MAHARASHTRA INSTITUTE OF TECHNOLOGY, AURANGABD

**An Autonomous Institute Affiliated to
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad, Maharashtra (India)**

First Year B.Tech. Syllabus (Group-A) 2021-22

			F. Y. B. Tech. Syllabus Structure w.e.f. 2021-22											
			Group A (Agricultural Engineering, Civil Engineering, Mechanical Engineering, Plastic and Polymer Engineering)											
Sr. No	Course Category	Course Code	Course Title	L	T	P	Contact Hr /Wk	Credits	MSE-I	MSE-II	CIE	TA	ESE/ Oral	Total
			Foundation Program/SIP: 3 Week Duration											
1.1	BSC	BSC101	Calculus and Differential Equations	3	-	-	3	3	15	15	10	10	50	100
1.2	HSMC	HSM101	Engineering Exploration	1	-	4	5	3	25	25	10	10	30	100
1.3	ESC	ESC101	C-Programming	3	-	-	3	3	15	15	10	10	50	100
1.4	ESC	ESC102/ ESC103	BME/BCE	3	-	-	3	3	15	15	10	10	50	100
1.5	BSC	BSC102 - BSC104	Open Elective-I	3	-	-	3	3	15	15	10	10	50	100
1.6	ESC	ESC201	Lab-I: C-Programming	-	-	2	2	1	-	-	-	-	25	25
1.7	ESC	ESC202- ESC203	Lab-II: BME/BCE	-	-	2	2	1	-	-	-	-	25	25
1.8	BSC	BSC201 - BSC203	Lab-III: Open Elective-I	-	-	2	2	1	-	-	-	25	-	25
1.9	ESC	ESC204	Lab-IV: Workshop	-	-	2	2	1	-	-	-	25	-	25
1.10	ESC	ESC205	Lab-V: Engineering Graphics	-	-	2	2	1	-	-	-	-	25	25
1.11	HSMC	HSM201	Lab-VI: Communication Skills	-	-	2	2	1	-	-	-	25	-	25
1.12	ESC	ESC206	Environmental Studies	-	-	2	2	Non-Credit Mandatory Course						
S1				13	0	18	31	21	85	85	50	125	305	650
Sr. No	Course Category	Course Code	Course Title	L	T	P	Contact Hr /Wk	Credits	MSE-I	MSE-II	CIE	TA	ESE/ Oral	Total
2.1	BSC	BSC151	Statistics and Integral Calculus	3	1	-	4	4	15	15	10	10	50	100
2.2	ESC	ESC151	Python Programming	3	-	-	3	3	15	15	10	10	50	100
2.3	ESC	ESC152	Engineering Mechanics	3	-	-	3	3	15	15	10	10	50	100
2.4	ESC	ESC153	Electrical and Electronics Engineering	3	-	-	3	3	15	15	10	10	50	100
2.5	BSC	BSC102 - BSC104	Open Elective-II	3	-	-	3	3	15	15	10	10	50	100
2.6	ESC	ESC251	Lab-I: Python Programming	-	-	2	2	1	-	-	-	-	25	25
2.7	ESC	ESC252	Lab-II: Engineering Mechanics	-	-	2	2	1	-	-	-	25	-	25
2.8	ESC	ESC253	Lab-III: Electrical and Electronics Engineering	-	-	2	2	1	-	-	-	25	25	50
2.9	BSC	BSC201 - BSC203	Lab-IV: Open Elective-II	-	-	2	2	1	-	-	-	25	-	25
2.10	HSMC	HSM251	Lab-V: Cognitive Aptitude	-	-	2	2	1	-	-	-	25	-	25
2.11	HSMC	HSM252/ HSM253	Language Proficiency- German Language/ Japanese	-	-	2	2	Non-Credit Mandatory Course						
S2				15	1	12	28	21	75	75	50	150	300	650

Open Elective-I/II

		ESC102	Basics of Mechanical Engineering
BSC102	Engineering Physics		(Compulsory for ME, PPE and AE)
BSC103	Engineering Chemistry	ESC103	Basics of Civil Engineering (Compulsory for CE)
BSC104	Biology for Engineers		
BSC201	Lab-III/IV: Engineering Physics	ESC202	Lab-II: Basics of Mechanical Engineering
BSC202	Lab-III/IV: Engineering Chemistry	ESC203	Lab-II: Basics of Civil Engineering
BSC203	Lab-III/IV: Biology for Engineers		

