/courses/117106086

COURSE OUTCOMES:

Upon completion of this course, the students would be able to

- Recall the basic concepts of current electricity and its various laws.
- Solve basic electronics problems with ac circuits that involve capacitance, inductance, impedance, reactance and power calculations.
- Differentiateall the four number systems studied.
- Review Boolean algebra and draw arithmetic circuits.
- Analyse the calibration of electrical instruments.

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ALLIED PRACTICAL
APPLIED PHYSICS
(Practical)

COURSE OBJECTIVES:

- To familiarize students with basic laboratory equipment to study the physics concepts encountered in the lecture course.
- To give knowledge of some basic electronic components and circuits.
- To promote the exhaustive requirements and expectations of the students to acquire practical knowledge for the theory given in their syllabus.

ANY 12 EXPERIMENTS:

1. Semi-Conductor diode - Characteristics.
2. Zener diode – Characteristics.
3. FET- Characteristics.
4. Transistor Characteristics - CE configuration.
5. Transistor Characteristics-CB Configuration.
6. Field along the axis of a coil – Determination of M and H
7. Metre Bridge-Determination of Specific Resistance.
8. Potentiometer-Measurement of Current.
9. Potentiometer-Calibration of low range voltmeter.
10. Carey Foster's Bridge- Determination of Specific Resistance.
11. LCR - Series resonance circuit
12. LCR - Parallel resonance circuit
13. Mathematical Operator-Addition, Subtraction using OP-Amp.
14. Logic Gates (AND, OR, NOT, NAND, NOR) Using IC's. -Verification of truth tables.
15. NAND and NOR as Universal Gates.
16. Verification of De-Morgan's Theorems.
17. Half Adder and Half Subtractor using logic gates.
18. Full Adder and Full Subtractor using logic gates.
19. Single Stage Amplifier.
20. Logic Gates (AND, OR, NOT) Using Discrete's. Components–Verification of truth tables.

REFERENCES:

1. Srinivasan M.N. Balasubramanian S. & Renganathan R., A Text book of Practical Physics, Sulthan Chand & Sons, New Delhi, 2000.
2. Somasundram S., Practical Physics, Apsara Publications, Tiruchirappalli.2012.
3. Arora C L., B.Sc. Practical physics, Chand and company, 2010.
4. Department of Physics, Practical Physics, (B.Sc. Physics Main), St. Joseph's College, Tiruchirapalli 2009. .
5. Kushwaha P S., Applied physics practical & viva-voce, Bharat BharatiPrakashan&Co, 2015.
6. John Henderson, Practical Electricity and Magnetism, Forgotton books publisher, 2018.
7. Tooley M .,Practical Digital Electronics Hand book Bpb Publications,2008
8. https://nptel.ac.in/courses/122106025
9. https://onlinecourses.nptel.ac.in/noc20_ph16/preview

COURSE OUTCOMES:

Upon completion of this course, the students would be able to

- Gain the practical knowledge about electricity, magnetism and measurements such as resistance, voltage, current.
- Distinguish electronic components
- Construct the learnt electronic circuits on their own
- Analyze the logic gates and their usage in digital circuits.
- Develop the skill of conducting an experiment collaboratively.

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ALLIED COURSE II
APPLIED PHYSICS II
(Theory)

COURSE OBJECTIVES:

- To impart knowledge of certain important fields of physics by simplifying the learning process to a greater extent
- To make the students understand how Laser and Maser is powerful than normal light, their types and its advantages.
- To inculcate the knowledge of transistor and different configurations, H parameters and applications of FET amplifier.

UNIT – I SEMICONDUCTOR PHYSICS

Theory of energy bands in crystals- Distinction between conductors, Insulators and Semiconductors – Intrinsic and Extrinsic semiconductors – Hall effect in semiconductor– Zener diode –Tunnel diode - Backward diode - Breakdown voltage avalanche Breakdown.

UNIT – II TRANSISTORS:

Transistors - PNP and NPN transistors - DC Characteristics of CE and CB configuration-Hybrid parameters-Functions of Transistor as an amplifier and oscillator – FET-N-channel FET - performance Characteristics - FET amplifier.

UNIT – III LASERS:

Laser and Maser - Basic concepts of stimulated emission –Population inversion and Meta stable state-He-Ne laser-Ruby laser - Ammonia Maser - production – Advantages.

UNIT – IV OPTO-ELECTRONIC DEVICES:

LED Radiation transition - Emission spectra –Luminescent efficiency-Method of Excitation-Visible LED-Materials for LED - LED configuration -Photo conduction – Photo diode-Photo transistor-electronic watches-seven segment display -LCD.

