Curriculum for B.Tech

Engineering Physics

From The Academic Year 2025

(Approved in Senate 60)

Indian Institute of Information Technology Design and Manufacturing, Kancheepuram

Chennai-600 127

Semester 1					
Category	**Course Name**	**L**	**T**	**P**	**C**
BSC	Calculus	3	1	0	4
BSC	Physics for Engineers	3	0	2	4
BEC	Basic Electrical Engineering	3	1	0	4
ITC	Problem Solving and Programming	3	0	2	4
DSC	Concepts in Engineering Design	2	0	2	3
BEC	Engineering Skills Practice	0	0	2	1
HMC	Effective Language and Communication Skill	1	0	2	2
HMC	NSO/NCC/SSG/NSS/YOGA	0	0	2	P/F
					22.0
Semester 2					
Category	**Course Name**	**L**	**T**	**P**	**C**
BSC	Differential Equations	3	1	0	4
PCC	Semiconductor Physics	3	0	0	3
BEC	Engineering Graphics and Modeling	2	0	2	3
ITC	Data Structures and Algorithms	3	0	2	4
DSC	Design Realization	2	0	2	3
PCC	Classical Mechanics and Relativity	3	1	0	4
HMC	Earth, Environment and Design	1	0	0	P/F
					21.0
Semester 3					
Category	**Course Name**	**L**	**T**	**P**	**C**
SEC	Dept. Specific Science Elective I (Mathematical Physics)	3	0	0	3
ITC	Introduction to AI with Python	2	0	2	3
PCC	Electronic Devices and Circuits	3	1	0	4
PDC	Digital Circuit Design	3	1	0	4
PCC	Signals and Systems	3	1	0	4
PCC	General Physics	1	0	2	2
PDC	Digital Circuit Design Practice	0	1	2	2
PCC	Electronic Devices and Circuits Practice	0	1	2	2
HMC	Indian Constitution and Essence of Indian Traditional Knowledge	1	0	0	P/F
					24.0
Semester 4					
Category	**Course Name**	**L**	**T**	**P**	**C**
SEC	Dept. Specific Science Elective II (Numerical and Computational Methods)	3	0	2	4
PCC	Optics and Photonics	3	0	0	3
ITC	Data Science for Electronics Engineers	2	0	2	3
PCC	Statistical and Thermal Physics	3	1	0	4
PCC	Introduction to Quantum Mechanics	3	1	0	4
PCC	Applied Physics Practice	0	1	2	2
PDC	Microprocessors and Embedded System Design	2	1	2	4
HMC	Human Values and Stress Management	1	0	0	P / F

					24.0
	Semester 5				
Category	**Course Name**	**L**	**T**	**P**	**C**
HMC	Entrepreneurship and Management Functions	1	0	2	2
PCC	Atomic, Molecular and Laser Physics	3	1	0	4
PCC	Condensed Matter Physics	3	1	0	4
PCC	Electrodynamics	3	1	0	4
PCC	Condensed Matter Physics Practice	0	1	2	2
PEC	Program Elective 1	3	1	0	4
HMC	Professional Ethics and Organizational Behaviour	1	0	0	P/F
					20.0
	Semester 6				
Category	**Course Name**	**L**	**T**	**P**	**C**
PCD	Product Design and Prototyping	0	0	2	1
PCC	Nuclear and Particle Physics	3	1	0	4
PDC	Analog Circuit Design	3	1	0	4
PCC	Photonics and Spectroscopy Practice	0	1	2	2
PDC	Analog Circuit Design Practice	0	1	2	2
PEC	Program Elective 2	3	1	0	4
ELC	Open Elective 1	3	0	0	3
HMC	Professional Communication	1	0	2	2
HMC	Intellectual Property Rights	1	0	0	P/F
					22.0
	Summer				
PCD	**Summer Internship MID MAY to MID JULY**				**P/F**
	Semester 7				
Category	**Course Name**	**L**	**T**	**P**	**C**
PEC	Program Elective 3	3	0	0	3
ELC	Open Elective 2	3	0	0	3
ELC	Open Elective 3	3	0	0	3
ELC	Open Elective 4	3	0	0	3
ELC	Open Elective 5	3	0	0	3
PCD	Comprehensive Exam				P/F
HMC	Invited Expert Lectures*	0	0	0	P/F
	*** 6 Expert lectures to be attended from Sem 1 to Sem 7**				**15.0**
	Semester 8				
Category	**Course Name**	**L**	**T**	**P**	**C**
PCD	B.Tech. Project (BTP)	0	0	18	9
					9.0

9 Credits for the BTP can be earned by any of the following:
1. Fully In-house BTP at the institute.
2. BTP IITs/IISc/IISERs/TIFR/ISI/DRDO/ISRO, etc if 148 credits are completed by the end of 7th semester.
3. Three Program Elective courses, each with a minimum of three credit, in lieu of BTP.
4. Industry Internship/Training in lieu of BTP at the company selected through the Institute Placement Cell and if 148 credits are completed by the end of 7th semester.

Semester wise Credit Distribution	**Credits**									
Category	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**Total**	**%**
Basic Science Course (BSC)	8	4	0	0	0	0	0	0	12	8
Science Elective Course (SEC)	0	0	3	4	0	0	0	0	7	4.5
Basic Engineering Course (BEC)	5	3	0	0	0	0	0	0	8	5.1
Design Course (DSC)	3	3	0	0	0	0	0	0	6	3.8
IT Skill Course (ITC)	4	4	3	3	0	0	0	0	14	8.9
Program Core Course (PCC)	0	7	12	13	14	6	0	0	52	33.1
Program Design Course(PDC)	0	0	6	4	0	6	0	0	16	10.2
Program Elective Course (PEC)	0	0	0	0	4	4	3	0	11	7.0
Open Elective Course (ELC)	0	0	0	0	0	3	12	0	15	9.6
Humanities and Management Course (HMC)	2	0	0	0	2	2	0	0	6	3.8
Professional Career Development (PCD)	0	0	0	0	0	1	0	9	10	6.4
Total	22	21	24	24	20	22	15	9	157	100
	22	**43**	**67**	**91**	**111**	**133**	**148**	**157**	**157**	

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COURSE FORMAT

Course Name		Course Name	Calculus			
Offered by the Department	SH-Mathematics	Structure (LTPC)	3	1	0	4
To be offered for	B Tech	Course type	Core			
Pre-requisite	NIL	Approved In	Senate 61			
Learning Objectives	The course will introduce the students to basic concepts in Calculus, such as convergence, differentiation & integration, and their applications.					
Contents of the Course	➢ Limit and Continuity of functions defined on intervals, Intermediate Value Theorem, Differentiability, Rolle's Theorem, Mean Value Theorem, and Taylor's Formula (5L+2P) ➢ Sequences and series (7L+2P) ➢ Definite integral as the limit of sum, Mean value theorem, Fundamental theorem of integral calculus, and its applications (9L+3P) ➢ Functions of several variables, Limit and Continuity, Geometric representation of partial and total derivatives, Derivatives of composite functions (8L+3P) ➢ Directional derivatives, Gradient, Lagrange multipliers, Optimization problems (7L+2P) ➢ Multiple integrals: Evaluation of line and surface integrals (6L+2P)					
Essential Reading	1. Thomas G B. and Finney R. L., Calculus, Pearson Education, 2007					
Supplementary Reading	1. Piskunov N., Differential and Integral Calculus, Vol. I & II, Mir Publishers, 1981 2. Kreyszig E., Advanced Engineering Mathematics, Wiley Eastern, 2007. 3. Hass J., Weir M. D., Giordano F. R., Thomas Calculus, 11th Edition, Pearson.					

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COURSE FORMAT

Course Code		Course Title	Physics for Engineers			
Dept./ Specialization	SH -Physics	Structure (LTPC)	3	0	2	4
To be offered for	B. Tech. and DD	Status	Core ■		Elective ☐	
Faculty Proposing the course	SH - Physics	Type	New ■		Modification ☐	
Pre-requisite	None	Submitted for approval			Senate-61	
Learning Objectives	To learn about • Transformation of three dimensional coordinate systems for scalar and vector fields • Concepts of gradient, divergence and curl in the context of scalar and vector fields. • Theories of electrostatics, magnetostatics, magnetism with hands on experience experiments.					
Learning Outcomes	At the end of the course, the student should be able to • Visualize the three dimensional coordinates transformation of vectors and curved surfaces • Describe physical meaning of gradient, divergence and curl for practical purposes • Explain knowledge of electrostatics, magnetostatics and magnetism					
Contents of the course *(With approximate break-up of hours for L/T/P)*	• Vectors-an introduction; Unit vectors in Cartesian, spherical, and cylindrical polar co-ordinates; Transformation of coordinate systems, line, surface, and volume integrals, Concept of scalar and vector fields; Gradient of a scalar field; Directional derivative, Equipotential surfaces, Conservative vector fields and their potential functions-gravitational and electrostatic examples. (9L) • Flux, divergence of a vector, Gauss's theorem, Continuity equation; Curl– rotational and irrational vector fields, Stoke's theorem. Conservation principles for matter, energy, and electrical charge, physical applications in gravitation and electrostatics. Irrotational versus rotational vector fields. (8L) • Electrostatics: Electrostatic potential and field due to discrete and continuous charge distributions, boundary condition, Energy for a charge distribution, Conductors and capacitors, Laplace's equation Image problem, Dielectric polarization, Electric displacement vector, Dielectric susceptibility, Energy in dielectric systems. (12L) • Magneto statics: Lorentz force law, Bio-Savart's law and Ampere's law in magneto statics, Divergence and curl of B, Magnetic induction due to configurations of current-carrying conductors, Magnetization and bound currents, Energy density in a magnetic field, Magnetic permeability and susceptibility, Boundary conditions. (13 L) Practice components will cover the experiments on electrostatics and magneto statics viz. Electrostatic field, dielectric polarization, Electric Permittivity, capacitance, electric conductivity, Biot Savart law, Magnetic field, Magnetic permeability, Helmholtz Coil, Magnetization, Hysteresis, Faraday's law etc. (28 P)					
Text Book	1. David J. Griffiths, Introduction to Electrodynamics, 4th Edition, Pearson, 2015, ISBN – 13: 978-9332550445 2. Bhag Singh Guru, Huseyin R. Hiziroglu, Electromagnetic field Theory, 2nd Edition, Cambridge University Press, 2009; ISBN-13 : 978-0521116022					
Reference Books	1. W. H. Hayt, J. A. Buck and M. Jaleel Akhtar, Engineering Electromagnetics, McGraw Hill (India) Education Pvt. Ltd, Special Indian Edition 2020. 2. G. B. Arfken, H. J. Weber and F. E. Harris, Mathematical Methods for Physicists, Academic Press, 7th Edition, 2013, ISBN-13: 978-9381269558					

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Basic Electrical Engineering</td></tr>
<tr><td rowspan="2">Dept./Faculty proposing the course</td><td rowspan="2">ECE</td><td rowspan="2">Structure (LTPC)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B.Tech & DD (All Branches)</td><td>Type</td><td colspan="2">Core</td><td colspan="2">Elective</td></tr>
<tr><td>Status</td><td colspan="2">New</td><td colspan="2">Modification</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 61</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">● To impart foundational knowledge on the construction, operation, and analysis of basic electrical and electronic circuits.
● To develop the ability to systematically analyze DC and AC circuits for practical engineering applications.
● To introduce students to fundamental electrical machines and their relevance in industrial and consumer contexts.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">At the end of the course, the students will be able to
• Represent and interpret basic electrical systems using standard technical conventions.
• Analyze and solve linear electric circuits (both DC and AC) with single or multiple power sources in the time domain.
• Understand the fundamentals of electronic components and circuits.
• Understand the construction, operation, and applications of electrical machines commonly used in industry.</td></tr>
<tr><td>Contents of the course
(With approximate break-up of hours for L/T/P)</td><td colspan="6"><u>Basics of Electricity:</u> Systems of units - charge and current, voltage, power and energy, electricity tariff, circuit elements - sources and passive elements (R,L,C), Overview of power system (4L+1T)

<u>DC Circuits:</u> Basic laws and circuit analysis - Ohm’s law, Kirchhoff’s laws, voltage and current division, Wye-Delta transformations, Nodal and Mesh analysis with independent sources (6L+3T).

