Scheme and Syllabus

of

B. Tech. VLSI Design and Technology

(2024-2025 onwards)

Offered by:

Department of Electronics & Communication Engineering

NATIONAL INSTITUTE OF TECHNOLOGY DELHI

Delhi-110036, INDIA

(An autonomous Institute under the aegis of Ministry of Education, Govt. of India)

**Approved in the 3rd Meeting of Board of Studies of the Dept. of ECE, held on February 23, 2024 and in line with the recommendation of the Honourable Senate in the 17th Senate Meeting held on May 30, 2024.

Department of Electronics and Communications Engineering
National Institute of Technology Delhi

1.1 About the Department

Welcome to the Department of Electronic and Communication Engineering (ECE), National Institute of Technology Delhi. It was established in 2010, immediately with the beginning of the Institute under the aegis of the Ministry of Human Resource and Development (MHRD), Govt. of India. Currently, Department is offering two Undergraduate Program as B. Tech (ECE) & B. Tech (VLSI Design and Technology). Department is offerings two Postgraduate programs as M. Tech. ECE and M. Tech. ECE (VLSI). The Department also offers Ph.D. and Post-Doctoral Fellowship (PDF) Programme in relevant areas. It has excellent laboratories and research facilities in electronic devices and circuits, electronic measurement and instrumentation, microprocessor and microcontroller, microwave and antenna design, optical fiber communication and optical device, multimedia, and advanced communication and design automation and simulation laboratory. The Department has received projects, grants, and fellowships from the Ministry of Electronics and Information Technology (MeitY), the Department of Science and Technology (DST)-SERB, and other funding agencies. The Department has active collaborations with academic Institutes & research institutes in India and abroad.

The Department of ECE has a blend of young as well as experienced dynamic faculty members and is committed to providing quality education and research in the field. Faculty members of the department have excellent academic & research credentials and published numerous peer-reviewed journal articles/papers, Books, Book Chapters, etc. in the diversified field and have adequate experience in advanced research. The department of ECE provides a creative learning environment to the students for excellence in technical education. Here the students learn to face the challenges related to emerging technologies in electronics and communication engineering. The department of ECE promotes a self-learning attitude, entrepreneurial skills, and professional ethics. The department hopes to achieve the national goals and objectives of industrialization and self-reliance. As a result, it hopes to produce graduates with strong academic and practical backgrounds so that they can fit into the industry immediately upon graduation.

1.2 Vision

Create an educational environment to prepare the students to meet the challenges of the modern electronics and communication industry through state of art technical knowledge and innovative approaches beneficial to society

1.3 Mission

- To promote teaching and learning by engaging in innovative research and by offering state-of-the-art undergraduate, postgraduate, and doctoral programs.
- To cultivate an entrepreneurial environment and industry interaction, leading to the emergence of creators, innovators, and leaders.
- To promote co-curricular and extra-curricular activities for the overall personality development of the students.
- Building of responsible citizens through awareness and acceptance of ethical values.

B. Tech. in VLSI Design and Technology

2.1 Preamble

B. Tech. (VLSI Design and Technology) program offered at NIT Delhi is designed to equip students with a unique blend of skill sets that include:

- Strong theoretical foundation
- Predominantly practice-oriented approach with access to well-equipped and specialized laboratories, and supervised internship via the Practice School
- Hands-on technical training
- Life skills orientation
- Hard and soft skills
- Business perspective, along with emphasis on innovation and entrepreneurship

2.2 Salient Features

- Minimum Credits requirements for completion of B.Tech. Program is 160.
- The Curriculum is based on the guidelines of National Education Policy (NEP) – 2020.
- The curriculum has embedded the Multi Exit/ Multi Entry in the B. Tech. program.
- There is provision of Major degree and Minor Degree for students.
- The curriculum is designed to meet the prevailing and ongoing industrial requirements.
- The curriculum includes Project based Education with Projects every year.
- The curriculum is flexible and offers Choice Based Credit System (CBCS).
- The curriculum inherits the Value based Education and offers Interdisciplinary/ Multidisciplinary Courses.
- The Curriculum offers Digital Pedagogy & Flipped Learning with adequate motivation for Entrepreneurship/ Start-ups.
- The curriculum aims the Holistic Development of the students.

2.3 Cardinal Mentions

- Students exiting after completing 1st Year, 2nd Year and 3rd Year will be awarded Certificate, Diploma and Advanced Diploma in VLSI Design and Technology respectively. A minimum Credit requirement for Certificate is 40 Credits, Diploma is 80 Credits and Advanced Diploma is 120 Credits respectively.
- The students can opt for Minor Degree across any specialization offered in the Institute from 5th Semester e.g. a student pursuing B. Tech. (VLSI Design and Technology) may opt for Minor Degrees offered by the different Departments in the Institute depending upon his/her interest.
- The students opting for Minor Degree will have to earn additional credits for the Minor Degree as per Institute norms which may vary from time to time.

2.4 Program Educational Objectives (PEOs)

PEO-1	Engineering Graduates will excel in Microelectronics and VLSI technology & design field both in the industry and academics by analyzing and applying their knowledge in a professional manner.
PEO-2	Will be able to demonstrate design and skills to analyze, interpret and create solutions to the real-life VLSI chip and testing problems.
PEO-3	Embrace capability to expand horizons beyond engineering for creativity, innovation and entrepreneurship.
PEO-4	Imbibe competence and ethics for social and environmental sustainability with a focus on the welfare of humankind.