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<table>
<tr><td colspan="2" align="center">Faculty of Science & Technology
Syllabus of F. Y. B.Tech. All Branches (Semester I)</td></tr>
<tr>
<td>Course Code: BSC101
Course: Calculus and Differential Equations
Teaching Scheme:
Theory: 03 Hrs/week</td>
<td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Continuous Internal Evaluation: 10 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 50 Marks
End Semester Examination (Duration): 2 Hrs</td>
</tr>
<tr>
<td>Prerequisite</td>
<td>Students required the knowledge of all basic concepts related to calculus and differential equations.</td>
</tr>
<tr>
<td>Objectives</td>
<td>1. To develop skills and create interest to use mathematics in Engineering & technology
2. To know how the real word problems governed by the first order differential equations and calculus.
3. To understand the importance of differential calculus and differential equations in Engineering & technology.
4. To learn formation and solving various types of differential equations.</td>
</tr>
<tr>
<td>Unit-I</td>
<td>Differential Calculus: n^{th} Derivative of Standard functions, Leibnitz's Theorem, Taylor's Series, Maclaurin's Series, Indeterminate Forms: L' Hospital's Rule (Without Proof), Evaluation of Limits. (6 Hrs)</td>
</tr>
<tr>
<td>Unit-II</td>
<td>Infinite Series: Sequences, Introduction to Infinite Series, Convergence and Divergence of Infinite Series: p-Series Test, Comparison Test, D' Alembert's Ratio Test, Cauchy's N^{th} Root Test. (6 Hrs)</td>
</tr>
<tr>
<td>Unit-III</td>
<td>Differential Equations: Solution of First Order and First Degree Differential Equation: Exact, Linear and Bernoulli's Equation (Reducible to Linear) (6 Hrs)</td>
</tr>
<tr>
<td>Unit-IV</td>
<td>Application Of Differential Equations: Application of First Order and First-Degree Differential Equations: Electrical Circuit, Mechanics and Orthogonal Trajectories. (6 Hrs)</td>
</tr>
<tr>
<td>Unit-V</td>
<td>Partial Differentiation: Partial Derivatives - Introduction, Homogeneous Functions of Two Variables - Euler's Theorem, Implicit Functions, Total</td>
</tr>
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		Derivative, Change of Variables. (7 Hrs)			
Unit-VI		**Applications of Partial Differentiation**: Maxima and Minima of Functions of Two Variables, Jacobians and Its Properties. (5 Hrs)			
Textbooks / Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1.	Advanced Engineering Mathematics	Louis C. Barrett, Ray Wylie C	McGraw-Hill Publishing Company Ltd, New Delhi, 2003.	6th Edition
	2.	Engineering Mathematics-Volume I	Venkatraman. M.K	National publishing company, Chennai, 2008.	4th edition
	3.	Higher Engineering Mathematics	Dr. Grewal. B.S.	Khanna Publications, New Delhi, 2007.	40th Edition
	4.	Advanced Engineering Mathematics	H. K. Dass.	S. Chand And Co. Ltd	18th Edition
	5.	Advanced Engineering Mathematics	Erwin Kreyszig	Willey Eastern Ltd. Mumbai	10th Edition
	6.	Advanced Engineering Mathematics	M. D. Greenberg	Pearson Publication	2nd Edition
	7.	A Textbook of Engineering Mathematics	Peter O'Neil	Thomson Asia Pvt. Ltd., Singapore	7th Edition

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Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester I)	
Course Code: HSM101	Credits: 1-0-2
Course: Engineering Exploration	Mid Semester Examination-I: 25 Marks
Teaching Scheme:	Mid Semester Examination-II: 25 Marks
Theory: 01 Hr/week	Teacher Assessment: 10 Marks
Practical: 04 Hrs/week	Continuous Internal Evaluation: 10 Marks
	End Semester Examination: 30 Marks
	End Semester Examination (Duration): 2 Hrs
Objectives	1. To make student understand the role of an Engineer as a problem solver. 2. To enable students to build simple systems using engineering design process. 3. To introduce ethical, sustainability perspectives. 4. To get students familiar with engineering project management skills. 5. To make students explore different aspects of engineering.
Unit-I	**Engineering and multidisciplinary applications** Difference between school and engineering study, difference between science and engineering, introduction to industrial revolutions, their key characteristics, related case studies evolution and need of multidisciplinary engineering, job roles, skill set of engineers, engineer and society, challenges towards 21st century (4 Hrs)
Unit-II	**Project Management** Project, key elements of project, Project management strategies, Introduction to Agile practices, SCRUM framework, Significance of team work, Project management tools: Checklist, Timeline, Gantt Chart, project libre (6 Hrs)
Unit-III	**Engineering Design** Engineering Design Process, problem formulation from need, conceptual design, product architecture, relevant tools for engineering design steps: pairwise comparison chart, morphological chart, Pugh chart, selection criteria for components, Motor and battery sizing concepts (15 Hrs)
Unit-IV	**Mechanisms**