UNIT - V OPERATIONAL AMPLIFIER:

The basic operational amplifier– Inverting and Non inverting operational Amplifier – Differential operational amplifier- CMRR-Basic uses of operational amplifier as sign and scale changer and phase shifter - Adder – Subtractor – comparator - Differentiator - ADC Successive approximation.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Electric car technology-IOT sensors and devices-Robot control-Laser cladding-Barcode reader- Laser surgery-Laser pointer-ADC-DAC.

REFERENCES:

1. Jacob Millman, Micorelectronics, McGraw Hill publications, New Delhi, 1985.
2. Mithal G.K. and Vanvasi, Pulse and Digital electronics, Khanna publication, New Delhi, 2006.
3. Sundaravelusamy, A, Applied Physics Paper-II B.Sc Computer Science, Karur: Priya Publications, 2011.
4. Theraja, B L, Electronics Devices & Circuits, Delhi: S. Chand & Co, 2011
5. Mehta V.K. & Mehta Rohit, Principles of Electronics (Multicolour Edition) ,10th Rev.edition,2006
6. Ramanan, Function Electronics, TMH, New Delhi, 1994.
7. Millman & Halkias, Electronics devices and Circuits, McGraw-Hill, 1967.
8. J.R. Taylor, C.D. Zafiratos, M.A. Dubson, *Modern Physics*, 2009, PHI.
9. Sanjay D Jain, Engineering Physics, Universities Press, Hyderabad, Telengana 2012.
10. Ali, S N, Basic Electronics, Delhi: Vayu Education of India,2011
11. Amar K Gangully, Opto Electronic Devices and Circuits Theory and Applications, Delhi: Narosa Publishing House, 2011.
12. Mehta V.K, Principles of Electronics, S. Chand & Co, 2005.electronics.
13. William T. Silfvast, *Laser fundamentals* Second edition ,University of Central Florid, Cambridge University Press, June 2012.
14. K. Thyagarajan Ajoy Ghatak, *Lasers- Fundamentals And Applications* ,Edition: 2,Laxmi Publications Pvt Ltd,2019
15. Thomas F. Schubert, Jr. And Ernest M. Kim. *Fundamentals Of electronics. Book 1, Electronic devices and circuit applications,* San Rafael, California (1537 Fourth Street, San Rafael, CA 94901 USA): Morgan & Claypool, 2014.
16. **https://nptel.ac.in/courses/115102025**
17. **https://www.classcentral.com/course/swayam-laser-fundamentals-and-applications-12914**.
18. **https://www.tutorialspoint.com/linear_integrated_circuits_applications/linear_integrated_circuits_applications_op_amp_applications.htm**

COURSE OUTCOME:

Upon completion of this course, the students would be able to

- Understand the rapid growth of electronic technology.
- Know the semiconductors classification and their applications in various domains.
- Analyse the characteristics of transistor, transistor biasing circuits and oscillator circuits.
- Evaluate the advantages of Opto-Electronic Devices.
- Demonstrate analog electrical devices, particularly operational amplifiers and their applications applying the learnt concepts.

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024

APPLIED PHYSICS FOR
B.Sc. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING,
B.Sc. CYBER SECURITY, B.Sc. INFORMATION TECHNOLOGY AND
B.Sc. SOFTWARE DEVELOPMENT PROGRAMMES

(For the candidates admitted from the academic year 2026-27 onwards)

ALLIED COURSE I
DIGITAL COMPUTER FUNDAMENTALS
(Theory)

COURSE OBJECTIVES:

- To provide knowledge on various number systems
- To inculcate the concepts of Boolean algebra
- To make the students learn combinational circuits and flip-flops

UNIT – I NUMBER SYSTEMS AND CODES:

Binary Number System – Binary to Decimal Conversion – Decimal to Binary Conversion – Binary Addition and Subtraction – Binary subtraction by 1s and 2s complement - Binary Multiplication and Division – Octal Numbers – Hexadecimal Numbers – Binary Codes – 8421 code - Error Detecting and Correcting Codes.

UNIT – II BOOLEAN ALGEBRA AND LOGIC GATES:

Boolean Algebra – Laws and Theorems – Minterms and Maxterms –– DeMorgan's Theorems. Logic Gates: AND,OR,NOT,NAND,NOR and Exclusive OR Gates – Exclusive NOR Gate – Positive and Negative Logic – Logic Characteristics – Bipolar Logic Families – Universal Building Blocks (UBB) – NAND Gate as UBB – NOR Gate as UBB.

UNIT – III K MAP TECHNIQUES:

Simplification of Boolean expression using Karnaugh Map with 2, 3 and 4 variables -Sum of Products - AND-OR Network and Product of Sum - NAND and NOR Implementation –– AND-OR-INVERT Implementation – OR-AND-INVERT Implementation – Don't Care Conditions – Overlapping Groups – Rolling the Map – Eliminating Redundant Group

UNIT – IV COMBINATIONAL LOGIC CIRCUITS:

Half and Full Adders – BCD Adder - Half and Full Subtractors – Multiplexers (4:1 line) – 1 to 4 line Demultiplexers – Decoders: BCD to decimal ,BCD to Seven Segment. Encoders: 4:2 line.