<u>Circuit theorems</u> (with independent sources) - Linearity property, Superposition, source transformation, Thevenin’s theorem, Norton’s theorem, maximum power transfer theorem (5L+3T)

<u>AC Circuits:</u> Sinusoids and phasors – phasor relationships, Impedance and Admittance; sinusoidal steady-state analysis – Nodal and mess analysis, theorems; AC power analysis- Instantaneous and average power, RMS, apparent and PF, complex power (10L+4T)

<u>Electrical Machines:</u> Transformers – principle of operation, types, EMF equation, equivalent circuit, Losses and efficiency calculation, Dot convention (4L+1T)

<u>DC Machines</u> - principle of operation, emf and torque equation, types, characteristics and speed control of DC motors (4L+1T).

<u>AC Induction Machines-</u> operating principles, equivalent circuits, torque-speed characteristics, speed control, efficiency (4L+1T)

<u>Electronic Circuits:</u> Operational Amplifiers - Ideal op-amp, inverting and noninverting amplifier, Applications of Op-Amp (2L+1T)</td></tr>
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	Diodes - V-I characteristics and their applications (2L)
Text Books	1. Alexander C. and Sadiku M. N. O., Fundamentals of Electric Circuits, 7th Edition, Tata McGraw-Hill, New Delhi, ISBN: 9781260226409, 2013. 2. A.E. Fitzgerald and Charles Kingsley, 'Electric Machinery', Tata McGraw-Hill Education Publications, 6th Edition, 2002.
Reference Books	1. Hughes, 'Electrical and Electronic Technology', Pearson Education India, 10th Edition, 2010. 2. W. H. Hayt and T. E. Kimmerley, Engineering Circuit Analysis, 9th Edition, TMH, ISBN: 9780073545516, 2019. 3. Joseph. A. Edminister, 'Electric Circuits - Schaum's Outline Series', McGraw-Hill Publications, 6th Edition, 2003.

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<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">**Problem Solving and Programming**</td></tr>
<tr><td rowspan="2">Dept./Faculty proposing the course</td><td rowspan="2">CSE</td><td rowspan="2">Structure (LTPC)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B.Tech, DD</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ☐</td><td colspan="2">Modification ■</td></tr>
<tr><td>Pre-requisite</td><td>--</td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 61</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">The course focuses on problem solving skills / techniques. Students shall be exposed to data representations, base conversions, arithmetic in fixed and floating point representations. Sequence, selection, iterative statements and various other programming constructs in C,Python shall be discussed with case studies. The practice component of this course shall equip the students to test drive the theory concepts using appropriate case studies.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">• The teaching and assessment shall ensure that given a computational problem, students can use computers as a tool to solve the problem.
• Developing pseudo codes and programs using various programming constructs are expected out of the students.
• Students will be able to develop simple applications using the various programming constructs.</td></tr>
<tr><td>Contents of the course *(With approximate break-up of hours for L/T/P)*</td><td colspan="6">Evolution of Computing Machines - Number Representation - Fixed & Floating Point - Base Conversions: Binary, Decimal, Octal, Hexa-decimal number systems and conversions. Introduction to algorithms and flow chart, Data types in C – Input and output statements – Formatted input/output – Phases of program development –Applications involving sequence statements (8L)
Operators - Arithmetic, logical, relational, shift, unary operators – Precedence and Associativity - Selection Statements: IF-ELSE, SWITCH-CASE - Programs involving sequence & selection - GOTO statements - break statement - Nested IF (6 L)
Repetition Statements - FOR, WHILE, DO WHILE - Programs involving sequence, selection & repetition - continue statement - Nested loops - Introduction to Arrays and Strings - Array manipulation - string manipulation -string operations - multi-dimensional arrays (10 L)
Functions in C – Function declaration, definition – scope -storage class-Built-in and user defined functions –Recursive functions (5 L)
Introduction to Pointers, Pointer Arithmetic, Dynamic Memory Allocation – Basic data structures using pointers, Structures and File processing, Command Line Arguments (6 L)
Introduction to Python programming: basic programming constructs, selection (IF), Looping Statements, Functions and Recursion - Examples. (7 L)
Practice Component: Introduction to text editors - basic text processing - case studies involving office software - doc and ppt creation, Introduction to Linux commands - file/directory creation - copy, move, pdf creation, zip commands -Applications using sequence statements - input/output statements - arithmetic with precedence and associativity. Case studies involving selection and repetition statements – arrays, functions, strings, recursion. Case studies involving pointers, dynamic memory allocation, structures, file processing (28P)
Note: 30% of the practice component to be done using Python</td></tr>
<tr><td>Text Books</td><td colspan="6">1. Deitel P J and Deitel H M, C How to Program, Prentice Hall, 9th Edition, 2022, 978-0137398355.
2. Deitel P J and Deitel H M, Python for Programmers, Pearson Education, 2019, 978-0135224335.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Kernighan, Ritchie D, The C Programming Language, Prentice Hall, 2nd Edition, 2015, 978-9332549449
2. Byron S. Gottfried, Programming with C, TMH Publishers, 4th Edition, 2018, 978-9353160272
3. Donald E. Knuth, The Art of Computer Programming, 3rd Edition,2022, 978-0137935109.
4. Yashavant Kanetkar, Understanding Pointers in C& C++, BPB Publications, 5th Edition, 2019, 978-9388176378.</td></tr>
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<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Concepts in Engineering Design</td></tr>
<tr><td rowspan="2">Dept./Faculty proposing the course</td><td rowspan="2">SIDI</td><td rowspan="2">Structure (LTPC)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>2</td><td>0</td><td>2</td><td>3</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B Tech/DD</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td>None</td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 61</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">To understand the engineering design process, product development cycles, and market influences on design decisions.
To transform customer needs into technical specifications using QFD and competitive benchmarking.
To assess design alternatives using structured decision frameworks.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Students will formulate engineering problems by translating customer requirements into technical specifications, generate and evaluate innovative design concepts using creative thinking methodologies.</td></tr>
<tr><td>Contents of the course
(With approximate break-up of hours for L/T/P)</td><td colspan="6">Introduction - Importance of engineering design- types of design- the design process-total life cycle- regulatory and social issues-product design- types of products- phases of product development process- product and process cycles-organization for product development-markets and marketing-technological innovation (5L+5P)
Problem definition & need identification - Identifying customer needs- gathering information- classifying customer requirements- establishing engineering characteristics- competitive benchmarking- quality function deployment- product design specification (6L+6P)
Conceptual design - Creativity in design- creativity and problem solving- creative thinking methods- conceptual decomposition- morphological methods-TRIZ (Theory of Inventive Problem Solving)- Decision making and concept selection-decision theories-concept screening and concept scoring (6L+6P)
Embodiment design - Product architecture- steps in developing product architecture-configuration design-industrial design- human factors design- prototyping and testing (6L+6P)
Product Economics and related issues - Risk, reliability and safety- failure mode & effects analysis- concept of total quality- robust design- economic decision making-time value of money-profitability of investment- cost estimation-design to cost (5L+5P)</td></tr>
<tr><td>Text Books</td><td colspan="6">George E.Dieter & Linda C.Schmidt, Engineering Design, McGraw-Hill International Edition 5, 2013, ISBN-10 : 9355322259, ISBN-13 : 978-9355322258
Anita Goyal, Karl T Ulrich, Steven D Eppinger, Product Design and Development , Tata McGraw-Hill Education, 4th Edition, 2009, ISBN-10: 0070146799, ISBN-13: 978-0070146792</td></tr>
<tr><td>Reference Books</td><td colspan="6">Kevin Otto, Kristin Wood, Product Design, Pearson Education, Indian Reprint, 2004, ISBN-10: 0130212717, ISBN-13: 978-0130212719
Yousef Haik, T.M.M. Shahin, Engineering Design Process, Cengage Learning, 2nd Edition Reprint, 2010, ISBN-10: 0495668141, ISBN-13: 978-0495668145
Clive L. Dym, Patrick Little, Engineering Design: A Project-based Introduction, John Wiley & Sons, 3rd Edition, 2009, ISBN-10: 0470225963, ISBN-13: 978-0470225967</td></tr>
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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Engineering Skill Practice</td></tr>
<tr><td rowspan="2">Dept./Faculty proposing the course</td><td rowspan="2">Mechanical Engineering</td><td rowspan="2">Structure (LTPC)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">All UG & DD</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ☐</td><td colspan="2">Modification ■</td></tr>
<tr><td>Pre-requisite</td><td>NIL</td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 61</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">The objective of this course is to give an exposure on the basic practices followed in the domain of mechanical, electrical, electronics and communication engineering. The exercises will train the students to acquire skills which are very essential for the engineers through hands-on sessions.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">At the end of the course, the students will be able to choose suitable process/method among the mechanical, electrical, electronics, and communication engineering concepts that can full fill the functional outcomes of the parts/prototypes/products.</td></tr>
<tr><td>Contents of the course (With approximate break-up of hours for L/T/P)</td><td colspan="6">Experiments will be framed to train the students in following common engineering practices:

Basic manufacturing processes: Fitting, Drilling & tapping, Material joining processes, Carpentry, Sheet-metal work, Arc Welding, 3D Printing. (10P)

Familiarization of electronic components by Nomenclature, meters, power supplies, function generators and Oscilloscope – Bread board assembling of simple circuits: IR transmitter and receiver - LED emergency lamp – Communication study: amplitude modulation and demodulation. (6P)

Domestic wiring practice: Fluorescent lamp connection, Staircase wiring - Estimation and costing of domestic and industrial wiring - power consumption by Incandescent, CFL and LED lamps. (2P)