	Basic Components of a Mechanism, structure, Degrees of Freedom or Mobility of a Mechanism,4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism, Simple Robotic Arm building, introduction to linkage (10 Hrs)
Unit-V	**Platform Based Development** Arduino platform, electronic component overview, different variants of Arduino, Development Environment of Arduino, developing logic for program, creation of flow charts, mblock coding, creating sketches, interfacing different I/O with Arduino, developing mechatronics system (15 Hrs)
Unit-VI	**Documentation and software tools** Importance of communication in engineering profession, Significance of documentation, introduction to report writing and presentation: types of presentation, presentation making using software tools (10 Hrs)

	Sr. No.	Title	Author	Publication	Edition
Textbooks/ Reference Books	1.	Engineering Design: A Project Based Introduction	C.L. Dym, P. Little	Wiley Publication	4th Edition
	2.	Project Design & Development	Karl Ulrich	McGraw Hill Publication	5th Edition
	3.	Theory of Machines	S. S. Rattan	McGraw Hill Publication	4th Edition
	4.	Getting Started with Arduino	Massimo Banzi	O'Reilly	1st Edition
	5.	Project Management Methodologies and Framework	-	Active.collab	1st Edition
	6.	Manuals and datasheets of respective software and hardware tools			

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester I)	
Course Code: ESC101	Credits: 3-0-0
Course: C-Programming	Mid Semester Examination-I: 15 Marks
Teaching Scheme:	Mid Semester Examination-II: 15 Marks
Theory: 03 Hrs/week	Continuous Internal Evaluation: 10 Marks
	Teacher Assessment: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration): 2 Hrs

Objectives	**Course Objectives:** 1. To introduce students to the basic knowledge of programming fundamentals of C language. 2. To impart writing skill of C programming to the students and solving problems. 3. To impart the concepts like decision control structures, looping, array, functions, pointers, structure.
Unit-I	**Programming Languages:** Introduction to programming language, Types of programming language- Machine language, Assembly Language, High Level Language, compiler, assembler, interpreter, loader, linker, editor. **Introduction to C:** C Character set, Constants, Variables, Keywords and Operators, Basic data types, Type conversion, Instructions, Algorithm, Flow Chart, C program structure, Simple C program. (6 Hrs)
Unit-II	**The Decision control structures:** If, if-else, nested if statements, Logical operators, conditional operator, relational operator. (6 Hrs)
Unit-III	**Looping Control Structures:** While, for and do-while, Break and continue statements, Switch -case statement. (6 Hrs)
Unit-IV	**Arrays**: Array declaration, Initialization, One dimensional and Two dimensional arrays, Matrix operations. **Strings**: Introduction, Standard Library Functions - strlen(), strcpy(), strcat(), strcmp(), strrev(), etc. (6 Hrs)

Unit-V	**Functions** Introduction to function, Uses of functions, Function declaration and definition, Scope rule of functions, Call by value, Recursion. **Pointers:** Introduction to pointers, Pointer notation, Call by Reference, Passing an array and array elements to a function. (6 Hrs)				
Unit-VI	**Structures:** Introduction to Structure, Uses of Structures, Declaring a Structure, Accessing structure elements, Array of structures. (6 Hrs)				
Textbooks/ Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1.	Introduction to computers	Peter Norton	Tata McGraw Hill	4th Edition
	2.	Let us C	Yeshwanth Kanetkar	BPB	8th Edition
	3.	The C Programming language	Kernighan B.W and Ritchie D.M	Pearson Education	2nd Edition
	4.	Programming with C	Byron S Gottfried	Tata McGraw-Hill, Schaum's Outlines	2nd Edition
	5.	Programming in C	E. Balagurusamy	Tata McGraw Hill	4th Edition

	Faculty of Science & Technology
	Syllabus of F. Y. B.Tech. Non-Circuit Branches (Semester I)

Course Code: ESC102	Credits: 3-0-0
Course: Basics of Mechanical Engineering	Mid Semester Examination-I: 15 Marks
Teaching Scheme:	Mid Semester Examination-II: 15 Marks
Theory: 03 Hrs/week	Continuous Internal Evaluation: 10 Marks
	Teacher Assessment: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration): 2 Hrs

Prerequisite	1. To understand fundamental concepts of thermal engineering
	2. To study engineering applications of thermal engineering
	3. To understand working principle of machine tools
	4. To understand the functions of various power transmitting elements

Objectives	1. To study the fundamental principles and laws of heat transfer and to explore the implications of these principles for system behavior.
	2. To study, analyse and design heat transfer systems through the application of these principles.
	3. To develop the problem-solving skills essential to good engineering practice of heat transfer in real-world applications.

