MANIPAL UNIVERSITY JAIPUR

Faculty of Engineering

B.Tech programs (1st Year) starting 2023-2024

Course Structure

CHEMISTRY CYCLE						PHYSICS CYCLE					
Code	Subject Name	L	T	P	C	Code	Subject Name	L	T	P	C
CY1001	Engineering Chemistry	2	1	2	4	PY1001	Engineering Physics	2	1	2	4
MA1001	Calculus & Matrices	2	1	0	3	MA1002	Computational Mathematics	2	1	0	3
EE1002	Electrical & Electronics Systems	3	1	0	4	CY1002	Environmental Studies	2	0	0	2
ME1007	Creativity & Innovation	1	1	0	2	CV1201	Engineering Materials & Mechanics	3	1	0	4
CS1002	Problem Solving Using Computers	2	1	0	3	ME1006	MatLab for Engineers	2	0	0	2
ME1035	Engineering Graphics Lab	0	0	2	1	BI1001	Biology for Engineers	2	0	0	2
LN1001	Technical Writing Clinic 1	1	1	0	1	LA1010	Constitution of India	1	0	0	1
EC1030	Electrical & Electronics Lab	0	0	2	1	MC1030	IoT Fab Lab	0	0	2	1
	Math Bridge for BioTech					DA1001	Universal Human Values	1	0	0	1
CS1031	Problem Solving Using Computers Lab	0	0	2	1						
		12	5	6	20			16	4	2	20
	Total Contact Hours (L+T+P)	23					Total Contact Hours (L+T+P)	22			

-Math Bridge for BioTech is a value Added course (VAC)for students having taken admission in B.Tech in BioTechnology

Course Name: Engineering Chemistry

Course Code: CY1001 [2 1 2 4]

Classification of Fuels, Gross Calorific value and Net Calorific value. Solid, Liquid and Gaseous fuels. Concept of corrosion and its importance, types of corrosion, factors affecting corrosion, Corrosion control methods. Chemistry of primary and secondary batteries. Working principles of fuels cells and their applications. Water treatment technology. Theory and application phase rule (up to two component system). Advanced materials and polymers: ceramics, semiconductors, conducting polymers, composites, bio-materials, nanomaterials, and their properties and applications. Experiential learning on chemistry-Chemical Fuel: Determination of coefficient of viscosity of liquid; Determination cloud and pour point of a given sample of lubricating oil using cloud and pour point apparatus; Determine the water equivalent of bomb calorimeter using benzoic acid as fuel. Corrosion: Redox titrations for electrochemistry Water Treatment: Determination of hardness of water and ion exchange method, pH-metric titration; Conductometric acid base titrations Polymer and advanced material: Synthesis of polymer and advanced materials

References Books:

1. Jain P.C. and Jain M., Engineering Chemistry, Dhanpat Rai and Sons, Delhi, Revised, 15th Edn. 2006.
2. Engineering chemistry, Wiley India Pvt. Ltd., 2018.
3. Kuriacose J.C., Raja R. J., Chemistry in Engineering and Technology, Vol. I/II TMH 1988.
4. Fischer T., Materials Science for Engineering Students, Academic Press, London, 2009.
5. Fuel Science &Technology Hand Book, James G Speight; Marcel Dekker, New York.
6. https://nptel.ac.in/courses/122/101/122101001/#

Course Name: CALCULUS AND MATRICES

Course Code: MA1001 [2 1 0 3]

Differential calculus: Curvatures, Asymptotes; Partial differentiation, total derivatives, Taylor's theorem, maxima and minima, Lagrange's method. Integral Calculus: Double and Triple integrals, Change of the order of integration. Change of variables. Applications of Multiple integrals. Vector Calculus: Differentiation of vectors and their physical meaning. Line and surface integrals. Matrix Algebra: Rank, Inverse of a matrix, and solution of linear simultaneous equations. Eigenvalues and Eigenvectors of a matrix, Cayley-Hamilton theorem.

Reference Books:

1.   E. Kreyszig, Advanced Engineering Mathematics, 9th edition, John Wiley and Sons, Inc., U.K.2011.
2.   R.K. Jain and S.R.K. Iyenger, Advanced Engineering Mathematics, 2nd Edition, Narosa Publishing House. 2005.
3.   M.D. Weir, J. Hass, F.R. Giordano, Thomas' Calculus, 11th Edition, Pearson Education.2008.