Dismantle and assembly of PC. Installing OS and disk management. (4P).</td></tr>
<tr><td>Text Books</td><td colspan="6">1. Uppal S. L., “Electrical Wiring & Estimating”, 5Edn, Khanna Publishers, 2003.
2. Chapman. W. A. J., Workshop Technology, Part 1 & 2, Taylor & Francis.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Clyde F. Coombs, “Printed circuits hand book”, 6Edn, McGraw Hill, 2007
2. John H. Watt, Terrell Croft, “American Electricians' Handbook: A Reference Book for the Practical Electrical Man”, Tata McGraw Hill, 2002.</td></tr>
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<table>
<tr><td>Course Code</td><td></td><td>Course Name</td><td colspan="4">Effective Language and Communication Skills</td></tr>
<tr><td>Offered by Department</td><td>SH-English</td><td>Structure(LTPC)</td><td>1</td><td>0</td><td>2</td><td>2</td></tr>
<tr><td>To be offered for</td><td>B.Tech</td><td>Course Type</td><td colspan="4">Core</td></tr>
<tr><td>Prerequisite</td><td>NIL</td><td>Approved In</td><td colspan="4">Senate 61</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• Hone LSRW and practice critical thinking
• Enable students to speak and write grammatically acceptable sentences
• Train students in technical communication
• Cultivate interest to learn language and to build the confidence to communicate in English
• Develop an interest in updating their language skills through continuous learning
• Connecting personal growth with improvement in their proficiency in English</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">• Able to communicate effectively with grammatically acceptable constructions and appropriate words in formal and informal situations
• Can extract information effectively and able to think critically
• Able to present technical content confidently</td></tr>
<tr><td>Course Contents(with approximatebreakup of hours forlecture/ tutorial/ be donepractice)</td><td colspan="6">• Introduction: Language, effective communication, ethics and aesthetics of communication (L1)
• Phonetics – sounds, pronunciation of words, stress, intonation, listening, Varieties of English (L3, P4)
• Sentence structure, concord, punctuation, stylistic errors, common errors (L3, P4)
• Reading and comprehension (L2, P5)
➢ Different types of reading, analyzing the organization of the text
➢ Critical thinking- thesis statement, argument, hypothesis, order, reason, evidence, consistency,tautology, conclusion
• Exercises for vocabulary enrichment (for daily practice)
• Speaking (L2, P5)
➢ Barriers to effective communication, technical presentation and presentation skills, self-introduction,
➢ Requests, enquiry, suggestion in formal and informal situations, reporting an event, grouppresentation – debate
• Writing (L3, P8)
➢ Writing formal letters, email, résumé,
➢ Data interpretation, reports, product description/requirements/ technical instructions, recordingobservations
➢ The language of content strategy - voice and tone strategy - the language of localization_ textanalysis tools
➢ Plagiarism – the importance of documentation, different methods of note-taking
➢ Essays/story/ book & movie reviews/writing for social media/blogging/ journaling
• Life lessons through stories and activities (P2)</td></tr>
<tr><td>Essential & Supplementary Reading</td><td colspan="6">1. Tebeaux, Elizabeth, and Sam Dragga. The Essentials of Technical Communication OUP, 2018.
2. Rizvi, M Ashraf. Effective Technical Communication. McGraw-Hill, 2017
3. Hancock, Mark. English Pronunciation in Use: Intermediate Self-study and Classroom Use.CUP,2012.
4. Cottrell, Stella. Critical Thinking Skills: Developing Effective Argument and Analysis. Palgrave,2005.
5. Gower, Roger. Grammar in Practice. CUP, 2005.
6. Paterson, Ken. Oxford Living Grammar. OUP, 2014.
7. Sabin, William A. The Gregg Reference Manual:A Manual of Style, Grammar, Usage, andFormatting. McGraw-Hill, 2011.
8. Fitikides, T. J. Common Mistakes in English. London: Orient Longman, 1984.</td></tr>
</table>

Leech, Geoffrey and Jan Svartvik. A Communicative Grammar of English. Routledge, 2013.
9. Astley, Peter and Lewis Lansford. *Oxford English for Careers: Engineering*. OUP, 2013.
10. Savage, Alice and Patricia Mayer. *Effective Academic Writing*. OUP, 2013
11. Harari, Yuval Noah. *Sapiens: A Brief History of Humankind*. Vintage, 2014.
12. https://www.ted.com/
13. https://www.bbc.co.uk/learningenglish/features/pronunciation/tims-pronunciation-workshop-ep-13
14. https://learnenglish.britishcouncil.org/skills/listening
15. https://www.nationalgeographic.com/podcasts/overheard
16. https://www.youtube.com/user/NatureVideoChannel
17. https://www.youtube.com/watch?v=Aj-EnsvU5Q0&list=PLcetZ6gSk969oGvAI0e4_PgVnlGbm64bp
18. https://www.merriam-webster.com/word-of-the-day
19. https://www.newyorker.com/tag/book-reviews

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COURSE FORMAT

Course Code		Course Name	Differential Equations			
Offered by the Department	SH-Mathematics	Structure (LTPC)	3	1	0	4
To be offered for	B. Tech	Course Type	Core			
Pre-requisite	NIL	Approved In	Senate 61			
Learning Objectives	To provide an exposure to the theory of ODEs & PDEs and the solution techniques.					
Contents of the course	➢ Linear ordinary differential equations with constant coefficients, method of variation of parameters, Linear systems of ordinary differential equations (10L +3P) ➢ Power series solution of ordinary differential equations, Singular Points, Frobenius series solutions, Bessel and Legendre differential equations, Properties of Bessel functions and Legendre Polynomials (12L+4P) ➢ Fourier series (6L+2P) ➢ Laplace transforms: Elementary properties of Laplace transforms, inversion by partial fractions, convolution theorem, and its applications to ordinary differential equations (6L+2P) ➢ Introduction to partial differential equations, wave equation, heat equation, and diffusion equation (8L+3P)					
Essential Readings	1. Simmons G. F., Differential Equations, Tata McGraw-Hill, 2003. 2. Kreyszig E., Advanced Engineering Mathematics, Wiley, 2007.					
Supplementary Reading	1. William E. Boyce and R. C. Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley, 8th Edition, 2004. 2. Sneddon I., Elements of Partial Differential Equations, Tata McGraw-Hill, 1972. 3. Ross L. S., Differential Equations, Wiley, 2007. 4. Trench W., Elementary Differential Equations, http://digitalcommons.trinity.edu/mono					

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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Semiconductor Physics</td></tr>
<tr><td>Dept./
Specialization</td><td>SH -Physics</td><td>Structure
(LTPC)</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>To be offered for</td><td>B. Tech. and DD</td><td>Status</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Faculty Proposing the course</td><td>SH - Physics</td><td>Type</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 61</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">The objectives of the course are to
• Introduce the physics of semiconductors, and phenomena of drift and diffusion current
• Study I-V characteristics and small-signal model of p-n junction diode
• Understand operation and biasing characteristics of BJTs, MOSFETs, and solar cells.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">At the end of the course, the students would be able to
• Describe the essential physics of semiconductors, and the flow of electric current
• Explain DC and AC characteristics of p-n junction diode
• Comprehend the I-V characteristics of BJT, MOSFET and Solar cells</td></tr>
<tr><td>Contents of the course
(With approximate break-up of hours for L/T/P)</td><td colspan="6">Semiconductor Fundamentals and Electrical Properties: Formation of Energy Bands, Electrical Conduction in Solids, drift current, electron effective mass, concept of the hole, Density of States; Fermi-Dirac distribution function, and Fermi energy; The Semiconductor in Equilibrium: charge carriers, equilibrium distribution, intrinsic and extrinsic semiconductors, doping, Law of mass action, charge neutrality and Fermi energy levels. (L12)

Carrier Transport and Nonequilibrium Dynamics: Drift current density, mobility effects, conductivity, velocity saturation; Diffusion current density, total current density, Einstein relation, and the Hall effect; Nonequilibrium Carrier Processes– excess carrier generation, recombination mechanisms, Continuity and Diffusion Equations, and Ambipolar Transport. (L8)

p-n Junction Diodes: Basic Structure and Built-in Potential, space charge width; derivation of dc and ac characteristics, Forward and reverse biasing, p-n junction current, Small-signal Model of the p-n junction, Diode current equation, Junction breakdown, metal semiconductor junction-Schottky Barrier and Ohmic contacts. (L8)
Semiconductor Devices: Bipolar Junction Transistors (BJTs)– Fundamentals and Transistor Action (basic operation, biasing, switching, current gain, amplification); Field-Effect Transistors (FETs) - MOSFETs and MOS Capacitors (device physics, threshold voltage, current-voltage characteristics, mobility and nonideal effects), Solar Cells. (L14)</td></tr>
<tr><td>Text Book</td><td colspan="6">1. Neamen, Donald A., Semiconductor Physics and Devices: Basic Principles, 4th Edition, NY: McGraw-Hill, ISBN-13: 978-9354601125, 2021.
2. M K Achuthan, K N Bhat, Fundamentals of Semiconductor Devices, ISBN-13: 978-0070612204 ISBN-10: 007061220X, 2017, McGraw-Hill Education,</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. S. M. Sze., K. K. Ng, Physics of Semiconductor Devices, 3rd Edition, United Kingdom, Wiley, ISBN: 978-0471143239, 2021.
2. B. G. Streetman and S. K. Banerjee, Solid State Electronic Devices, 7th Edition, Pearson, ISBN: 9780133356038, 2015
3. M. S. Tyagi, Introduction to Semiconductor Materials and Devices, 1st Edition, John Wiley, ISBN: 9788126518678, 2008.</td></tr>
</table>

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<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Engineering Graphics and Modeling</td></tr>
<tr><td rowspan="2">Dept./Faculty proposing the course</td><td rowspan="2">Mechanical Engineering Department</td><td rowspan="2">Structure (LTPC)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>1</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B.Tech. programs of CSE, ECE and Physics</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ☐</td><td colspan="2">Modification ■</td></tr>
<tr><td>Pre-requisite</td><td>Nil</td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 61</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To introduce the basic concepts and techniques of technical drawing
• To learn 2D and 3D representation of various shapes/objects and its engineering applications.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Students will acquire visualization skills and will be able to prepare technical drawings and 3D models using computer aided tools</td></tr>
<tr><td>Contents of the course
(With approximate break-up of hours for L/T/P)</td><td colspan="6">• Role of technical drawing in product development process, Basics of technical drawing, Standards, Dimensioning principles (L2+P2)
• Computer aided drafting (L2 + P2)
• Principles of orthographic projection. 3D drawings of objects to orthographic projection (L4+P4)
• Principles of isometric projections. 2D orthographic to isometric drawings (L4+P4)
• Introduction to 3D modelling of shapes and objects (L2+P2)
• Solid Modelling – part modelling & assembly modelling; Surface modelling; NURBS modelling (L6+P6)
• 3D modelling from physical objects (L2+P2)
• Modelling of engineering applications including electrical CAD (L2+P2)</td></tr>
<tr><td>Text Books</td><td colspan="6">1. Venugopal K and Prabhu Raja V, Engineering Drawing + AutoCAD, New Age International (P) Limited. 7th Edition, 2024 (ISBN: 9360749222)
2. Narayana. K.L, and Kannaiah. P, Engineering Drawing, Scitech Publications (India) Pvt. Ltd, 3rd Edition, 2021 (ISBN: 9789385983177)</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Bertoline G.R, Wiebe E.N, Hartman N, Ross W, Technical Graphics Communication, Mcgraw-Hill College, 2008, IRWIN Graphic Series, 2008 (9780077221300)
2. Varghese P.I, Engineering Graphics, McGraw Hill Education, 2017 (ISBN: 1259081001)
3. Bhatt. N.D, Engineering Drawing – Plane and Solid Geometry, Charotar Publishing House Pvt. Ltd., 54th Edition, 2023 (ISBN: 9789385039706)</td></tr>
</table>