2.5 Program Outcomes (POs)

PO-1	**Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO-2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO-3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO-4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO-5	**Modern Tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO-6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO-7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO-8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO-9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO-10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO-11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO-12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

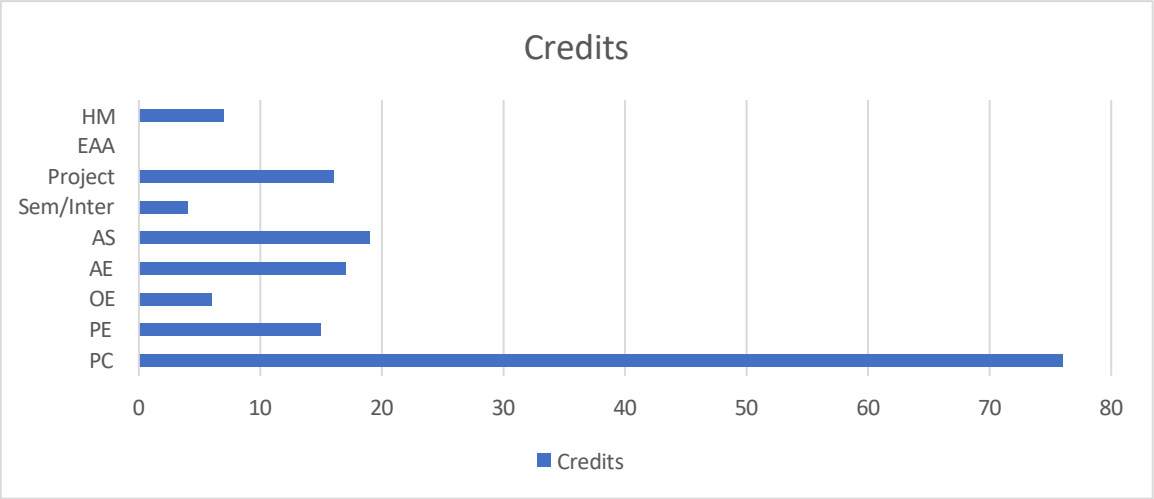
2.6 Program Specific Objectives (PSOs)

PSO -1	Capability to analyze the problems and develop solutions in the area of Microelectronics and VLSI.
PSO -2	An ability to make use of acquired technical knowledge for a successful career, contribution to research and entrepreneurship.

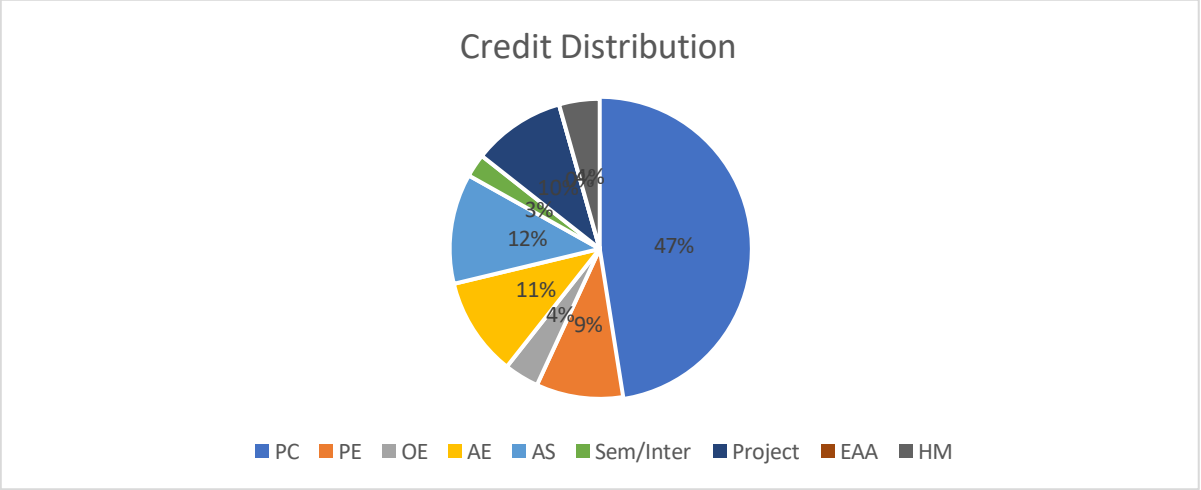
3.1 Semester wise Credit Structure

Sl. No.	**Category of Courses**	**1st Year**		**2nd Year**		**3rd Year**		**4th Year**		**Total**
		Sem I	**Sem II**	**Sem III**	**Sem IV**	**Sem V**	**Sem VI**	**Sem VII**	**Sem VIII**	
1.	Program Core	--	08	12	20	17	14	05	0	76
2.	Program Electives	--	--	--	--	03	03	09	--	15
3.	Open Electives						03	03		06
4.	Allied Engineering	08	04	05	--	--	--	--	--	17
5.	Applied Sciences	08	08	03	--	--	--	--	--	19
6.	Seminar/ Summer Internships/ Independent Study and Seminar	--	--	--	--	--	---	--	04	04
7.	Project	--	--	--	--	--	--	--	16	16
8.	Extra Academic Activity	--	--	--	--	--	--	--	--	--
9.	Humanities	04	--	--	--	--	--	03	--	07
Total		**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**160**

3.2 Credits Distribution



3.3 Credits Distribution (in %)



Course Coding Pattern
• Numeric code (XXX) -First digit for semester and rest two for course number • EC- Program Core • PE – Program Elective • AE – Allied engineering • MA – Mathematics (Applied Science) • PH – Physics (Applied Science) • CY – Chemistry (Applied Science) • HM- humanities and Management • HSP - Extra Academic activity • V- VLSI, L- Lecture, P- Practical, B- Both, • MP-Project/Minor project/Major Project • ST- Seminar/ Summer Internship/Training • TP-Term Paper

Teaching Scheme

For

B. Tech VLSI Design & Technology

Semester I						
Course Code	**Course Name**	**Type**	**L**	**T**	**P**	**Credit**
MAVL101	Mathematics-I	Applied Sciences	3	1	0	4
CYVB 102	Engineering Chemistry	Applied Sciences	3	0	2	4
CELB 101	Environmental Sciences	Allied Engineering (CE)	2	0	0	2
MEVP 102	Engineering Graphics and Design	Allied Engineering (ME)	1	0	2	2
EEVB 103	Basics of Electrical and Electronics Engineering	Allied Engineering (EE)	3	0	2	4
HMVB 101	Human Values and Ethics	Humanities and Management	2	0	2	3
HMVP 102	Technical Communication	Humanities and Management	0	0	2	1
Total Credits			**13**	**1**	**12**	**20**