UNIT – V SEQUENTIAL LOGIC CIRCUITS:

Flip Flops – RS Flip Flop – Clocked RS Flip Flop – D Flip Flop – JK Flip Flop – T Flip Flop – Triggering of Flip Flops – Master Slave Flip Flop – Conversion of D Flip Flop and T Flip Flop – Clock – Counters and Shift Registers: Counters – Asynchronous or Ripple Counter – Ring Counter.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Twisted Ring Counter – State Diagrams and State Tables – Magnitude Comparator – Programmable Arrays of Logic Cells – Shift Registers-SISO – SIPO – PIPO – PISO

REFERENCE:

1. Principles of Digital Electronics, Dr. K. Meena, PHI Learning Private Limited, New Delhi, 2009.
2. Integrated Electronics (Analog and digital circuits and systems), Jacob Millman and Christos C. Hal Kias, Tata McGraw Hill edition, New Dehli.
3. Micro Electronics, Digital and Analog circuit and System – Jacob Mill man
4. *Digital Logic Design*, M. Morris Mano, Pearson Education, 2010
5. *Digital Technology*, Virendrakumar, New Age international (P) Ltd., publisher, New Delhi, 2001.
6. Malvino and Leach –Digital Principles and Application, 2014
7. W.H. Gothmann–Digital Electronics, Prentice-Hall of India Pvt. Ltd
8. https://archive.org/details/digitalcomputerf00bart
9. https://www.pdfdrive.com/digital-computer-fundamentals-computer-architecture-e5719965.html

COURSE OUTCOMES:

On successful completion of the program, the students will be able to

- Convert numbers from any system to another system
- Design logical circuits based on the learnt concepts of Boolean algebra
- Construct combinational circuits

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ALLIED PRACTICAL

DIGITAL COMPUTER FUNDAMENTALS LAB

(Practical)

(ANY 12 EXPERIMENTS)

1. Verification of Logic gates
2. Construction of Half and Full adder
3. Construction of Half and Full subtractor
4. K-Map
5. Arithmetic Logic Unit
6. Study of Multiplexer and De-multiplexer
7. Encoder and Decoder using diodes
8. Flip-flops using NAND and NOR gate
9. Shift Register
10. Up Down Counters
11. Ring Counter
12. Johnson counter / Twisted ring counter
13. NAND as UBB
14. NOR as UBB
15. Study of RAM

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ALLIED COURSE II
COMPUTER AND ORGANIZATION ARCHITECTURE
(Theory)

COURSE OBJECTIVES:

- To gain the knowledge in computer and architecture**.**
- To provide the knowledge in memory organization
- To inculcate the knowledge in microprocessors.
- To introduce the knowledge in 8085 Microprocessor

UNIT – I COMPUTER ORGANIZATION, ARCHITECTURE AND FUNCTIONS:

General Organization and Architecture of computers– Structure and function – Computer Component – Computer Function – Interconnection Structures – Bus Interconnections.

UNIT – II MEMORY ORGANIZATION:

Computer Memory System Overview – Cache Memory principles – Semiconductor Main Memory: Organization – DRAM and SRAM – Types of ROM – EPROM-EEPROM - Error Correction.

UNIT – III I/O MODULES:

External Devices - I/O Modules – Programmed I/O – Direct Memory Access – I/O Channels and Processors.

UNIT – IV INSTRUCTION SETS, PROCESSOR ORGANIZATION AND CONTROL UNIT:

Machine Instruction Characteristics – Types of operands – Addressing – Instruction formats – processor organization – Register Organization – instruction cycle. Control Unit: Micro Operations – Control of the processor.

UNIT – V PARALLEL PROCESSING:

Parallel Organization – Multiprocessor Organization – Symmetric multiprocessors – Multithreading and Chip Microprocessor – Non-uniform memory Access - Vector Computation.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

8085 Microprocessor – architecture – Instruction set – Assembly language programming using 8085 instructions

REFERENCE:

1. Computer Organization & Architecture Designing for Performance – William Stallings, Pearson Education, 2014
2. Mano M Morris, Computer System Architecture, Pearson Education; Third edition (30 June 2017)
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COURSE OUTCOME:

On successful completion of the program the students will be able to

- Acquire skills on computer organization and functions.
- Analyse the processor organizations
- Acquire knowledge in basic concepts, architecture and instruction set of Intel 8085 microprocessor
- Acquire skills in assembly language programming using 8085 instruction set.

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