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<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Data Structures and Algorithms</td></tr>
<tr><td rowspan="2">Dept./Faculty proposing the course</td><td rowspan="2">CSE</td><td rowspan="2">Structure (LTPC)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B.Tech, DD</td><td>Type</td><td colspan="2">Core ☒</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ☐</td><td colspan="2">Modification ☒</td></tr>
<tr><td>Pre-requisite</td><td>--</td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 61</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">Given a computational problem, the focus is on design and implementation of algorithms using suitable data structures. The notion of time and space complexity, design of efficient algorithms and data structures shall also be explored. The course also focuses on exploring role of data structure for solving problems efficiently.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Students are expected to design efficient algorithms and data structures for computational problems</td></tr>
<tr><td>Contents of the course (With approximate break-up of hours for L/T/P)</td><td colspan="6">ADT- Review of elementary data structures – List, Stack, Queue– time and space complexity – step count method based computation – asymptotic analysis and bounds – big oh, little oh,omega,theta notation (5L)
Analysis using recurrence relations – solving recurrence relations through guess method, recurrence tree method, Master theorem (5L)
Analysis of sorting/searching algorithms - Incremental Design - insertion sort, decremental Design - Celebrity problem - Divide and Conquer- quicksort ,merge sort– comparison/ non-comparison based sorting algorithms on restricted inputs –counting, radix sorting - discussion on inputs with best/worst case complexities (7L)
Binary Trees - Tree representation, traversal, Introduction to expression trees: traversal vs post/pre/infix notation. Recursive traversal and other tree parameters (depth, height, number of nodes etc.) (5L)
Dictionary ADT: Binary search trees, balanced binary search trees - AVL Trees. (5L)
Hashing - collisions, open and closed hashing, properties of good hash functions. Priority queue ADT: Binary heaps with application (5L)
Data Structures in Python – Strings, Lists, Tuples, Dictionary – Examples (5L)
Graphs: Representations (Matrix and Adjacency List),basic traversal such as BFS, DFS with complexity, spanning tree (5L)
Practice Component: Elementary Data Structures, Implementation of case studies involving algorithms and data structures using C, Binary Trees–Traversal –Computation of Structural parameters, Hashing–implementation of hash functions–computing collisions– Open vs closed hashing, Sorting and Searching Algorithms, Priority Queues and Heaps and its applications, Graph Traversals–BFS, DFS and its applications (28P)
Note: 30% of the practice component to be done using Python</td></tr>
<tr><td>Text Books</td><td colspan="6">1. M.A. Weiss,Data Structures and Algorithm Analysis in C,Pearson,2nd edition,2002, 978-8131714744.
2. Deitel P J and Deitel H M, Python for Programmers, Pearson Education, 2019, 978-0135224335.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Introduction to Algorithms, Prentice Hall of India, 4th Edition, 2022, 978-0262046305.
2. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Pearson, 3rd edition, 2017, 978-9332585485.
3. Horowitz, Sahni and Anderson-Freed, Fundamentals of Data Structures in C, Silicon Press, 2nd Edition, 2008, 978-8173716058
4. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Data Structures and Algorithms in Python, 1st edition, 2013, 978-1118290279.</td></tr>
</table>

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Design Realisation</td></tr>
<tr><td rowspan="2">Dept./Faculty proposing the course</td><td rowspan="2">SIDI</td><td rowspan="2">Structure (LTPC)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>2</td><td>0</td><td>2</td><td>3</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B.Tech/ DD</td><td>Type</td><td colspan="2">Core ☑</td><td colspan="2">Elective</td></tr>
<tr><td>Status</td><td colspan="2">New ☑</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td>Concepts in Engineering Design</td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 61</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">To understand the user-centric design principles to identify and prioritize customer needs accurately.
To generate creative design solutions using Morphological tools, SCAMPER, and TRIZ methodologies.
To assess product concepts systematically through Pugh charts and concept scoring techniques.
To learn visualization skills by producing freehand sketches and models for product development.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Analyze customer needs through structured methods like interviews and Quality Function Deployment (QFD).
Create innovative design concepts using tools like Morphological tool, SCAMPER, and TRIZ.
Evaluate design concepts using Pugh charts for effective concept screening and scoring
Design product architecture by applying configuration and industrial design principles.</td></tr>
<tr><td>Contents of the course
(With approximate break-up of hours for L/T/P)</td><td colspan="6">Practical case studies using
Customer need analysis, Indoor Customer interviews, Quality Function Deployment – House of quality (5L+5P)
Tools for conceptual design - creative thinking methods - Morphological tool, SCAMPER, TRIZ (6L+6P)
Embodiment design - Product architecture - steps in developing product architecture-configuration design-industrial design (6L+6P)
Concept screening - concept scoring – Pugh chart (5L+5P)
Realisation using free hand sketched and models (6L+6P)</td></tr>
<tr><td>Text Books</td><td colspan="6">1. George E.Dieter & Linda C.Schmidt, Engineering Design, McGraw-Hill International Edition 5, 2013, ISBN-10 : 9355322259, ISBN-13 : 978-9355322258</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Anita Goyal, Karl T Ulrich, Steven D Eppinger, Product Design and Development , Tata McGraw-Hill Education, 4th Edition, 2009, ISBN-10: 0070146799, ISBN-13 : 978-0070146792
2. Kevin Otto, Kristin Wood, Product Design, Pearson Education, Indian Reprint, 2004, ISBN-10: 0130212717, ISBN-13: 978-0130212719</td></tr>
</table>

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COURSE FORMAT

Course Code		Course Title	**Classical Mechanics and Relativity**				
Dept./ Specialization	SH -Physics	Structure (LTPC)	3	1	0	4	
To be offered for	B. Tech. EP	Status	Core ■		Elective ☐		
Faculty Proposing the course	SH Faculty	Type	New ■		Modification ☐		
Pre-requisite		Submitted for approval			Senate 61		
Learning Objectives	• To provide students with a comprehensive understanding of the principles and applications of classical mechanics, rigid body dynamics and the special theory of relativity.						
Learning Outcomes	• Students will be able to analyze and solve problems related to the motion of particles and rigid bodies, including concepts like linear momentum, angular momentum, and mechanical energy conservation. • Students will gain an understanding of the foundational principles of the special theory of relativity, including transformations, time dilation, length contraction, and the equivalence of mass and energy.						
Contents of the course *(With approximate break-up of hours for L/T/P)*	• Revisit the Newtonian Mechanics, Constraints, D'Alembert's principle of least action, Euler Lagrange formalism, conservation laws and generalised coordinates, Lagrange's equations, and Lagrange multipliers, Examples of work energy, rigid body motion, rotational dynamics (16L + 5T) • Introduction to the Hamilton formalism, General treatment of the two-body problem and Kepler's laws, Small Oscillations, coupled oscillators, normal modes (15L+ 5T) • Special theory of relativity: Michelson-Morley experiment, Galilean transformation, Length contraction, Time dilation, Lorentz transformations, Simultaneity, Relativistic addition of velocities, Doppler Effect, Equivalence of mass and energy. (11L+4T)						
Text Book	1. David Morin. (2009). **Introduction to Classical Mechanics with Problems and Solutions, Cambridge University Press, ISBN-13:** 978-0521185028 2. Stephen T. Thornton, Jerry B. Marion (2012). **Classical Dynamics of Particles and Systems,** Cengage India Private Limited; 5th edition, **ISBN-13 :** 978-9383635993						
Reference Books	1. Young, H. D., & Freedman, R. A. (2020). University Physics with Modern Physics (15th ed.). Pearson Education. 2. Goldstein, H., Poole, C., & Safko, J. (2001). Classical Mechanics (3rd ed.). Pearson Education.						

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COURSE FORMAT

Course Code		Course Title	Mathematical Physics			
Department proposing the Course	S&H	Structure (LTPC)	3	0	0	3
To be offered for	B. Tech. EP	Type	Core ■		Elective ☐	
		Status	New ■		Modification ☐	
Pre-requisite		Submitted for approval			Senate 62	
Learning Objectives	• To develop a practical understanding of mathematical methods employed by physicists					
Learning Outcomes	At the end of the course, the learners are expected to • Gain foundational knowledge in linear algebra, special functions, and complex analysis • Apply these mathematical tools to solve problems in classical mechanics, statistical mechanics, quantum mechanics, and electromagnetism.					
Contents of the course	Introduction to complex analysis: Limits and continuity. Differentiation and the Cauchy-Riemann equations, analytic functions, elementary functions and their mapping properties, harmonic properties and functions, Power series, their analyticity, Taylor's theorem [12L] Zeroes of analytic functions, Rouche's theorem Isolated singularities, removable singularities. Isolated Singularities and Residue Theorem Poles, classification of isolated singularities. Casoratti-Weierstrass theorem, Laurent's theorem. Residue theorem, the argument principle [12L] Linear systems of equation, linear Independence; Rank of a matrix, Solutions of linear systems, Existence and uniqueness; Vector space; Orthogonal bases eigenvalues eigenvectors and applications; Diagonalisation and quadratic forms; Gramm-Schmidt orthogonalization [18L]					
Text Book	1. Jim Hefferon, Linear Algebra (Chapters 2 and 3), Orthogonal Publishing, 4^{th} edition, ISBN: 9781944325114, 2020. 2. G. Arfken, H. J. Weber, Mathematical Methods for Physicists, Academic Press, 7^{th} edition, ISBN: 9789381269558, 2012.					
Reference Books	1. P. Dennery, A. Krzywicki, Mathematics for Physicists, Dover Publications, ISBN: 9780486691930, 2012. 2. Ken F. Riley, Mike P. Hobson, Stephen J. Bence, Mathematical Methods for Physics and Engineering, Cambridge University Press, 3^{rd} edition, ISBN: 9780521139878, 2018. 3. L.A. Pipes, L.R. Harwell, Applied Mathematics for Engineers and Physicists, Dover Publications, 3^{rd} edition, ISBN: 9780486779515, 2014. 4. B. Friedman, Principles and Techniques of Applied Mathematics, Dover Publications, ISBN: 9780486664446, 1991. 5. David W. Lewis, Matrix Theory, Allied Publishers, ISBN: 9788170234623, 2011. 6. Mary L. Boas, Mathematical Methods in the Physical Sciences, Wiley, 3^{rd} edition, ISBN: 9780471198260, 2005.					