Semester II						
Course Code	**Course Name**	**Type**	**L**	**T**	**P**	**Credit**
MAVL 203	Mathematics - II	Applied Sciences	3	1	0	4
PHVB 204	Engineering Physics	Applied Sciences	3	0	2	4
CSVB 204	Problem Solving and Computer Programming	Allied Engineering (CSE)	3	0	2	4
MAVL 205	Probability Theory and Stochastic Process	Applied Science	3	0	0	3
ECVL 201	Basics of Semiconductor Materials	Program Core	3	1	0	4
HSPB 151	Holistic Health & Sports	Extra Academic Activity	0	0	2	1
Total Credits			**15**	**2**	**8**	**20**

SEMESTER-I

Course Code: MAVL 101	Applied Science course: (Y/N)	HM Course: (Y/N)	PC Course: (Y/N)	PE Course: (Y/N)
	Y	N	N	N
Type of Course	Theory Course/ Lab Course			
Course Title	**MATHEMATICS-1**			
Course Coordinator				
Course Objectives	To build fundamental knowledge to solve mathematical problems of calculus and Geometry			

Course Outcomes		**Cognitive Levels**
CO1	Understand the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions.	L2
CO2	Understand the fundamentals of series and sequence theorems.	L2
CO3	Apply the differential equations to calculus in multivariable domain.	L3
CO4	Apply the Integral equations to calculus in multivariable domain.	L3

Semester	**1st**	**Autumn**

Contact Hours	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total Teaching Hours**
	3	1	0	4	**48**

Prerequisite course codes with course names	
Equivalent course codes as per proposed course and old course	

Text Books		
1.	Title	Engineering Mathematics
	Author	Reena Garg
	Publisher	Khanna Book Publishing Company
	Edition	2022
2.	Title	Reena Garg
	Author	Advanced Engineering Mathematics
	Publisher	Khanna Book Publishing Company
	Edition	2021
Reference Books		
1.	Title	Calculus and Analytic geometry
	Author	G.B. Thomas and R.L. Finney
	Publisher	Pearson
	Edition	2002

Course Contents	**UNIT I:** Basic Calculus: Curvature, evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Single-variable Calculus (Differentiation): Rolle's Theorem, Mean value theorems and applications; Extreme values of functions; Linear approximation; Indeterminate forms and L'Hospital's rule.	**9**
	UNIT II: Sequences and series: Limits of sequence of numbers, Calculation of limits, Infinite series; Tests for convergence; Power series, Taylor and Maclaurin series; Taylor theorem, convergence of Taylor series, error estimates.	**9**
	UNIT III: Multivariable Calculus (Differentiation): Limit, continuity and partial derivatives, directional derivatives, gradient, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers.	**9**
	UNIT IV: Multivariable Calculus (Integration): Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Centre of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Gradient, curl and divergence, Theorems of Green, Gauss and Stokes.	**9**
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	

Course Code: CYVB 102	Open Elective Course: (Y/N)	HM Course: (Y/N)	DC Course: (Y/N)	DE Course: (Y/N)
	Y	N	N	N

Type of Course	Theory Course and Lab Course
Course Title	**ENGINEERING CHEMISTRY**
Course Coordinator	
Course Objectives	To provide fundamental knowledge of chemical structure and properties.

Course Outcomes		**Cognitive Levels**
CO1	To understand chemical bonding in the molecules and complexes.	L2
CO2	To analyze the ranges of the electromagnetic radiation used for exciting different molecular energy levels in various spectroscopic techniques.	L4
CO3	To understand thermodynamic and electrochemical concepts.	L4
CO4	To understand periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.	L3

Semester	**1st**	**Autumn**

Contact Hours	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total Teaching Hours**
	3	0	2	4	**48**

Prerequisite course codes with course names	
Equivalent course codes as per proposed course and old course	

Text Books		
1.	Title	Inorganic Chemistry: Principles of Structure and Reactivity
	Author	J. E. Huheey
	Publisher	Pearson
	Edition	4th
2.	Title	Concise Inorganic Chemistry
	Author	J. D. Lee
	Publisher	Wiley India
	Edition	5th
3	Title	Organic Chemistry
	Author	Bruice Yurkanis Paula
	Publisher	Pearson Education India
	Edition	7th
Reference Books		
1.	Title	Physical Chemistry
	Author	P. W. Atkins
	Publisher	Oxford
	Edition	10th

Course Contents	**UNIT I:** Chemical Bonding: Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions, valence shall electron pair repulsion (VSEPR) theory. Crystal Field Theory (CFT), comparison of the stability of octahedral and tetrahedral complexes on the basis of crystal field stabilization energy (CFSE), factor affecting the magnitude of CFSE, application of crystal field theory. Jahn-Teller effect definition and example from d^9 and high spin d^4 systems.	**10**
	UNIT II: Spectroscopic techniques and applications: Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications. Vibrational and rotational spectroscopy of diatomic molecules and applications. Nuclear magnetic resonance and magnetic resonance imaging.	**10**
	UNIT III: Use of free energy in chemical equilibria: Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and EMF. Cell potentials, oxidation reduction reaction, Nernst equation and applications.	**08**
	UNIT IV: Periodic properties: Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases.	**08**
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	
Tentative List of Experiments	1. To find the strength in grams per litre of the given solution of sodium hydroxide with the help of stander oxalic acid solution. 2. ESTIMATION OF WATER HARDNESS BY EDTA METHOD (a) To determine the strength of calcium ion in given $CaCO_3$ solution by Complexometric Titrations. (b) To determine the strength of magnesium ion in given $MgSO_4$ solution by Complexometric Titrations. (c) To determine the total hardness of given water sample by Complexometric Titrations. 3. To determination the strength of ferrous ammonium sulphate with the help of $K_2Cr_2O_7$ solution. 4. To synthesize copper ammonium complex. 5. To synthesize $[Cu(H_2O)_6](ClO_4)_2$ complex. 6. Order of a reaction (redox). 7. Blue printing. 8. Acid-base titration using pH meter. 9. Acid-base titration by conductometry. 10. Determination of Fe(III) by colorimetry	

Course Code: CELB 101	Allied Engineering Course: (Y/N)	HM Course: (Y/N)	PC Course: (Y/N)	PE Course: (Y/N)
	Y	N	N	N
Type of Course	Theory Course/ Lab Course			
Course Title	**ENVIRONMENTAL SCIENCE**			
Course Coordinator				
Course Objectives	To provide fundamental knowledge environmental science to solve environment related problems.			