Course Name: Electrical & Electronics

Systems

Course Code: EE1002 **[3 1 0 4]**

Overview of Electrical System: Renewable and conventional energy sources, Transmission & Distribution Systems, Electrical Loads- Classification, types & characteristics. Electrical system for residential/industrial installations. DC and AC Circuits and Analysis: Mesh and Nodal analysis methods, Superposition theorem,

Thevenin's theorem, and Maximum power transfer theorem. AC Circuits - Phasor representation, single-phase and 3-phase circuits. Measurement Systems and Instrumentation: Transducer characteristics, strain gauges, accelerometers, displacement sensor, pressure transducers, and temperature sensors. Signal acquisition - A/D converters. Fundamental of Electric Vehicles: Types of EVs, Constructional aspects, Hybrid EV Configurations, EV Battery, and Electric Motors. Semiconductors devices: PN Junction diode - construction, biasing, equation and its I-V characteristics, wave-shaping circuits, BJT: Operation and DC Biasing analysis. Introduction to Operational Amplifier. Digital System Design: Boolean algebra, De Morgan's Theorem, K-map for minimization of Boolean expressions, Adder and Subtractor, Introduction to Encoders, Decoders, Multiplexer, Demultiplexer. Introduction to Modern Electronic Systems: Introduction, block diagram, components, and operation of 5G, Drone Technology, IoT and 3-D Printers.

Reference Books

1. T.K. Nagasarkar and M.S. Sukhija. Basic Electrical Engineering (3e), Oxford University Press, 2017.
2. D.C. Kulsheshtha. Basic Electrical Engineering (2e), McGraw Hill Education India, 2019.
3. D.P. Kothari and I.J. Nagrath, Basic Electrical and Electronics Engineering, McGraw Hill Education India, 2014.
4. D.P. Kothari, K.C. Singal, and R. Ranjan, Renewable Energy Sources and Emerging Technologies (3e), PHI, 2022.
5. H.S. Kalsi, Electronic Instrumentation (4e), McGraw Hill Education India, 2019.
6. R.L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory (10e), Pearson, 2009.
7. R.A. Gayakwad Op-Amps and linear Integrated Circuit (4e), PHI.
8. S. Salivahanan and S. Arivazhagan. Digital circuits and Design (5e), Oxford University Press, 2018.

Course Name: Creativity & Innovation

Course Code: ME1007 [1 1 0 2]

What is creativity? Brain networks associated with creativity. Divergent thinking and innovation; Need of innovation: types of innovation; What type of innovation is needed in india? Innovation in solving problems, data analysis, automation & innovation, idea generation, design thinking, idea convergence and divergence, focused problems, prototype development, implementation of idea. Innovation in Indian and global context; automation, convergence of ideas, Innovation management; importance, difference with creativity, invention and discovery. Case studies in on business ideas on established startups. Economic aspects; venture capital, angel investors, Evaluation of effectiveness of innovation; Legal aspects: IPR. Prototyping; ability to materialize concepts and ideas through modeling and "Rapid prototype", Communicating ideas trough visual maps and three-dimensional representations. Implementation; Controlling and combining multiple variables of a problem, Detecting the key proposals and synthesizing them in a final solution, Creating a system around the solution and developing a value proposition. Lean Canvas features and applications.

Reference Books:

1. *Tom Kelley and David Kelley, Creative Confidence: Unleashing the creative potential within us all, William Collins, 2013*
2. *Vinnie Jauhari & Sudhanshu Bhushan, "Innovation Management" Oxford University Press 2014.*
3. *Pradip N Khandwalla, Lifelong Creativity, An Unending Quest, Tata McGraw Hill, 2004 A.DaleTimpe, Creativity, Jaico Publishing House, 2003.*
4. *P. N. Rastogi, Managing Creativity for Corporate Excellence, Macmillan 2009.*

Course Name: Problem Solving Using Computers

Course Code: CS1002 [2 1 0 3]

Digital computer fundamentals: Algorithms and flowcharts, the von Neumann architecture, programs, assembly language, high level programming languages; Imperative programming (Using C): data types, variables, Storage Classes, enumerated data types, operators, expressions, statements, control structures, functions, arrays and pointers, recursion, records (structures), files, input/output, some standard library functions and some elementary data structures.