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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Electronic Devices and Circuits</td></tr>
<tr><td>Department proposing the course</td><td>ECE</td><td>Structure (LTPC)</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. ECE/EP,
DD ECE (CMS),
DD ECE (MVS)</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective □</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification □</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To introduce the fundamentals and working principle of semiconductor devices.
• To demonstrate the concepts of applications of these semiconductor devices.
• To explain the significance of various types of semiconductor devices.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">At the end of this course, the student will be able to
• Understand and explain the fundamentals of semiconductor devices.
• Appreciate the applications of the semiconductor devices.
• Design circuits using the semiconductor devices.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">Diodes: Characteristics, applications-rectifiers, filters, voltage regulators and multipliers, clippers and clampers, special purpose diodes [L10+T3]

Bipolar Junction Transistor (BJT): Characteristics, Biasing and amplifier circuits, Frequency response [L10+T3]

Field Effect Transistor(FET): JFET and MOSFET - Characteristics, Biasing and amplifier circuits, Frequency response [L11+T4]

Other semiconductor devices: Optoelectronic devices-LED, photodiode and solar cell, pnpn and emerging devices [L11+T4]</td></tr>
<tr><td>Text Book</td><td colspan="6">1. L. Nashelsky, R.L. Boylestad, Electronic Devices and Circuit Theory, Pearson publishers, 11th edition. ISBN: 9332542600, 2021.
2. Millman's Electronic Devices and Circuits, McGRAW HILL publishing company, 4th edition, ISBN: 9789339219543, 2015.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Albert Malvino, David J. Bates, Electronic Principles, McGraw Hill Education, 7th edition, ISBN: 0070634246, 2017.
2. David. A .Bell, Electronic Devices and Circuits, Oxford University Press, 5th edition, ISBN: 019569340X, 2008.</td></tr>
</table>

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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Digital Circuit Design</td></tr>
<tr><td>Department proposing the course</td><td>ECE</td><td>Structure (LTPC)</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. ECE/EP,
DD ECE (CMS),
DD ECE (MVS)</td><td>Type</td><td colspan="2">Core</td><td colspan="2">Elective</td></tr>
<tr><td>Status</td><td colspan="2">New</td><td colspan="2">Modification</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• Introduce the fundamental concepts of digital systems and demonstrate the application of Boolean algebra in logic analysis and design.
• Develop a comprehensive understanding of digital logic design principles and methodologies at the gate level, encompassing both combinational and sequential logic elements.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">The course would equip the students to
• Utilize Boolean algebra and related techniques to formulate and simplify logical expressions.
• Analyze and design both combinational and sequential digital systems with a systematic approach.
• Develop Digital Circuits / Systems for practical problems.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">Introduction to Digital Systems: Introduction to Digital Logic, Data Representations, Number systems, Code Conversion [L3+T1]

Boolean Algebra and Logic Gates: Laws and Theorems of Boolean Algebra, Truth Table and Algebraic Form, Logic Operations and Logic Gates, Boolean Functions, Canonical and Standard Forms [L6+T2]

Gate-Level Minimization: Boolean Logic Minimization, Karnaugh Maps (K Map), Quine – McCluskey Method (QM method), Don't-care Conditions, NAND and NOR Implementations [L8+T3]

Combinational Circuit Design: Analysis and Design of Combinational Circuits, Adder, Subtractor, Multiplexer, Decoder, Encoder, Comparator, Code Converters, Parity generator, Implementation of Logic Functions using MUX [L8+T3]

Sequential Circuit Design: Asynchronous and Synchronous Design, Flip Flops and Latches, Design of Sequential Modules– SR, D, T and J-K Flip-flops, Analysis of Clocked Sequential Circuits, Mealy and Moore Models of Finite State Machines, State Reduction and Assignment [L9+T3]

Registers and Counters: Shift registers, Asynchronous and synchronous counters, Modulo counters, Applications of counters and registers [L6+T2]

Introduction to HDL and Design Examples [L2]</td></tr>
<tr><td>Text Book</td><td colspan="6">1. M. Morris Mano, Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL, Pearson, 6th edition, ISBN: 9789353062019, 2018.
2. Charles H. Roth, Jr., Larry L. Kinney, Fundamentals of Logic Design, Cengage Learning, 7th edition, ISBN: 9781133628477, 2013.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. D. D. Givone, Digital Principles and Design, McGraw Hill, ISBN: 9780070529069, 2017.
2. Thomas L. Floyd, Digital Fundamentals, Pearson, 11th edition, ISBN: 9789332584600, 2017.
3. S.Brown, Z. Vranesic, Fundamentals of Digital Logic with VHDL Design, McGraw-Hill Education, 3rd edition, ISBN: 97812590259760, 2017.
4. R.J.Tocci, N.S.Widmer, G.L.Moss, Digital Systems Principles and applications, Pearson Prentice Hall Edition, 12th edition, ISBN: 9780134220130, 2017.</td></tr>
</table>

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY ,
DESIGN AND MANUFACTURING (IIITDM), KANCHEEPURAM

COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Signals and Systems</td></tr>
<tr><td>Department proposing the course</td><td>ECE</td><td>Structure (LTPC)</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. ECE/EP,
DD ECE (CMS),
DD ECE (MVS)</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">Signals and Systems equips students with the ability to analyze, design, and implement systems that process continuous-time signals.
• To understand the fundamental concepts of continuous and discrete-time signals and systems, including classifications, operations, and system properties such as linearity, time-invariance, causality, and stability.
• To analyze signals and systems using time-domain and frequency-domain techniques, including convolution, Fourier series, Fourier transform, and Laplace transform.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">At the end of the course, the students are expected to
• Students will be able to classify and analyze continuous and discrete-time signals and systems based on their fundamental properties.
• Students will be able to apply transform techniques (Fourier and Laplace) to evaluate and interpret the behavior of signals and systems in both time and frequency domains.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">Signals (continuous-time), standard signals, transformations of the independent variable, Systems (continuous-time): System classification [L5+T2]

Analysis of an LTI system: Natural and forced response, zero-input and zero-state solutions, step response, system stability, Impulse response of an LTI system, convolution integral, graphical convolution, system properties from impulse response, interconnection of LTI systems, evaluating impulse response from the step response [L8+T3]

Discrete-time signals and systems: Emphasize similarities and differences with continuous-time counterpart, transformations of signals, discrete-time convolution [L4+T2]

Continuous-time Fourier series (FS): Periodic signals and their properties, complex exponential as Eigen function of LTI systems, exponential and trigonometric FS representation of periodic signals, convergence, FS of standard periodic signals, salient properties of Fourier series, FS and LTI systems, some applications of FS [L6+T2]

Continuous-time Fourier transform: Development of Fourier representation of a periodic signals, convergence, FT of standard signals, FT of periodic signals, properties of FT, some applications of FT [L6+T2]

Laplace transform: Unilateral and Bilateral transform, ROC, relation between Fourier and Laplace transform, properties, poles and zeros of rational transfer function, zero-state and zero-input response [L8+T2]

Sampling (Bridge continuous and discrete): Sampling theorem and signal reconstruction, notion of aliasing with examples, discrete-time processing of continuous-time signals, continuous-time processing of discrete-time signals [L5+T1]</td></tr>
<tr><td>Text Book</td><td colspan="6">1. Alan Oppenheim, Alan Willsky, S. Nawab, Signals and Systems: Pearson New International Edition, Pearson Education Limited, 2nd edition, ISBN: 9781292025902, 2013.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. B P Lathi, Principles of Linear Signals and Systems, 2nd edition, ISBN: 9780198062271, 2009.
2. S. S. Soliman, M.D. Srinath, Continuous and Discrete Signals and Systems, Pearson, 2nd edition, ISBN: 9780135184738, 1997.</td></tr>
</table>

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COURSE FORMAT

Course Code		Course Title	General Physics			
Department proposing the course	SH-Physics	Structure (LTPC)	1	0	2	2
To be offered for	B. Tech. EP	Type	Core ■		Elective □	
		Status	New ■		Modification □	
Pre-requisite		Submitted for approval			Senate 62	
Learning Objectives	• To learn about the general properties of matter • To carry out various experiments for understanding the science behind various physical processes					
Learning Outcomes	At the end of the course student is expected to be able to • Understand the science and experiments for determination of parameters associated with general properties of matter. • Become capable of designing new alternative experiments for finding the values of some of the physical parameters of matter.					
Contents of the course	Stress-Strain diagram, Poisson's ratio and elastic constants, determination of Poisson's ratio and modulus of rigidity, Bending of Beam: Bending moment, uniform and non-uniform bending, Surface tension: Variation in surface tension with temperature, Capillary rise and Quincke's method [5L+6P] Review of results of kinetic theory of gases: Pressure exerted by gas -rms, average and most probable speed-Equi-partition Theorem – Heat capacities - Distribution of molecular velocities in a perfect gas-Distribution of molecular speeds-Mean free path (Zeroth and First order) [4L+2P] Transport phenomena- Viscosity (Zeroth order approximation)- Effects of Temperature and Pressure on viscosity- Thermal Conductivity- Diffusion – Real gases -Deviations from Perfect gas behaviour- Regnault's Experiment – Vander Waals' equation of state – Discussion of Vander Waals' equation – Joule Experiment – Porous Plug experiment – Joule – Thomson Coefficient for Vander Waals' gas [5L+6P] In addition, laboratory experiments related to conservation of angular momentum, coupled pendulum, LCR circuits, Norton and Thevenin's theorem shall be also be included [14P]					
Text Book	1. Samuel J. Ling, Jeff Sanny, William Moebs, University Physics: Volume 1, Open Stax, XanEdu Publishing Inc, ISBN: 9781506698175, 2016. 2. D.S. Mathur, Elements of Properties of Matter, S Chand & Company, ISBN: 9788121908153, 2010.					
Reference Books	1. David Halliday, Robert Resnick, Jearl Walker, Fundamentals of Physics, Wiley, 10th edition, ISBN: 9781118886328, 2013.					

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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Digital Circuit Design Lab</td></tr>
<tr><td>Department proposing the course</td><td>ECE</td><td>Structure (LTPC)</td><td>0</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. ECE/EP,
DD ECE (CMS),
DD ECE (MVS)</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• This course aims to provide practical experience in the design and implementation of digital circuits and systems.
• Students will learn to formulate logic solutions for given problems, optimize logic using various techniques, and implement designs using logic gates and digital ICs. The process is carried out in three phases: circuit simulation using Multisim, experimental validation, and Verilog/VHDL implementation.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">The course would equip the students to
• Understand digital circuits
• Design Combinational circuits
• Design sequential circuits
• Formulate logic and design circuits for practical problems.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">• Exploration of the digital design flow with hands-on implementation using Hardware Description Languages (HDLs).
• Formulating Boolean expressions and truth tables from practical statements, designing logic diagrams, simplifying using K-map, designing NAND-NAND and NOR-NOR diagrams, and verifying the same by simulation and experiment.
• Design and analysis of combinational logic circuits, including arithmetic units, multiplexers, demultiplexers, encoders, decoders, code converters, comparators, parity generator etc, and verifying the same by Verilog and experiment.
• Implementation of sequential logic systems such as flip-flops, shift registers, counters, sequence generators etc, and verifying the same by Verilog and experiment.</td></tr>
<tr><td>Text Book</td><td colspan="6">1. M. Morris Mano, Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL, Pearson, 6th edition, ISBN: 9789353062019, 2018.
2. R.J. Tocci, N.S. Widmer, G.L.Moss, Digital Systems Principles and applications, Pearson Prentice Hall Edition, 12th edition, ISBN: 9780134220130, 2017.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Palnitkar S. Verilog, HDL: A guide to digital design and synthesis, Prentice Hall Professional, 2nd edition, ISBN: 9788177589184, 2003.
2. S. Brown, Z. Vranesic, Fundamentals of Digital Logic with VHDL Design, McGraw-Hill Education, 3rd edition, ISBN: 97812590259760, 2017.
3. Charles H. Roth, Jr. and Larry L. Kinney, Fundamentals of Logic Design, Cengage Learning, 7th edition, ISBN: 9781133628477, 2013.
4. Thomas L. Floyd, Digital Fundamentals, Pearson, 11th edition, ISBN: 9789332584600, 2017.</td></tr>
</table>