Course Outcomes		**Cognitive Levels**
CO1	Gain a comprehensive understanding of the Environmental Science aspects.	L2
CO2	Develop awareness of environment related issues.	L4
CO3	Learn about the ethical and moral responsibilities of the engineers towards environment.	L2
CO4	Learn remedial measures to solve environmental issues.	L2

Semester	**1st**	**Autumn**		
Contact Hours	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total Teaching Hours**
	2	0	0	2	**24**
Prerequisite course codes with course names					
Equivalent course codes as per proposed course and old course					

Text Books		
1.	Title	Introduction to Environmental Engineering
	Author	Mackenzie L. Davis and David A. Cornwell.
	Publisher	Tata McGraw-Hill Education Private Limited
	Edition	4rth edition 2010
2.	Title	Introduction to Environmental Engineering and Science
	Author	Gilbert M. Masters
	Publisher	Pearson Education
	Edition	2nd edition 2007
Reference Books		
1.	Title	Environmental Science and Engineering
	Author	J. Glynn Henry and Gary W. Heinke
	Publisher	Pearson Education
	Edition	2nd edition 2004

Course Contents	**UNIT I:** Multidisciplinary nature of environmental studies, Definition, scope and importance, need for public awareness. Ecosystems - Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystems: - a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems, Biogeochemical cycles	**12**
	UNIT II: Biodiversity and its conservation Introduction – Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation, Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity	**8**
	UNIT III: Environmental Pollution Definition, Cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. nuclear hazards, Causes, effects and control measures of urban and industrial wastes. Pollution case studies. Solid waste Management.	**8**
	UNIT IV: Social Issues and the Environment, From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Climate change, global warming, acid rain, ozone layer depletion and Eutrophication.	**8**
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	

Course Code: MEVP 102	Open Elective Course: (Y/N)	HM Course: (Y/N)	DC Course: (Y/N)	DE Course: (Y/N)
	Y	N	N	N

Type of Course	Theory Course/ Lab Course
Course Title	**Engineering Graphics & Design**
Course Coordinator	
Course Objectives	The objective of this Course is to provide the basic knowledge about Engineering Drawing.

Course Outcomes		**Cognitive Levels**
CO1	To Understand the concept of Engineering Graphics.	L2
CO2	Apply the concept of engineering drawing to draw the various geometrical shapes.	L3
CO3	Apply the concepts are given in projections, technical drawing,	L3
CO4	Design team project that illustrates Geometry and topology of engineered components using CAD.	L5

Semester	**1st**	**Autumn**

Contact Hours	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total Teaching Hours**
	1	0	2	2	**24**

Prerequisite course codes with course names	
Equivalent course codes as per proposed course and old course	

Text Books		
1.	Title	Engineering Graphics & Design
	Author	Pradeep Jain
	Publisher	Khanna Book Publishing
	Edition	
2.	Title	Engineering Graphics & Design
	Author	Jain, Maheshwari, Gautam
	Publisher	Khanna Book Publishing
	Edition	

Reference Books		
1.	Title	Engineering Drawing
	Author	N.D.Bhatt, V.M. Panchal &P.R., Ingle
	Publisher	Engineering Drawing
	Edition	

Course Contents	**UNIT I:** **Introduction to Engineering Graphics & Design: Drawing:** Principles of Engineering Graphics and their significance, usage of Drawing instruments, Lettering. Computer Graphics: Engineering Graphics Software - Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling.	**6**
	UNIT II: **Engineering Scales & Curves:** Types of scales-Plain scale, Diagonal scale, Conic sections, Cycloid, Epicycloid, Hypocycloid, Spiral and Involute**.** Orthographic Projections: Principles of Orthographic Projections-Conventions - Projections of Points, Lines and Plane.	**6**
	UNIT-III **Projections of Solids:** Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans. Sections and Sectional Views of Right Angular Solid Prism, Cylinder, Pyramid, Cone – Auxiliary Views, Sectional views of Right Regular Solids- Prism, Pyramid, Cylinder and Cone. **Isometric Projections:** Principles of Isometric projection – Isometric Scale, Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.	**6**
	UNIT-IV **CAD Modelling:** Overview of Computer Graphics, theory of CAD, important commands and their uses. Customisation & CAD Drawing, setting up of Modules and drawing limits; ISO and ANSI standards, tolerance; Annotations, Layering, applying annotations to drawings; Printing documents; orthographic projection techniques; Drawing sectional views of different objects, CAD modelling of parts and assemblies, surface, and wireframe models, Dimensioning guidelines, tolerance techniques; dimensioning and scale multi views of dwelling.	**6**
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	

Course Code: EEVB 103	Allied Engineering Course: (Y/N)	HM Course: (Y/N)	PC Course: (Y/N)	PE Course: (Y/N)
	Y	N	N	N
Type of Course	Theory Course/ Lab Course			
Course Title	**BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**			
Course Coordinator				
Course Objectives	The objective of this Course is to provide the students with an introductory and broad treatment of the field of Electrical Engineering.			