Reference Books:

1. E. Balagurusamy, *Programming in ANSI C*, 8th Edition, McGraw Hill Publication, 2019.
2. Y. P. Kanetkar, *Let us C*, 19th Edition, BPB Publication, 2022.
3. B. W. Kernighan, D. M. Ritchie, *The C Programing Language*, 2nd Edition, Prentice Hall of India, 2014.
4. B. Gottfired, *Schaums Outline Series: Programming with C*, 4th Edition, McGraw Hill Publication, 2018.

Course Name: Engineering Graphics Lab

Course Code: ME1035 [0 0 2 1]

Introduction to Engineering Graphics. Principle of Orthographic Projections Projection of Points located in different quadrants. Introduction to AutoCAD, Basic commands for 2D drawing. Projection of line with its inclination to the reference planes. Projections of planes with its inclination to the reference planes, Concept of auxiliary method for projections of the plane. Classification of solids, Projection of solids along with frustum with its inclination to one reference Plane.

Reference Books:

1. *Computer Aided Engineering Drawing, K R Gopala Krishna and Sudheer Gopala Krishna, CBCS, 2015*
2. *Engineering Drawing and Graphics + AutoCAD, Venugopal, New Age International Publisher, 2009*
3. *Engineering Graphics, Basant Aggarwal & CM Aggarawal, McGraw Hill Publication,2018..*
4. *Engineering Graphics with AUTO CAD, DM Kulkarni & AP Rastogi, PHI Learning Private Limited,2010.*
5. *Engineering Graphics with AUTO CAD, TM Jeyapovan, Vikas Publishing House,2015.*

Course Name: Technical Writing Clinic 1

Course Code: LN1001 [0 0 2 1]

Process & Types of Communication: Definition, Features, Modes & Barriers. Non-Verbal Communication: Types, Significance. Listening Skills: Listening, Hearing, Active Listening, Passive Listening. Speaking Skills: Making effective Presentations, Creating Power Point Presentations (PPTs), Presenting in Groups/Individually. Reading Skills: Reading Techniques, Skimming & Scanning, Comprehension & Precis Writing. Writing Skills: Basics of Resume Writing & Professional Social Media Profiling; Letter & Email Writing; Reviewing Research Papers, Blog Writing

Reference Books:

1. *Meenakshi Raman and S. Sharma, Technical Communication: Principles and Practice, (2/e), Oxford University Press, 2013.*
2. *Ronald B. Adler, George Rodman and Athena du Pré, Understanding Human Communication, Oxford University Press, 2020.*
3. *Sanjay Kumar and Pushplata, Communication Skills, Oxford University Press, 2016.*
4. *Sunita Mishra and C. Muralikrishna, Communication Skills for Engineers, Pearson, 2014.*

Course Name: Electrical & Electronics Lab

Course Code: EC1030 **[0 0 2 1]**

Familiarization of different electrical and electronics components and instruments. Electrical System: Residential / industrial installations, understanding different electrical machines using cut-section models, P-V and I-V characteristics of Solar PV system. Measurement Systems: Virtual instrumentation using LABVIEW, real-time data acquisition, voltage measurement, temperature measurement. Electrical Vehicle: basic design of electric vehicle using BLDC motors. Electronic Devices and Circuits: VI characteristics of diode, BJT, and MOSFET. Inverting and non-inverting amplifier using op-amp. Digital Circuits: Verification and/or implementation of various digital circuits. Semiconductor fabrication process and computerized PCB design.

References Books:

1. D.P. Kothari and I.J. Nagrath, Basic Electrical and Electronics Engineering, McGraw Hill Education India, 2014.
2. D.P. Kothari, K.C. Singal, and R. Ranjan, Renewable Energy Sources and Emerging Technologies (3e), PHI, 2022.
3. H.S. Kalsi, Electronic Instrumentation (4e), McGraw Hill Education India, 2019.
4. R.L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory (10e), Pearson, 2009.
5. R.A. Gayakwad Op-Amps and linear Integrated Circuit (4e), PHI.