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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Electronic Devices and Circuits Lab</td></tr>
<tr><td>Department proposing the course</td><td>ECE</td><td>Structure (LTPC)</td><td>0</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. ECE/EP,
DD ECE (CMS),
DD ECE (MVS)</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective □</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification □</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To build circuits for studying the characteristics of semiconductor devices.
• To develop circuits for investigating the applications of semiconductor devices.
• To design circuits for realizing real world devices.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Upon completion of the course, the student will be able to
• Develop the circuits using various semiconductor devices.
• Simulate, build and design circuits for various real world applications.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">The lab includes both simulation and hardware. The simulation can be done in any SPICE software like LTSpice.
• VI and input/output characteristics of diodes, BJT and FET (2P)
• Diode circuits – Rectifiers, clippers and clampers (3P)
• BJT: Transistor biasing and amplifiers (3P)
• Optoelectronic devices: LED-Photodiode (2P)</td></tr>
<tr><td>Text Book</td><td colspan="6">1. L. Nashelsky, R.L. Boylestad, Electronic Devices and Circuit Theory, Pearson publishers, 11th edition, ISBN: 9332542600, 2021.
2. Millman's Electronic Devices and Circuits, McGRAW HILL publishing company, 4th edition, ISBN: 9789339219543, 2015.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Albert Malvino, David J. Bates, Electronic Principles, McGraw Hill Education, 7th edition, ISBN: 9780070634244 , 2017.
2. David. A .Bell, Electronic Devices and Circuits, Oxford University Press, 5th edition, ISBN: 019569340X, 2008.</td></tr>
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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Numerical and Computational Methods</td></tr>
<tr><td>Department proposing the course</td><td>S&H</td><td>Structure (LTPC)</td><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. EP, B. Tech. ME, B. Tech. SM, B. Tech. DE,
DD AI Robotics</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To understand the Importance of error analysis and their propagation.
• To solve complex mathematical problems using computer-based numerical techniques, including error analysis, solving equations, interpolation, and integration.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">• To solve mathematical problems using numerical techniques.
• To understanding error analysis, developing skills in solving equations and systems of equations, and applying numerical methods to various applications.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">Errors: lts sources, propagation and analysis, computer representation of numbers, Roots of Nonlinear Equations: Bisection, Newton-Raphson, secant method, System of Nonlinear equations, Newton's method for Nonlinear systems, Applications in Physics problems [10L+6P]

Solution of linear systems: Gauss, Gauss-Jordan elimination, matrix inversion and LU decomposition. Eigen values and Eigenvectors, Applications [6L+4P]

Interpolation and Curve fitting: Introduction to interpolation, Lagrange approximation, Newton and Chebyshev polynomials. Least square fitting, linear and nonlinear, Application in Physics problems [6L+4P]

Numerical Differentiation and integration: Approximating the derivative, numerical differentiation formulas, introduction to quadrature, trapezoidal and Simpson's rule, Gauss-Legendre integration, Applications [6L+4P]

Solution of ODE: Initial value and boundary value problems, Euler's and Runge-Kutta methods, Finite difference method, Applications in Chaotic dynamics, Schrodinger equations [8L+6P]

Solution of PDE: Hyperbolic, Parabolic, and Elliptic Equations by finite difference, Application to 2- dimensional Electrostatic Field problems [8L+4P]</td></tr>
<tr><td>Text Book</td><td colspan="6">1. K. E. Atkinson, Numerical Analysis, John Wiley, 2nd edition, ISBN: 9780471624899, 2004.
2. Steven C. Chapra, Raymond P. Canale, Numerical Methods for Engineers, McGraw-Hill Science Engineering, 7th edition, ISBN: 9780073397924, 2014.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. John H. Mathews, Numerical Methods for Mathematics, Science, and Engineering, Pearson Education (US), 2nd edition, ISBN: 9780136249900, 1992.
2. Samuel S. M. Wong, Computational Methods in Physics and Engineering, World Scientific, 2nd edition, ISBN: 9789810230432, 1997.
3. W. H. Press, B. P. Flannery, S. A. Teukolsky, W. T. Vetterling, Numerical Recipes in C, Cambridge University Press, 1st edition, ISBN: 9780521354653, 1998.</td></tr>
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COURSE FORM

Course Code		Course Title	Optics and Photonics			
Department proposing the course	SH-Physics	Structure (LTPC)	3	0	0	3
To be offered for	B. Tech EP	Type	Core ■		Elective ☐	
		Status	New ■		Modification ☐	
Pre-requisite		Submitted for approval			Senate 62	
Learning Objectives	• To learn the nature of light through the prospective of Ray, Wave and Quantum optics • To understand the properties of light through different physical experiments and theory					
Learning Outcomes	The student would be able to differentiate the characteristics of light in holistic manner and apply those to solve different real-time problems					
Contents of the course	Geometrical Optics: Ray propagation, Fermat's principle, Thin lenses, Aberration and optical instruments including eye [9L] Physical Optics: Wave nature of light, Interference by division of amplitude, Interference by division of wave fronts, Single/double slit Diffraction, Diffraction grating, Polarization, Double refraction, polarimetry, Holography [24L] Quantum Optics: Photon optics, Line spectra of atoms, Quantum Theory and Entanglement, LASER action [9L]					
Text Book	1. Eugene Hecht, A. R. Ganesan, Optics, Pearson, 5th edition, ISBN: 9789353439590, 2019. 2. Ajoy Ghatak, Optics, Mc Graw Hill, 8th edition, ISBN: 9789390113590, 2025.					
Reference Books	1. Francis Jenkins and Harvey White, Fundamentals of Optics, Tata Mc Graw Hill, ISBN: 9781259002298, 4th edition, 2017.					

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<u>COURSE FORMAT</u>

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Data Science for Electronics Engineers</td></tr>
<tr><td>Department offering the course</td><td>Electronics and Communication Engineering</td><td>Structure (LTPC)</td><td>2</td><td>0</td><td>2</td><td>3</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. ECE/EP,
DD ECE (CMS),
DD ECE (MVS)</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• Understand the foundational concepts of Data Science and its applications.
• Apply descriptive and inferential statistical techniques to analyze and interpret data.
• Use predictive modeling methods to make data-driven decisions.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">• Identify characteristics of dataset and implement effective visualization techniques to understand data distribution.
• Describe and apply basic statistical models and machine learning techniques suitable for one and two dimensional data.
• Perform regression, correlation, and knowledge discovery to extract insights from data.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">Introduction to Data Science: Tools for Data Science, Data types, Data Collection, Exploratory Data Analysis – Estimates of location and variability, Data Sampling and distribution [8L]

Descriptive and Inferential Statistics – Data Visualization & Interpretation -Measures of Central Tendency & Dispersion - Basic and advanced plots such as Stem-Leaf Plots, Histograms, Pie charts, Box Plots, Violin Plots - Hypothesis Testing - Tests of Significance (t-test, ANOVA, chi-square test) – Regression and prediction, parametric and non-parametric tests [14L]

Statistical Machine Learning – Gradient Descent, Supervised and Unsupervised Learning, Classification, Regression, Clustering, Time series analytics, Signal and Image analysis, case study [8L]

Practice Component:
Implementation with Python - Concepts from Descriptive Statistics and Inferential Statistics – Machine Learning algorithm for supervised and unsupervised Learning, classification and regression would be offered as part of the practice exercises. Course project as case studies. (12 sessions – weekly exercises)</td></tr>
<tr><td>Text Book</td><td colspan="6">1. Joel Grus, Data Science from Scratch, Orielly, 2nd edition, ISBN: 9781492041139, 2019.
2. P Bruce, Practical Statistics for Data Scientists, O'Reilly, ISBN: 9789352135653, 2017.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. J. VanderPlas, Python data science handbook: Essential tools for working with data, O'Reilly Media, Inc., 2016.
2. J. Han, M. Kamber, Data Mining Concepts & Techniques, Elsevier, 3rd edition, ISBN: 9780123814791, 2007.</td></tr>
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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Statistical and Thermal Physics</td></tr>
<tr><td>Department proposing the course</td><td>SH-Physics</td><td>Structure (LTPC)</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. EP</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To understand statistical physics concepts of temperature, entropy, Boltzmann and Gibbs factors, partition functions, and distribution functions.
• To understand theoretical/ statistical difference between the classical and quantum systems, including phase transformations, blackbody radiation, and Fermi gases.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Upon successful completion, students will have the knowledge and skills to:
• Identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, chemical potential, Free energies, partition functions.
• Analyze phase equilibrium condition and identify types of phase transitions of physical systems.
• Make connections between applications of general statistical theory in various branches of physics.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">Application of Thermodynamics to gases: Laws of thermodynamics, condensed matter and phase transition, Maxwell relations; Enthalpy, Gibbs and Helmholtz potentials, chemical potential, Heat capacities of Liquids, Entropy equations, Applications of Maxwell relations for magnetic system, phase transition and critical phenomenon [14L + 4T]

Canonical, grand canonical ensembles and distribution: Introduction to probability theory, Ensembles in statistical Physics, Canonical distribution, Partition functions and Helmholtz potential, Choice of statistical ensemble, partition function for an ideal gas, Grand canonical distribution, Grand potential [17L+5T]

Quantum Distribution Functions: Fermions and Bosons, Fermi Dirac distribution, Bose Einstein distribution, classical limit, equation of state, Ideal Fermi gas properties, Ideal Bose gas properties, Photons and phonons; Planck gas, Specific heat of solids [12L+4T]</td></tr>
<tr><td>Text Book</td><td colspan="6">1. F Reif, Statistical Physics, McGraw Hill Education, 1st edition, ISBN: 9780070702196, 2017.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Michael J.R. Hoch, Statistical and Thermal Physics: An Introduction, Routeledge Taylor and Francis, 2nd edition, ISBN: 9780367461348, 2021.</td></tr>
</table>

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COURSE FORM

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Introduction to Quantum Mechanics</td></tr>
<tr><td>Department proposing the course</td><td>SH-Physics</td><td>Structure (LTPC)</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. EP</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To develop in the student, an awareness of situations in engineering, which need ideas of quantum mechanics.
• To emphasize on concepts of essential mathematics needed for understanding and using quantum mechanics.
• To enable the student with those aspects of quantum mechanics, which are necessary to begin to deal with microscopic systems.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Students will be able to
• Understand the fundamental concepts and quantum mechanical processes in the nature.
• Apply principles of quantum mechanics to calculate observables on known wave functions or potentials.
• Pursue more advanced courses such as quantum communications, quantum computation, quantum optics, nanophotonic devices etc.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">Introduction: The bizarre aspects and continuing evolution of quantum mechanics, and how we need it for engineering modern technology [L4+T2]

Schrodinger's wave equation: Getting to Schrodinger's wave equation. Solution of stationary-state Schrodinger equation for one dimensional bound state problems. Potential barrier and tunneling and applications such as, Esaki diode, scanning tunneling microscope, etc.; Particle in 3D box and related examples (quantum dot, quantum wire etc); Quantum mechanical measurements and wave function collapse [L15+T5]

Aspects of angular momentum and spin: Angular momentum operators. Stern-Gerlach experiment-spin. Solution of hydrogen atom problem [L13+T4]

Introduction to Quantum information : Quantum cryptography, Entanglement, Quantum computing, EPR paradox, Bells inequality [L10+T3]</td></tr>
<tr><td>Text Book</td><td colspan="6">1. David J. Griffiths, Darrell F. Schroeter, Introduction to Quantum Mechanics, Cambridge University Press, 3^{rd} edition, ISBN: 9781107189638, 2018.
2. Asher Peres, Quantum Theory: Concepts and Methods, Springer, 1995^{th} edition, ISBN: 9780792336327, 1995.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. R. Shankar, Principles of Quantum Mechanics, Springer, 2^{nd} edition, ISBN: 9788181286864, 2010.
2. David A.B. Miller, Quantum Mechanics for Scientists and Engineers, Cambridge University Press, ISBN: 9780521897839, 2008.</td></tr>
</table>