Course Outcomes		**Cognitive Levels**
CO1	Understand basics of semiconductor theory and principle of diode operation.	L2
CO2	To study the design and operation of rectifiers and transistor amplifiers.	L3
CO3	To study and apply circuit theorems to AC and DC circuits.	L3
CO4	Understand and analyses the working principles of electrical machines.	L4

Semester	**1st**	**Autumn**		
Contact Hours	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total Teaching Hours**
	3	0	2	4	**48**
Prerequisite course codes with course names					
Equivalent course codes as per proposed course and old course					

Text Books

1.	Title	Basic Electrical Engineering
	Author	Ritu Sahdev
	Publisher	Khanna Book Publishing
	Edition	2022
2.	Title	Basic Electrical Engineering
	Author	Nagrath I.J. and D. P. Kothari
	Publisher	McGraw-Hill Education
	Edition	2001

Reference Books

1.	Title	Engineering Circuit Analysis,
	Author	Hayt and Kimberly
	Publisher	Tata McGraw Hill
	Edition	8th edition 2013

Course Contents	**UNIT I:** Conductivity of insulators, metals, and semiconductors in terms of energy bands, the chemical bond in Si and Ge, conductivity of intrinsic semiconductors, extrinsic semiconductors: n-type and p-type semiconductors, Hall Effect in semiconductors, Mechanism in current flow: drift and diffusion, Einstein relation, semiconductor materials: Element semiconductor, II-VI compound, III-V compounds, ternary and quaternary compounds. V-I characteristics of PN-junction diode. Diode equivalent circuit, diode as a switch, diode testing.	**9**
	UNIT II: Rectifiers: Half wave, center tapped and bridge full-wave, Zener diode regulator and voltage multiplier, clipping and clamping circuits. TRANSISTORS: Construction and characteristics of BJT, Transistor configuration: CB, CE, CC configuration, Transistor at low frequency, small signal low frequency transistor model(h-parameters), Analysis of transistor amplifier using h-parameters, Transistor biasing and bias stabilization: Operating point, Stability factor, Analysis of fixed bias, collector to base bias, Emitter resistance bias circuit and self-bias circuit, Bias compensation techniques.	**9**
	UNIT III: Voltage and current sources, dependent and independent sources, source conversion, DC circuit's analysis using mesh & nodal method, Thevenin's& superposition theorem, star-delta transformation. 1-phase AC circuits under sinusoidal steady-state, active, reactive, and apparent power, physical meaning of reactive power, power factor, 3-phase balanced and unbalanced supply, star and delta connections.	**9**
	UNIT IV: Transformers: Magnetic Circuits: Review of laws of electromagnetism, Flux, MMF and their relation, analysis of the magnetic and electric circuit. Single-phase transformer: Basic concepts, constructional features, EMF equation, voltage, current, and impedance transformation, Equivalent circuits. Electrical Machines: DC Machines: Constructional features, working principle, emf equation, types of dc machines, and their characteristics. Induction Machines: Constructional features, working principle, emf equation, the concept of slip and torque–slip characteristics. Synchronous Machines: Constructional features, working principle and emf equation.	**9**
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	
Tentative List of Experiments	1. To verify KCL and KVL 2. To study the V-I characteristics of an incandescent lamp. 3. To measure single phase power by using three ammeter method. 4. To measure the single-phase power by using three voltmeter method.	

	5. To perform short circuit test on a single-phase transformer. 6. To perform open circuit test on a single-phase transformer. 7. To measure three phase power by using two wattmeter method. 8. To study the PN Junction diode characteristics. 9. To design the half wave and full wave rectifiers circuits. 10. To study CB, CE, CC input and output characteristics.

Course Code: HMVB 101	Open Elective Course: (Y/N)	HM Course: (Y/N)	PC Course: (Y/N)	PE Course: (Y/N)
	N	Y	N	N
Type of Course	Theory Course/ Lab Course			
Course Title	**HUMAN VALUES AND ETHICS**			
Course Coordinator				
Course Objectives	To give the fundamental knowledge of ethical practice and human values.			

Course Outcomes		**Cognitive Levels**
CO1	Understand the Organization and Organizational behaviour.	L2
CO2	Understand the emotion, feeling, authority and responsibility.	L2
CO3	Develop the moral and ethical values.	L3
CO4	Analyze the policy of human resources.	L4

Semester	**1st**	**Autumn**		
Contact Hours	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total Teaching Hours**
	2	0	2	3	**48**
Prerequisite course codes with course names					
Equivalent course codes as per proposed course and old course					

Text Books		
1.	Title	Organizational Behaviour: Text and Cases
	Author	A.K. Chitale, R.P. Mohanty and N.R. Dubey
	Publisher	PHI Learning Private Limited
	Edition	2019
2.	Title	Text & Cases in Human Resources Management
	Author	K. Ashwathappa
	Publisher	Tata McGraw Hill
	Edition	2012

Reference Books		
1.	Title	Engineering Ethics includes Human Values
	Author	M. Govindarajan, S. Nataraja and V.S. Senthil Kumar
	Publisher	PHI Learning Pvt. Ltd
	Edition	2011

Course Contents	**UNIT I:**	
	Introduction: Organization and Organizational Behaviour- Concept and significance, Organizational Structures, Individual & Group Behaviour; Morals, Values and Ethics; Engineering Ethics- Need, Scope, and Approach; Personality- meaning and definition, Types of Personality; Personality Attributes; Determinants of Personality- Biographical and Personal factors, Environmental Factors, Psychological Factors; Big Five Personality traits.	**9**

	UNIT II: Feelings, Classification of Feelings; Dimensions of Emotions, Emotions and External Constraints; Emotional Intelligence; Spiritual Intelligence; Authority, Responsibility and Accountability: Meaning of Authority, Responsibility and Accountability, Balance between Authority, Responsibility and Accountability.	**9**
	UNIT III: Moral Development; Variety of Moral Issues; Moral Dilemma; Moral Autonomy; Theories of Moral Development- Cognitive Moral Development; Concept of moral Relativism and Moral Imperialism; Encouragement and Approaches to Ethical Behaviour.	**9**
	UNIT IV: Human Resource Policies& Procedures- Introduction, Importance of Policies, Policy Formation, Human Resources Planning. Decision-making & Ethics.	**9**
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	
List of Experiments:	1. Management Activities and Games 2. Case Studies 3. Group Discussion 4. Debate 5. Presentation Skit	

Course Code: HMVP 102	Allied Engineering: (Y/N)	HM Course: (Y/N)	PC Course: (Y/N)	PE Course: (Y/N)
	N	Y	N	N

Type of Course	Theory Course/ Lab Course
Course Title	**TECHNICAL COMMUNICATION**
Course Coordinator	
Course Objectives	To develop the technical communication skills among the young engineers