Course Name: Math Bridge for BioTech

Set, Relation and Functions - Set Theory: Definition and Representation, Types of Sets, Operations on Sets. Relations: Definition, types of Relations. Functions: Definition, Classification, Domain and Range, Types of Functions. Matrices and Determinants: Concept and Definition of Matrix, Types of Matrices, Operations on matrices, Determinant of a matrix, Inverse of a square matrix, Properties of Matrices and Determinants. Differential and Integral Calculus: Differentiability, Derivatives of some elementary functions, product and quotient rules, chain rule, Limits and continuity, Indefinite integral, Definite integral. Differential equations: Introduction to ordinary and partial differential equations. Solutions to first order differential equations, Exact differential equations, integrating factor, and inspection method. Probability: Counting principle, Permutation and Combination, Concept of Probability, Trial and Events, Sample space, Types of events, Classical and Axiomatic definition of Probability, Additive and Multiplicative Law, Conditional Probability. Trigonometry and Vector Algebra - Trigonometry: Angles - Measurements - Degrees - Radians - Quadrants - Trigonometric ratios - Ratios of particular angles, Representation of vectors, types of vectors, operation on vectors, direction ratios and direction cosines.

References Books:

1. Mathematics Textbooks of Class IX, NCERT,2022
2. Mathematics Textbooks of Class XII, NCERT,2022
3. AICTE module for bridge course in Mathematics,2022
4. https://www.aicte-india.org/sites/default/files/final%20maths.pdf

Course Name: Problem Solving Using Computers Lab

Course Code: CS1031 [0 0 2 1]

Digital computer fundamentals: Algorithms and flowcharts, the von Neumann architecture, programs, assembly language, high level programming languages; Imperative programming (Using C): data types, variables, Storage Classes, enumerated data types, operators, expressions, statements, control structures, functions, arrays and

pointers, recursion, records (structures), files, input/output, some standard library functions and some elementary data structures.

Reference Books:

1. E. Balagurusamy, *Programming in ANSI C*, 8th Edition, McGraw Hill Publication, 2019.
2. Y. P. Kanetkar, *Let us C*, 19th Edition, BPB Publication, 2022.
3. B. W. Kernighan, D. M. Ritchie, *The C Programing Language*, 2nd Edition, Prentice Hall of India, 2014.
4. B. Gottfired, *Schaums Outline Series: Programming with C*, 4th Edition, McGraw Hill Publication, 2018.

PHYSICS CYCLE

Course Name: Engineering Physics

Course Code: PY1001 [2 1 2 4]

Double slit interference, coherence, intensity in double slit interference, thin film interference, Newton`s rings, diffraction and wave theory of light, single-slit diffraction, intensity in single-slit diffraction (using phasor method), diffraction at a circular aperture, double-slit interference and diffraction, combined-intensity indouble-slit diffraction (qualitative approach), diffraction of light through multiples slits, diffraction gratings, polarization of electromagnetic waves, polarizing sheets, polarization by reflection, Black body radiation and Planck`s hypothesis, Stefan`s Law, Wein`s displacement law, Photoelectric effect, Compton effect, photons and electromagnetic waves, wave properties of particles, de Broglie hypothesis, Davisson-Germer experiment, quantum particle (wave packet, phase velocity, group velocity), the uncertainty principle. An interpretation of quantum mechanics, wave function and its significance, Schrödinger equation, particle in a box, particle in a well of finite height (qualitative), Tunneling through a potential barrier and its applications, X-ray spectrum, Moseley's law, spontaneous and stimulated transitions, metastable states, population inversion, laser system, Free electron theory, Fermi level, Density of states, Electron in a Periodic potential-Bloch's theorem, Kronig-Penny Model (Qualitative Treatment), origin of Energy Band Formation in Solids, Classification of Materials into Conductors, Semi-Conductors & Insulators, Effective mass of an Electron. Experiments on interference, diffraction (single slit and grating), polarization, ultrasonic waves, quantum physics (photo electric effect, Black body radiation, tunneling in Zener diode) and electronic materials (energy band gap, Hall-effect).

Reference Books:

1. Halliday D., Resnick R., Krane K. S., *Physics* (5e), Wiley, 2016.
2. Beiser A., Mahajan S., Rai Chaudhary S., *Concepts of Modern Physics*, (7e), McGraw Hill Education, 2017.
3. Serway R. A., Jewett J. W., *Physics for Scientists and Engineers with Modern Physics*, Thomson, 2013.