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COURSE FORM

Course Code		Course Title	Applied Physics Lab			
Department proposing the curse	SH-Physics	Structure (LTPC)	0	1	2	2
To be offered for	B. Tech. EP	Type	Core ■		Elective ☐	
		Status	New ■		Modification ☐	
Pre-requisite		Submitted for approval			Senate 62	
Learning Objectives	• To verifying the theoretical processes and concepts related to Statistical and Thermal Physics as well as light and electronics • To perform experiments on electronic circuits and sensors					
Learning Outcomes	Students will be able to • Develop the experimental knowledge of statistical and thermal processes and electronics after performing the experiments					
Contents of the course	The students will be doing the experiments on the following topics: • Noise generation and analysis: Boltzmann constant • Thermo-generator, heat capacity of metals • Measurement of speed of light by Fizeau's method • Rutherford scattering • Thickness and refractive index of thin film using variable angle laser Ellipsometry • Verify the Stefan-Boltzmann law by measuring the radiated power from a blackbody as a function of temperature/Planck constant • 555 timer and oscillator • Dielectric waveguides and interferometers • Optical fibers and sensors • Frank-Hertz experiment					
Text Book	1. Applied Physics Lab Manual, IIITDM Kancheepuram, Chennai. 2. Gregory S. Romine, Lab Manual to Accopmany Applied Physics: Concepts Into Practice, ISBN: 9780130870643, Pearson Education, Limited, 2000.					
Reference Books	1. Hannah Sathyaseelan, Laboratory Manual in Applied Physics, ISBN: 8122421792, New Age International Pvt Ltd, 3rd edition, 2007.					

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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Microprocessors and Embedded System Design</td></tr>
<tr><td>Department proposing the course</td><td>Electronics and Communication Engineering</td><td>Structure (LTPC)</td><td>2</td><td>1</td><td>2</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. ECE/EP,
DD ECE (CMS),
DD ECE (MVS)</td><td>Type</td><td colspan="2">Core ☑</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ☑</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• The goal of this course is to enable students to develop a solid understanding of microprocessor programming and embedded systems, empowering them to design and implement basic embedded applications.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">By the end of this course, students will be able to:
• Develop and implement real-time applications using the 8086 microprocessor and ARM controller.
• Interface 8086 Microprocessor and ARM controllers with external peripheral devices effectively.
• Designs embedded systems and apply RTOS and IoT platform.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">Intel 8086 Microprocessor: Introduction, Internal architecture, Hardware description, Segmentation, Instruction set, addressing modes, Assembly Language Programming, Interfacing with Programmable Peripheral Interface. Introduction to advanced processors: Intel (Pentium Series, i-series), AMD (Ryzen and EPYC series). (11L+06T)

Introduction to embedded processors- Design Process- Requirements- Specifications Hardware architecture- Software Architecture-Introduction to Harvard & Von Neuman architectures CISC & RISC Architectures. CPU Bus- Bus Protocols- Bus Organisation, Memory Devices, and their Characteristics- RAM, EEPROM-Flash Memory- DRAM. BIOS, POST, Device Drivers. ARM Microcontroller: Architecture, Hardware description, Register and Memory organization, Structure and interrupt priorities, Interfacing with external devices. (11L+06T)

Practice includes experiments from following topics: (20P)

Programming with 8086 and ARM processors, Arithmetic operations, Sorting, Operations on Matrices and String, Number conversion, Interfacing-LED, LCD, Stepper motor, 7-segment display, Interrupt, ADC and DAC)</td></tr>
<tr><td>Text Book</td><td colspan="6">1. Kenneth J. Ayala, the 8086 Microprocessor: Programming and Interfacing The PC, 1st edition, Delmar Publishers, ISBN: 9780314012425, 2007.
2. J. W. Valavno, Embedded Systems: Introduction to Arm® Cortex(TM)-M Microcontrollers, 5th edition, Create Space, ISBN: 9781477508992, 2012.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. K. Ray, K. M. Bhurchandi, Advanced Microprocessors and Peripherals, ISBN: 007014022, 3rd edition, Tata McGraw Hill, 2007.
2. Yu-Cheng Liu, Glenn A. Gibson, Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, 2nd edition, Prentice Hall of India, 2007.
3. A. N. Sloss, D. Symes, C. Wright, ARM System Developer's Guide, ISBN: 9781493303748, 1st edition, Morgan Kaufmann, 2004.
4. Muhammad Ali Mazidi, ARM Assembly Language Programming & Architecture: 1, 2nd edition, 2016.</td></tr>
</table>

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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Atomic, Molecular and Laser Physics</td></tr>
<tr><td>Department proposing the course</td><td>SH-Physics</td><td>Structure (LTPC)</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. EP</td><td>Type</td><td colspan="2">Core ☒</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ☒</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To introduce basic principles of Atomic and Molecular Spectroscopy and Lasers.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Students will be able to
• Understand atomic spectra, selection rules, fine/hyperfine structure, and atomic interactions in external fields.
• Analyze molecular motion, energy levels, rotational/vibrational spectra, and electronic transitions.
• Working principles and applications of Laser.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">Atomic Physics: Spectra of one- and two- electron systems, Alkali spectra, Electron spin and magnetic moment, electric-dipole allowed transition (E1) and selection rules, Fine structure splitting: spin orbit interaction and relativistic corrections; Lamb shift, Hyperfine structure and isotope shifts. [10L+3T]

Many-electron atoms, Pauli exclusion principle, Angular momentum coupling schemes: L-S and j-j coupling, equivalent and non-equivalent electrons, Hunds rules, ground state configurations of elements in periodic table; atoms in electric and magnetic fields (Zeeman effect, Paschen-Back effect and Stark effect), X-ray spectra. [10L+3T]

Molecular Physics: Types of molecules based on their moment of inertia, Types of molecular motions and energies, Born-Oppenheimer approximation; Origin of molecular spectra, Nature of molecular spectra, Theory of rigid rotator - energy levels and spectrum, Non-rigid rotator and centrifugal distortion, Theory of vibrating molecule as a simple harmonic oscillator - energy levels and spectrum, Electronic spectra of molecules - fluorescence and phosphorescence; Raman effect, Franck-Condon principle. Quantum numbers for molecular spectroscopy [12L+5T]

Lasers: Absorption, spontaneous and stimulated emission, Einstein's coefficients, Idea of metastable state, population inversion, Necessary condition for lasing, Two-level system: unattainability of population inversion, Three-level and four-level systems, Basic components of a laser system, Line broadening mechanism, Ruby laser, He-Ne laser and semiconductor laser working principle [10L+3T]</td></tr>
<tr><td>Text Book</td><td colspan="6">1. H. E. White, Introduction to Atomic Spectra, Tata McGraw Hill, ISBN: 9789352604777, 2019.
2. C.N. Banwell and E.M. McCash, Fundamentals of Molecular Spectroscopy, ISBN: 9789352601738, 4th edition, McGraw Hill Education, 2017.
3. A. Ghatak, K. Thyagarajan, Lasers: Theory and Applications, Springer Science, ISBN: 9789352745531, 2nd edition, 2019.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. B.H. Bransden, C.J. Joachain, Physics of Atoms and Molecules, ISBN: 9780582356924, 2nd edition, Pearson, 2003.
2. O. Svelto, Principles of Lasers, ISBN: 9781441913012, 5th edition, Springer-Verlag New York Inc., 2010.</td></tr>
</table>

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COURSE FORMAT

Course Code		Course Title	Condensed Matter Physics			
Department proposing the course	SH-Physics	Structure (LTPC)	3	1	0	4
To be offered for	B. Tech. EP	Type	Core ■		Elective ☐	
		Status	New ■		Modification ☐	
Pre-requisite		Submitted for approval			Senate 62	
Learning Objectives	• To learn the theory and techniques to understand structure of the condensed matter • To understand the theory explaining the electronic and thermal properties of the matter • To understand the theory explaining the magnetic and properties of the matter .					
Learning Outcomes	Student should be able to apply the classical, and quantum theory to comprehend different properties of the matter					
Contents of the course	Introduction to crystallography: Moseley's law, X-Ray diffraction, Scattering of X-rays, Bragg's law, Crystal diffraction- Bragg's X-ray spectrometer powder diffraction method, Intensity vs. 2θ plot (qualitative) [L7+T2] Electronic and thermal properties: Free electron theory of metals, Classical free electron model (Drude-Lorentz model), Quantum free electron theory, Fermi level and Fermi energy, Fermi-Dirac distribution function; Density of states for free electrons, Qualitative discussion of lattice vibration and concept of Phonons; Specific heats of solids: Classical theory, Einstein's and Debye's theory of specific heats, Hall Effect in metals [L14+T5] Magnetic Properties of Matter, Review of basic formulae: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, magnetization (M), Classification of Dia, Para, and Ferro magnetic materials; Langevin Classical Theory of dia - and Par amagnetism. Curie's law, Ferromagnetism and Ferromagnetic Domains. Hysteresis and Energy Loss, Hard and Soft magnetic materials [L14+T5] Superconductivity: Definition, London equation, Experimental results– Zero resistivity and Critical temperature –The critical magnetic field –Meissner effect, Type-I and Type-II superconductors, BCS theory. [L7+T2]					
Text Book	1. Neil W. Ashcroft, N. David Mermin, Solid State Physics, Cengage Learning, ISBN: 9780357670811, 2021. 2. Charles Kittel, Introduction to Solid State Physics, Wiley, ISBN: 9788126535187, 8th edition, 2012.					
Reference Books	1. M. Ali Omar, Elementary Solid State Physics Principle and Applications, ISBN: 9788177583779, Pearson Education, 2022.					