Course Outcomes		**Cognitive Levels**
CO1	Understand basic grammar principles and sentence construction.	L2
CO2	Demonstrate clear and coherent passages and effective letters for job application.	L2
CO3	Develop technical reports and interpret graphs.	L3
CO4	Analyze the reading comprehension.	L4

Semester	**1st**	**Autumn**

Contact Hours	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total Teaching Hours**
	0	0	2	1	**12**

Prerequisite course codes with course names	
Equivalent course codes as per proposed course and old course	

Text Books

1.	Title	English for Engineers and Technologists
	Author	Anna University
	Publisher	Orient Blackswan
	Edition	1st edition
2.	Title	Effective Technical Communication.
	Author	Ashraf, M Rizvi.
	Publisher	Tata McGraw-Hill
	Edition	2006

Reference Books

1.	Title	Technical Communication: Principles and Practice
	Author	Meenakshi Raman and Sangeetha Sharma
	Publisher	Oxford University Press
	Edition	2nd Edition, 2011

Course Contents	**UNIT I:** Grammar Principles (Correction of sentences, Concord) and Vocabulary Building (synonyms and antonyms): Idioms and Phrasal verbs--patterns of use and suggestions for effective employment in varied contexts. Effective Sentence Construction - strategies for bringing variety and clarity in sentences removing ambiguity - editing long sentences for brevity and clarity	**8**
	UNIT II: Paragraph-writing: Definition of paragraph and types- features of a good paragraph- Unity of theme- coherence- linking devices- direction- patterns of development. Note-making - definition- the need for note-making - its benefits - various note formats- like tree diagram, block or list notes, tables, etc. Letter-Writing: Its importance in the context of other channels of communication- qualities of effective letters-types -personal, official, letters for various purposes- emphasis on letter of application for jobs - cover letter and resume types -examples and exercises	**8**
	UNIT III: Reading techniques: Definition- Skills and sub-skills of reading- Skimming and Scanning- their uses and purposes- examples and exercises.	**8**
	UNIT IV: Reading Comprehension - reading silently and with understanding- process of comprehension types of comprehension questions. (technical paper reading, patents) Features of Technical English - description of technical objects and process-Report- Writing definition- purpose -types- structure- formal and informal reports- stages in developing report- proposal, progress and final reports-examples and exercises.	**8**
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	
Tentative list of Practice:	1. English Sound System -vowels, consonants, Diphthongs, phonetic symbols- using dictionary to decode phonetic transcription-- Received Pronunciation, its value and relevance- transcription of exercises- 2. Stress and Intonation –word and sentence stress - their role and importance in spoken English 3. Intonation in spoken English -definition, patterns of intonation- –falling, rising, etc.- use of intonation in daily life-exercises 4. Introducing oneself in formal and social contexts- Role plays. - their uses in developing fluency and communication in general. 5. Oral presentation - definition- occasions- structure- qualities of a good presentation with emphasis on body language and use of visual aids. 6. Listening Comprehension -Challenges in listening, good listening traits, some standard listening tests- practice and exercises. 7. Debate/ Group Discussions-concepts, types, Do’s and don’ts- intensive practice.	

Course Code	**:**	**HSPB 151**				
Course Title	**:**	**Holistic Health & Sports**				
Type of Course	**:**	**Practical**				
		Lecture	**Tutorial**	**Practical**	**Credits**	**Total Lab Hours**
Contact Hours		0	0	2	0	28 (P)
Pre-requisite	**:**	Nil				
Physical activities, Sports, Yoga, meditation, Indore and outdoor games, etc.						

SEMESTER-II

Course Code: MAVL 203	Applied Science Course: (Y/N)	HM Course: (Y/N)	PC Course: (Y/N)	PE Course: (Y/N)
	Y	N	N	N

Type of Course	Theory Course/ Lab Course
Course Title	**MATHEMATICS- II**
Course Coordinator	
Course Objectives	To provide fundamental knowledge to solve linear and differential equations

Course Outcomes		**Cognitive Levels**
CO1	Understand the mathematics fundamental necessary to formulate, solve engineering problems.	L2
CO2	Apply mathematical tools for the solutions of differential equations that model physical processes.	L3
CO3	Apply mathematical tools for the solutions of complex variable for differentiation.	L3
CO4	Apply mathematical tools for the solutions of complex variable for integration	L3

Semester	**2nd**		**Spring**		
Contact Hours	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total Teaching Hours**
	3	1	0	4	**48**

Prerequisite course codes with course names	
Equivalent course codes as per proposed course and old course	

Text Books		
1.	Title	Engineering Mathematics
	Author	Reena Garg
	Publisher	Khanna Book Publishing Company
	Edition	2022
2.	Title	Advanced Engineering Mathematics
	Author	Reena Garg
	Publisher	Khanna Book Publishing Company
	Edition	2021
Reference Books		
1.	Title	Advanced Engineering Mathematics
	Author	Erwin Kreyszig
	Publisher	John Wiley & Sons
	Edition	10thEdition, 2006

Course Contents	**UNIT I:** Matrices: Linear Systems of Equations; Linear Independence; Rank of a Matrix; Determinant, Inverse of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Orthogonal transformation; Diagonalization of matrices; Cayley-Hamilton Theorem.	**9**
	UNIT II: First order ordinary differential equations: Exact, linear and Bernoulli's equations. Equations not of first degree: equations solvable for p, equations Solvable for y, equations solvable for x and Clairaut's type. Ordinary differential equations of higher orders: Second order linear differential equations with variable coefficients: Euler-Cauchy equations, solution by variation of parameters; Power series solutions: Legendre's equations and Legendre polynomials, Frobenius method, Bessel's equation and Bessel's functions of the first kind and their properties.	**9**
	UNIT III: Complex Variable – Differentiation: Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.	**9**
	UNIT IV: Complex Variable – Integration: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.	**9**
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	

Course Code: PHVB 204	Open Elective Course: (Y/N)	HM Course: (Y/N)	DC Course: (Y/N)	DE Course: (Y/N)
	Y	N	N	N
Type of Course	Theory Course/ Lab Course			
Course Title	**ENGINEERING PHYSICS**			
Course Coordinator				
Course Objectives	To provide fundamental knowledge of classical physics and quantum mechanics			