Course Name: Computational Mathematics

Course Code: MA1002 [2 1 0 3]

Numerical Methods: Finite difference and interpolation for equal and unequal intervals, Numerical differentiation and integration. Solution of algebraic and transcendental equations, solutions of ordinary differential equations. Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism of graphs, Euler and Hamiltonian paths, Graph coloring. Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

References Books:

1. Liu and Mohapatra, "Elements of Discrete Mathematics", McGraw Hill,2018
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill,2019
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley, 2020
4. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI Learning Private Limited, Delhi India.
5. Numerical Methods: M.K. Jain, S.R.K. Iyenger and R.K. Jain,2021
6. Sastry S. S., Introductory methods of Numerical analysis, (4e), PHI, 2007.

Course Name: Environmental Studies

Course Code: CY1002 [2 0 0 2]

Meaning, multidisciplinary nature of environmental science, applications in engineering disciplines, environmental ethics, sustainable development, Natural (renewable and non-renewable) resources, Resource consumption, Biodiversity and conservation methods, different types of energy, Conventional sources & Non-Conventional sources of energy, Types and Structure of Ecosystem, Environmental Pollution and control, Disaster Management meaning, natural disasters especially earthquakes & Manmade disasters, Environmental Engineering:- Water demand, Water quality standards, basics of water treatment, Conservation of water, Characteristics of sewage, treatment and disposal, Environmental crisis & legislations, Environmental acts, Laws and Policies, EIA, Case studies of the past related to environmental issues, crisis, disasters, hazard, pollution, climate change & its effects, Practical activity related to environmental problems and its impacts on environment.

Reference Books:

1. Rajagopalan, R., Environmental Studies: From Crisis to Cure, (2e), Oxford University Press, 2016.
2. De, A. K. and De, A. K., Environmental Studies (2e), New Age Publishers, New Delhi, 2009.
3. Bharucha E., Text book of Environmental Studies for undergraduate courses, (4e), Universities Press, Hyderabad, 2013.

Course Name: Engineering Materials & Mechanics

Course Code: CV1201 [3 1 0 4]

Engineering materials: Classification and properties of materials. Engineering properties and testing of materials as per Indian standards: stones (IS:1126), bricks (IS:3495), cement (IS:650), concrete (IS:516), timber (IS:8745), steel (IS:1608), fibres, and polymers. Polymerization and condensation. Engineering properties and uses of PVC, polyethene. Polystyrene - nylon, rayon, and polyesters. Engineering Mechanics: Forces and its resultant, Law of superposition of forces, equilibrium and Degrees of freedom, applications of Varignon's theorem and Lami's theorem. Analysis of truss. Types of beam, support and loading types, Analysis of shear force and bending moment. Centroid and Moment of inertia of plane area, radius of gyration. Simple stress and strain, Hooke's law, Elastic constant and their relationship. Stresses in composite and compound bars. Thermal and Hoop stress. Thermodynamics: Thermodynamics properties, processes, laws of thermodynamics, properties of pure substance, Work & heat, air standard cycles, vapour power cycles.

Reference Books:

1. S.K.Duggal, Building Materials, New Age International Publisher, 2021.
2. S.C. Rangwala, Engineering Materials, Charotar Publication, 2017.
3. M. L. Gambhir and N. Jamwal, *Building Materials Products, Properties and Systems*, McGraw Hill Education, 2017.
4. S. Ramamrutham, *Engineering Mechanics*, Dhanpat Rai Publishing Company (P) Ltd, 2018
5. R. S. Khurmi, *A Textbook of Engineering Mechanics,* S Chand Publication, 2018.
6. S. Timoshenko, D. H. Young, J. V. Rao, *Engineering Mechanics*, McGraw Hill Education, 2017
7. R.C. Hibbeler, *Engineering Mechanics: Principles of Static and Dynamics*, Pearson India, 2017.

Course Name: Matlab for Engineers

Course Code: ME1006 [2 0 0 2]

Introduction to MATLAB environment and commands, Interactive Computation, Matrices and Vectors, Matrix and Array Operations, Character strings, Command- Line Functions, Saving and Loading Data, Programming in MATLAB: Scripts and Functions, Curve Fitting, and Numerical Techniques, Solving Equations (ODE and IDE), Computer Algebra and The Symbolic Math Toolbox, Using MATLAB for Simple engineering problems**.** Engineering Applications: Introduction to MATLAB SIMULINK and examples, MATLAB Toolboxes: Signal Processing Toolbox, Image Processing Toolbox, Statistics and Machine Learning Toolbox, Neural Network Toolbox, Control System Toolbox, Optimization Toolbox.