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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Electrodynamics</td></tr>
<tr><td>Department proposing the course</td><td>SH-Physics</td><td>Structure (LTPC)</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech EP</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• Understand the basic concepts of electromagnetic waves and Maxwell's equations.
• Learn how EM waves reflect, refract, and transmit at material boundaries.
• Explore how EM waves travel in free space, waveguides, and how they radiate from sources.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">At the end of the course, the learners are expected to do the following:
• Explain the wave equation, plane-wave solutions, and related ideas such as polarization and the Poynting vector.
• Solve basic problems on reflection, refraction, and transmission using Fresnel equations and boundary conditions.
• Describe how EM waves propagate in different media and understand the fundamentals of electromagnetic radiation.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">EM waves - Review of Maxwell's equations - Wave equation and uniform plane-wave solutions – Polarization – Power flow and Poynting vector [L3+T1]

Reflection and refraction of EMW, Fresnel relations, transmittance and reflectance [L8+T2]

EM Wave propagation in unbounded media – dielectrics and conductors - Skin effect - Plane wave at media interface – Boundary conditions-normal and oblique incidence [L9+T3]

EM Wave propagation in bounded media - Parallel plane waveguide - TEM mode - Rectangular waveguides – Dispersion and attenuation – TE and TM modes – Surface current and attenuation - Cavity Resonators - Dielectric waveguides [L10+T4]

Potentials, Fields and Radiation: Scalar and Vector Potentials, Gauge Transformations, Coulomb Gauge and Lorenz Gauge, Retarded Potentials, Jefimenko's Equations, Point Charges, Lienard-Wiechert Potentials, The Fields of a Moving Point Charge, Radiation from oscillating electric and magnetic dipoles, Power radiated by accelerating point charges [L12+T4]</td></tr>
<tr><td>Text Book</td><td colspan="6">1. D.J. Griffiths, Introduction to Electrodynamics, 5th edition, Cambridge University Press, ISBN: 9781009633017, 2025.
2. R K Shevgaonkar, Electromagnetic Waves, 1st edition, Tata McGraw Hill, ISBN: 9780070591165, 2017.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Andrew Zangwill, Modern Electrodynamics, 1st edition, Cambridge University Press, ISBN: 9780521896979, 2012.
2. David K. Cheng, Field and Wave Electromagnetics, 2nd edition, Pearson Education, ISBN: 9781292026565, 2014.</td></tr>
</table>

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COURSE FORMAT

Course Code		Course Title	Condensed Matter Physics Lab			
Department proposing the course	SH-Physics	Structure (LTPC)	0	1	2	2
To be offered for	B. Tech-EP	Type	Core ■		Elective ☐	
		Status	New ■		Modification ☐	
Pre-requisite		Submitted for approval			Senate 62	
Learning Objectives	• To perform experiments on phenomenon related to Condensed Matter Physics					
Learning Outcomes	Students will be able to • Consolidate the theoretical knowledge studied in the course • Gain good understanding of the concepts related to Solid state physics					
Contents of the course	Experiments on the following topics shall be conducted: • Dielectric constant • Thermal and electrical conductivity in metal • Hall effect in semiconductor • Hall effect in dielectric/metals • Band gap in semiconductor • Measurement of thickness of a thin film • I-V characterization of a thin film/semiconductor • Determination of specific heat of a liquid using a calorimeter • Photoelectric effect and work function • Solar cell fabrication and characterization					
Text Book	1. Condensed Matter Physics Lab Manual, IIITDM Kancheepuram, Chennai. 2. Jef Poortmans, Vladimir Arkhipov, Thin Film Solar Cells: Fabrication, Characterization and Applications, ISBN: 9780470091289, John Wiley & Sons Ltd, 2006.					
Reference Books	1. Michael P. Marder, Condensed Matter Physics, ISBN: 100470617985, John Wiley & Sons Inc, 2nd edition, 2010.					

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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Nuclear and Particle Physics</td></tr>
<tr><td>Department proposing the course</td><td>SH-Physics</td><td>Structure (LTPC)</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. EP</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective □</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification □</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To understand the fundamental principles of nuclear and particle physics, including nuclear structure, nuclear interactions, stability, decay mechanisms, and the detection and classification of elementary particles</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">• Demonstrate a comprehensive understanding of nuclear models, nuclear forces, decay mechanisms, and the principles underlying accelerators and detectors used in nuclear physics experiments.
• Apply the concepts of quantum numbers, particle classification, and the quark model to explain the behavior and interactions of elementary particles.</td></tr>
<tr><td>Contents of the course</td><td colspan="6">Properties of Nuclei and Models: Introduction to the nucleus, Fermi gas model, Introduction to shell model, Binding energy, Bethe-Weizsaecker mass formula and its application to explain most stable isobars and nuclear fission, Inferences of nuclear size from elastic electron-nucleus experiments [14L+5T]

Nuclear Force: Properties of nucleon-nucleon interaction, General forms of N-N potential, Description of low energy neutron-proton scattering to show the spin dependence of nuclear force [12L+4T]

Nuclear Stability: Nucleon emission, separation energy, Alpha decay and its energy spectrum, Q-value, Gamow's theory of alpha decay, Beta decay and its energy spectrum (for example, 137Cs), Need for neutrinos, Q-value for beta decay, Gamma decay, Selection rules for gamma transitions [8L+3T]

Accelerators and Detectors: Van de Graff, Synchrotrons, Geiger-Mueller detector, Ionization Chamber, Scintillation detector [4L+1T]

Elementary Particles: Classification of particles and their interactions, Quantum numbers, Quarks as the building blocks of hadrons, colour degree of freedom [4L+1T]</td></tr>
<tr><td>Text Book</td><td colspan="6">1. Kenneth S. Krane, Introductory Nuclear Physics, Wiley, ISBN: 9788126517855, 2008.
2. David Griffiths, Introduction to Elementary Particles, Wiley-VCH, 2nd edition, ISBN: 9783527406012, 2008.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Bogdan Povh, Klaus Rith, Christoph Scholz, Frank Zetsche, Particles and Nuclei: An Introduction to the Physical Concepts, Springer, 7th edition, ISBN: 9783662463215, 2015.
2. R.R. Roy, B.P. Nigam, Nuclear Physics: Theory and Experiment, New Age International Publishers, 2nd edition, ISBN: 9788122434101, 2014.</td></tr>
</table>

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COURSE FORMAT

Course Code		Course Title	Analog Circuit Design			
Department proposing the course	Electronics and Communication Engineering	Structure (LTPC)	3	1	0	4
To be offered for	B.Tech. ECE/EP, DD ECE (CMS), DD ECE (MVS)	Type	Core ■		Elective ☐	
		Status	New ■		Modification ☐	
Pre-requisite		Submitted for approval			Senate 62	
Learning Objectives	• This course provides an overview of the process of building amplifiers with transistors. • How to implement various controlled sources with transistors. • Stabilizing higher-order systems through frequency compensation techniques. • How to construct an operational amplifier and apply it to applications that generate both positive and negative feedback.					
Learning Outcomes	• The biasing arrangements and amplifier configurations in transistor circuits should be identifiable by students. • Stabilize higher-order amplifiers by performing dominant-pole compensation. Develop analogue systems for a variety of applications by utilizing op-amps and other components. • Develop circuits for a variety of real-world applications.					
Contents of the course	MOSFET for amplification, VTC, Q-point, Small signal analysis, Synthesis of Common Source, Common Gate and Common Drain Amplifier: biasing, AC coupling, swing limits, negative feedback biasing, bias stabilization [L8+T2] MOSFET-based dependent sources, IC biasing, and Cascode amplifier [L6+T1] Differential Circuits: differential pair, active load, small and large signal analysis, CM and DM [L5+T2] Frequency Response of Amplifiers [L3+T1] Miller compensation, Stability, frequency compensation [L4+T2] Op-amp circuits with negative feedback, Op-amp parameters, Arithmetic, linear, and nonlinear circuits, Active Filters [L9+T3] Op-amp circuits with positive feedback: Comparators, Sinusoidal oscillators, Schmitt Trigger, Multi-vibrators, 555 timers [L8+T3]					
Text Book	1. Adel S. Sedra, Kenneth C. Smith, Arun N. Chandorkar, Microelectronic Circuits, Theory and Application, Oxford University Press, 7th edition, ISBN: 9780199476299, 2017. 2. Sergio Franco, Design With Operational Amplifiers and Analog Integrated Circuits, McGraw Hill, 4th edition, ISBN: 9789352601943, 2016.					
Reference Books	1. Behzad Razavi, Fundamentals of Microelectronics, Wiley, 2nd edition, ISBN: 9781119695141, 2021. 2. Donald A. Neamen, Electronic Circuits: Analysis and Design, McGraw Hill, 4th edition, ISBN: 9780073380643, 2010. 3. Robert F. Coughlin, Frederick F. Driscoll, Operational Amplifiers and Linear Integrated Circuits, Pearson, USA, 6th edition, ISBN: 9780130149916, 2000.					

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COURSE FORMAT

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Photonics and Spectroscopy Lab</td></tr>
<tr><td>Department proposing the course</td><td>SH-Physics</td><td>Structure (LTPC)</td><td>0</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">B. Tech. EP</td><td>Type</td><td colspan="2">Core ■</td><td colspan="2">Elective ☐</td></tr>
<tr><td>Status</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 62</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To perform experiments on phenomenon related to photonics and spectroscopy</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Students will be able to
• Consolidate the theoretical knowledge studied in the course
• Gain good understanding of the concepts related to light and atomic structure</td></tr>
<tr><td>Contents of the course</td><td colspan="6">Experiments on the following topics shall be conducted.
• Air wedge experiment to determine diameter of wire
• Prism dispersion
• Grating diffraction
• Newton's ring
• Fresnel biprism
• Single slit diffraction
• Young's double slit experiment
• Properties of laser beam
• Identification of state of polarization of the light beam
• Construction of interferometers
• Balmer series and photoluminescence
• Zeeman effect</td></tr>
<tr><td>Text Book</td><td colspan="6">1. Photonics and Spectroscopy Lab Manual, IIITDM Kancheepuram, Chennai.
2. J.F. James, An Introduction to Practical Laboratory Optics, ISBN: 9781107050549, 1107050545, Cambridge University Press, 2014.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Stefan M. Koepfli, Michael Doderer, Shadi Nashashibi, Raphael Schwanninger, Optics and Spectroscopy Lab, Institute of Electromagnetic Fields, ETH Zurich, 2021.
2. Abdul Al-Azzawi, Photonics: Principles and Practices, CRC Press, 2007.</td></tr>
</table>

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COURSE FORMAT

Course Code		Course Title	Analog Circuit Design Lab			
Department proposing the course	Electronics and Communication Engineering	Structure (LTPC)	0	1	2	2
To be offered for	B.Tech. ECE/EP, DD ECE (CMS), DD ECE (MVS)	Type	Core ■		Elective ☐	
		Status	New ■		Modification ☐	
Pre-requisite		Submitted for approval			Senate 62	
Learning Objectives	• To construct amplifiers for practical applications. • To build basic analog systems incorporating transistors, R, L, C, and Op-amps. • To use analog circuits to generate multiple signals and process them appropriately for a specific application.					
Learning Outcomes	• It is expected that students can design amplifier circuits that can handle any load and interface, as well as generate signals, process them through circuits, and assess the outcomes. • Additionally, they should be able to construct larger analog systems by connecting smaller blocks that serve as substitutes.					
Contents of the course	• MOSFET Amplifiers (4P), Op-amp Circuits (8P), 555 Timer-based circuits (1P) Note: • The lab includes both simulation and hardware. • Simulation could be done in any SPICE software like LT Spice. • Components would be issued to the students one week before; they should build the circuit and come to the lab. • Lab time is to be utilized for applying input, verifying output, trouble shooting, thorough analyses and report submission.					
Text Book	1. Adel S. Sedra, Kenneth C. Smith, Arun N. Chandorkar, Microelectronic Circuits, Theory and Application, Oxford University Press, 7th edition, ISBN: 9780199476299, 2017. 2. Sergio Franco, Design With Operational Amplifiers and Analog Integrated Circuits, McGraw Hill, 4th edition, ISBN: 9789352601943, 2016.					
Reference Books	1. Behzad Razavi, Fundamentals of Microelectronics, Wiley, 2nd edition, ISBN: 9781119695141, 2021. 2. Donald A. Neamen, Electronic Circuits: Analysis and Design, McGraw Hill, 4th edition, ISBN: 9780073380643, 2010. 3. Robert F. Coughlin, Frederick F. Driscoll, Operational Amplifiers and Linear Integrated Circuits, Pearson, USA, 6th edition, ISBN: 9780130149916, 2000.					