Course Outcomes		**Cognitive Levels**
CO1	To understand the concepts of Electrostatics in vacuum and dielectric medium.	L2
CO2	Analyze the magneto static in linear magnetic medium.	L4
CO3	Apply the Faraday's law and Maxwell's equation in integral and differential forms.	L3
CO4	To understand the concepts of semiconductor physics.	L2

Semester	**2nd**	**Spring**

Contact Hours	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total Teaching Hours**
	3	0	2	4	**48**

Prerequisite course codes with course names	
Equivalent course codes as per proposed course and old course	

Text Books		
1.	Title	Introduction to Electrodynamics
	Author	D. J. Griffiths
	Publisher	Addison Wesley
	Edition	3rd ed. (1999)
2.	Title	Physics
	Author	Halliday and Resnick
	Publisher	John Wiely
	Edition	6th edition 2006
3.	Title	Principles of Electronic Materials and Devices
	Author	S. O. Kasap
	Publisher	Tata-McGraw Hill
	Edition	4th edition 2017
Reference Books		
1.	Title	Electricity, magnetism and light
	Author	W. Saslow
	Publisher	Academic press
	Edition	2002

Course Contents	**UNIT I:** **Electrostatics in vacuum:** Electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Boundary conditions of electric field and electrostatic potential; Energy of a charge distribution and its expression in terms of electric field. **Electrostatics in a linear dielectric medium:** Electrostatic field and potential of a dipole; Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; Solving simple electrostatics problems in the presence of dielectrics – Point charge at the centre of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field.	**12**
	UNIT II: **Magnetostatics:** Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities. **Magnetostatics in a linear magnetic medium:** Magnetization and associated bound currents; auxiliary magnetic field H; Boundary conditions on B and H. Solving for magnetic field due to simple magnets like a bar magnet; magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in the presence of magnetic materials.	**08**
	UNIT III: **Faraday's law:** Faraday's law in terms of EMF produced by changing magnetic flux; Lenz's law; Differential form of Faraday's law and calculating electric field due to changing magnetic fields in quasi-static approximation; Energy stored in a magnetic field; Magnetic field due to time-dependent electric field and Maxwell's equations: Continuity equation for current densities; Displacement current and magnetic field arising from time-dependent electric field; Calculating magnetic field due to changing electric fields in quasistatic approximation; Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field; Flow of energy and Pointing vector with examples.	**08**
	UNIT IV **Semiconductor physics:** Introduction to semiconductors; Energy bands; Quantum theory and fundamentals of band structure; Fermi-Dirac distribution; Density of states; Doping and intrinsic carrier concentration; Equilibrium carrier concentration; Temperature-dependence of carrier concentration; High doping effects; Carrier scattering and mobility; Introduction to diffusion; Drift-diffusion and trap statistics; basics of semiconductor opto-electronics	**08**

Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%
Tentative List of Experiments-	Experiments on electromagnetic induction and electromagnetic braking LC circuit and LCR circuit Determination of semiconductor bandgap Determination of Planck's constant using LED Basic experiments with PN junction diode, Zener diode, and LED Resonance phenomena in LCR series and parallel circuits Magnetic field from Helmholtz coil Measurement of Lorentz force in a vacuum tube

Course Code: CSVB 204	Allied Engineering Course: (Y/N)	HM Course: (Y/N)	PC Course: (Y/N)	PE Course: (Y/N)
	Y	N	N	N
Type of Course	Theory Course/ Lab Course			
Course Title	**PROBLEM SOLVING AND COMPUTER PROGRAMMING**			
Course Coordinator				
Course Objectives	To give the fundamental knowledge of computer architecture and interaction between the system			

Course Outcomes		**Cognitive Levels**
CO1	Understand computer systems hardware organization and the programmer interface with the goal of improving students' abilities to reason about the execution of their programs,	L2
CO2	Apply to write system software, and enhance the performance of the programs they write.	L3
CO3	Analyze the basis for other systems courses, such Operating Systems, Computer Networks or Computer Systems Organization.	L4
CO4	Build the programming ability by teaching the basic concepts underlying all computer systems.	L6

Semester	**2nd**	**Spring**		
Contact Hours	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total Teaching Hours**
	3	0	2	4	**48**
Prerequisite course codes with course names					
Equivalent course codes as per proposed course and old course					

Text Books		
1.	Title	Computer Systems: A Programmer's Perspective
	Author	Bryant and O'Halloran
	Publisher	Pearson
	Edition	3rd
2.	Title	Advanced Programming in the Unix Environment
	Author	Richard Stevens
	Publisher	Addison-Wesley
	Edition	1992

Reference Books		
1.	Title	Problem Solving & Programming Concepts
	Author	Maureen Sprankle, Jim Hubbard
	Publisher	Pearson
	Edition	9th edition 2011

Course Contents	**UNIT I:** Introduction to evolution of computers, computational Physics, transistors, photolithography, Moore's Law, bits, bytes, and logic, Introduction to CPU, Programming Languages.	**9**
	UNIT II: Program Structure and Execution: Representing and manipulating information: information storage, integer representations, integer Arithmetic and floating points Machine- level representation of programs: A historical perspective, program encodings, data formats, accessing information, arithmetic and logical operations, control flow, procedures, array allocation and access, heterogeneous data structures. Processor Architecture: microarchitecture, X-86-64 Extending IA32 to 64 bits, instruction set architecture, logical design and hardware control language HCL, implementations Program Optimization: Capabilities of operating compilers, expressing program performance, eliminating loop inefficiencies, reducing procedure calls, memory performance Memory Hierarchy: Storage technologies, locality, memory hierarchy, cache memories, impact of caches on program performance.	**9**
	UNIT III: Linking: Compiler Drives, Static linking, object files, relocatable object files, symbols and symbol tables, symbol resolution, relocation, executable object files, loading executable object field, dynamic linking with shared libraries. Exceptional Control flow: Exceptions, process, system call error handling, process control, signals. Virtual memory: Physical and virtual addressing, addressing space, VM as a tool for caching, memory management, address translation, memory mapping, dynamic memory allocation, garbage collection, common memory related bugs.	**9**
	UNIT IV: Interaction and communication between programs: System-level input output: Introduction to operating systems, types, Unix I/O, opening and closing files, reading and writing files, reading file metadata, sharing files, I/O redirection, standard I/O, Networking Programming: Client server programming model, Networks, Global IP Internet, Sockets Interface, Web servers, Concurrency, Distributed Systems. Introduction to AI, Security needs, Management Information System, Cloud and Quantum Computing etc.	**9**
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	