References Books:

1. Getting Started With MATLAB, Rudra Pratap, Oxford Press.
2. Stephen J. Chapman. MATLAB Programming for Engineers (6e), Cengage Learning, 2020. ISBN: 978- 0-357-03039-4.
3. Bansal R.K., Goel A.K., and Sharma M.K. MATLAB and Its Applications in Engineering (2e). Pearson 2016.
4. MATLAB An Introduction with Applications, Rao V Dukkipati, New Age International Publishers,
5. Gonzalez and Woods. Digital Image Processing Using MATLAB (4e), Pearson, 2018.

Course Name: Biology for Engineers

Course Code: BI1001 [2 0 0 2]

Biomolecules such as Carbohydrates, Nucleic acids, Proteins, Enzymes, and their applications. Human organ system and biodesign: Brain as a CPU system, Eye as a Camera system, Heart as a pump system, Lungs as purification system. Bioinspired materials: Echolocation (sonars), Photosynthesis (photovoltaic cells), bird flying (aircrafts), Lotus leaf effect (self-cleaning surfaces). Human Blood substitutes - hemoglobin-based oxygen carriers. Trends in Bioengineering: Bioprinting techniques and materials, 3D printing of ear, bone and skin, electrical tongue and electrical nose in food science, Bioimaging and Artificial Intelligence for disease diagnosis. Self-healing bio-concrete and bioremediation.

Reference Books:

1. *Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011.*

2. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 202.2
3. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
4. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
5. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
6. Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
7. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
8. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
9. 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
10. Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016

Course Name: Constitution of India

Course Code: LA1010 [1 0 0 1]

Historical Background & Preamble, Constitutional Governance, Constitutionalism and Theory of Statehood, Constitutional Supremacy and Constitution as a Grundnorm, Organs of the State and their Governance (Legislature, Executive and Judiciary), Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Writ Petition and Public Interest Litigation, Landmark Judgements in India.

Reference Books:

1. N.Shukla, Constitution of India. Eastern Book Agency,2014.
2. P.Jain, Indian Constitutional Law, Lexis Nexis,2023.
3. D. Basu, Introduction to the Indian Constitution of India, (20th Ed.2009)
4. M. Seervai, Constitutional Law of India, Universal Law Publishing Co, Reprint 2013.
5. M.Bakshi, The Constitution of India, Universal Law Publishing Co.,2014

Course Name: IoT Fab Lab

Course Code: MC 1030 [0 0 2 1]

Arduino - Introduction to Arduino and its different modules. Basic programming environment of Arduino. Interfacing of different sensors (IR, Ultrasonic and Temperature sensors) and actuators (Motors, LED/LCD, and Buzzer) with Arduino. Mini project using Arduino. Raspberry Pi (RPi)- Introduction, Interfacing different elements with RPi. 3D Printing - Introduction, (Interfacing of 3D Printer with CAD models), Hands on 3D printing.

Reference Books:

1. Simon Monk, 2015. The TAB Book of Arduino Projects, McGraw-Hill Education.
2. Simon Monk., 2016. Programming the Raspberry Pi: getting started with Python. McGraw-Hill Education.
3. Norris, Donald. The internet of things: Do-it-yourself at home projects for arduino, raspberry pi, and BeagleBone black. McGraw-Hill Education, 2015.
4. Scott Fitzgerald and Michael Shiloh, 2012. The Arduino Projects Book, Arduino.
5. France, Anna Kaziunas. Make: 3D printing: The essential guide to 3D printers. Maker Media, Inc., 2013.
6. Cline, L.S., 2017. 3D Printer Projects for Makerspaces. McGraw-Hill Education.

Course Name: Universal Human Values

Course Code: DA1001 [1 0 0 1]

Universal Human Value: Introductions, Sanskars-Educational, Aspirations and Concerns, Self-Management, Health, Trust, Relationships, Harmony, society and nature, Need for a holistic perspective and way of living, Right Understanding (Knowing)- Knower, Known & the Process.

Reference Books:

1. *R R Gaur, R Asthana, G P Bagaria,(2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi,2019*

2. *Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022*