Course Code: MAVL 205	Applied Science Course: (Y/N)	HM Course: (Y/N)	PC Course: (Y/N)	PE Course: (Y/N)
	Y	N	N	N

Type of Course	Theory Course/ Lab Course
Course Title	**PROBABILITY THEORY AND STOCHASTIC PROCESSES**
Course Coordinator	
Course Objectives	To provide the fundamentals and knowledge of random process and random signals for linear time invariant systems

Course Outcomes		**Cognitive Levels**
CO1	Understand representation of random signals	L2
CO2	Examine the characteristics of random processes	L4
CO3	Make use of theorems related to random signals	L3
CO4	To Assess the propagation of random signals in LTI systems.	L5

Semester	**3rd**	**Autumn**		
Contact Hours	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total Teaching Hours**
	3	0	0	3	**48**

Prerequisite course codes with course names	
Equivalent course codes as per proposed course and old course	

Text Books		
1.	Title	Probability and Random Processes with Applications to Signal Processing
	Author	H. Stark and J. Woods
	Publisher	Pearson Education
	Edition	Third Edition
2.	Title	Probability, Random Variables and Stochastic Processes
	Author	A.Papoulis and S. Unnikrishnan Pillai
	Publisher	McGraw Hill
	Edition	Fourth Edition
Reference Books		
1.	Title	Introduction to Probability Theory with Stochastic Processes
	Author	K. L. Chung
	Publisher	Springer International
	Edition	2012

Course Contents	**UNIT I:** Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models.	**9**
	UNIT II: Discrete random variables, probability mass function, probability distribution function, example random variables and distributions; Continuous random variables, probability density function, probability distribution function, example distributions	**9**
	UNIT III: Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds;	**9**
	UNIT IV: Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem. Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density.	**9**
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	

Course Code: ECVL 201	Open Elective Course: (Y/N)	HM Course: (Y/N)	PC Course: (Y/N)	PE Course: (Y/N)
	N	N	Y	N
Type of Course	Theory Course/ Lab Course			
Course Title	**BASICS OF SEMICONDUCTOR MATERIALS**			
Course Coordinator				
Course Objectives	To give fundamental knowledge of electrical circuits and p-n junction devices			

Course Outcomes		**Cognitive Levels**
CO1	To understand the formation and properties of semiconductor crystals.	Understand (Level II)
CO2	To associate the electronic band structure to the properties of semiconductor materials and devices.	Apply (Level III)
CO3	To analyze carrier dynamics and transport in semiconductors	Analyze (Level IV)
CO4	To construct energy band diagrams of semiconductor hetero-structures	Evaluate (Level V)

Semester	2nd	Autumn			
Contact Hours	Lecture	Tutorial	Practical	Credits	Total Teaching Hours
	3	**1**	**0**	**4**	**36**

Prerequisite course codes with course names	Engineering Physics (BSB 102)
Equivalent course codes as per proposed course and old course	

Text Books		
1.	Title	The Materials Science of Semiconductors
	Author	Angus Rockett, University of Illinois, Urbana, IL, USA
	Publisher	Springer Science, Business Media, LLC
	Edition	1st Ed., 2008. [ISBN 978-0-387-25653-5]
2.	Title	Quantum Physics of Semiconductor Materials and Devices
	Author	Debdeep Jena
	Publisher	Oxford University Press, UK.
	Edition	1st Edition, May 2022. [ISBN: 9780198856856]

Reference Books		
1.	Title	Engineering Materials
	Author	Kenneth G. Budinski
	Publisher	Prentice Hall of India, New Delhi
	Edition	9th Edition, March 2009. [ISBN: 0137128428]

Course Contents	**UNIT I**: Physics of Solids: Electronic band structures of solids, Intrinsic and extrinsic semiconductors, Properties and the band structure, Quantum wells and confined carriers in nano structures, Basic quantum mechanics and solid-state physics pertinent to modern (opto)electronic technologies.	**9**

	UNIT II: Overview Of Electronic Devices: energy band in solids, conductors, semiconductors and insulators, types of semiconductors, Intrinsic semiconductors, impurity type semiconductor, diffusion, the Einstein relation, hall effect, thermal conductivity of semiconductors, electrical conductivity of doped materials, pn junction diodes, Schottky barriers and ohmic contacts, Semiconductor heterojunctions, Bipolar junction Transistors, Metal-Oxide-Semiconductor Filed Effect Transistors, Light Emitting Diodes, LASER diodes, Solar Cells, Photodiodes.	**9**
	UNIT III: Aspects of Materials Science: Structures of materials, Crystal lattices, Basic thermodynamics of materials, Linking atomic orbitals to bands, Common semiconductor energy bands, Pressure and temperature dependence, Gunn diodes.	**9**
	UNIT IV: Semiconductor Alloys: Alloy selection, Semiconductor alloy thermodynamics, Band gap bowing, Silicon-germanium alloys, Metastable semiconductor alloys, Applications in Heterojunction bipolar transistors, Group IV semiconductors, Group III-V semiconductors. Defects in semiconductors, Growth Processes: Thin Film growth processes, physical vapour deposition, chemical vapour deposition etc.	**9**
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	

Course Code	**:**	**MPVP 202**				
Course Title	**:**	**Mini Project - I**				
Type of Course	**:**	**Program Core**				
		Lecture	**Tutorial**	**Practical**	**Credits**	**Total Lab Hours**
Contact Hours		0	0	2	1	--
Pre-requisite	**:**	Nil				
Mini project related with the Microelectronics/VLSI/ECE.						