Unit I	Scope & applications of thermodynamics, Macroscopic and microscopic description of matter, Pure and working substance, Thermodynamic system and its types, Thermodynamic state of the system, Thermodynamic properties, Thermodynamic processes and its types, Thermodynamic equilibrium, Zeroth law of thermodynamics Temperature and its measurement , Pressure and its measurement, Numerical on pressure measurement and temperature measurement. (4 Hrs)
Unit II	Introduction to forms of energy and non-conventional energy sources, Thermodynamic definition of work, types of work, quasi static process**,** P.dV work for different processes, Definition of heat, specific heat, Modes of heat transfer, Laws governing the modes of heat transfer, Comparison between heat & work, Statement of First law of thermodynamics for open and closed

	systems, Numerical on types of work and modes of heat transfer (8 Hrs)
Unit III	Classification of boiler, Boiler mountings and accessories (location, and applications only), Construction and Working and of 2 stroke and 4 stroke engines, Refrigerator, Air conditioner and air cooler, Basic working principle of Steam Turbine and Compressor (6 Hrs)
Unit IV	Engineering Materials (Introduction, Classification, Properties, Selection, and application only), Basic heat treatment Processes (Introduction to Annealing, Normalizing and Hardening only), Metal Forming and Metal Joining Processes (Introduction and Brief description of types only) (6 Hrs)
Unit V	Machine Tools: - Lathe Machine Milling Machine, Drilling Machine, Shaper Machine, Grinding Machine (All machine tools to be studied with respect to Working principle, Block diagram, Specification and Different operations performed), Introduction to NC/CNC machines) (6 Hrs)
Unit VI	Power Transmission Elements: - Belt, Pulleys, Gears, Bearings, Keys and Coupling: Clutches (All power transmission elements to be studied with respect to brief description of their types only) (6 Hrs)

Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Fundamentals of Classical Thermodynamics	P. K. Nag	Tata Mc Graw Hill	8th Edition
	2.	Thermodynamics An Engineering Approach	Y. Cengel & M Boles	McGraw Hill	5th Edition
	3.	Thermal Engineering	R.K. Rajput	Laxmi Publications	10th Edition
	4.	Engineering Thermodynamics (Principle and Practices)	D.S. Kumar	Katsons Publications	2nd Edition
	5.	Workshop Technology	Hajra Choudhary	Media Promotors	4th Edition

	6.	Manufacturing Science	Amitabha Ghosh & Malik	East West Press	2nd Edition
	7.	Manufacturing Technology	P. N. Rao	Tata Mc Graw Hill	4th Edition
	8.	Comprehensive Workshop Technology	S.K. Garg	Laxmi Publications	3rd Edition

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. Non-Circuit Branches (Semester I)	
Course Code: ESC103	Credits: 3-0-0
Course: Basics of Civil Engineering	Mid Semester Examination-I: 15 Marks
Teaching Scheme:	Mid Semester Examination-II: 15 Marks
Theory: 03 Hrs/week	Continuous Internal Evaluation: 10 Marks
	Teacher Assessment: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration): 2 Hrs
Prerequisite	Introduction to basic terminologies involved in general science.
Objectives	1. To get knowledge of various building materials and structural members. 2. To create awareness and knowledge in students about basic civil engineering terminologies and techniques which will be helpful in their day to day life 3. To understand concept of surveying and leveling.
Unit-I	**Civil Engineering Materials:** Study of properties and use of civil engineering materials namely bricks, rubble, cement, sand, coarse aggregate, etc. (6 Hrs)
Unit-II	**Foundation:** Introduction to foundation and types, isolated footing, combined footing, cantilever footing, Pile foundation - types. (6 Hrs)
Unit-III	**Masonry:** Introduction to brick masonry and bonds in brick, header bond, stretcher bond, English and Flemish bond. (6 Hrs)
Unit-IV	**Lintels, Doors and Window:** Types of lintels, definition of technical terms of doors and windows, study of battened, ledged and braced doors casement windows, glazed window, and metal windows. (6 Hrs)
Unit-V	**Roofs and Floors:** Trussed roofs, king post roof truss and queen post roof truss, flat RCC roof, components of floor, material for construction of floor. (6 Hrs)

Unit-VI	**Surveying and Leveling:** i) Surveying: Length measurement, use of metallic tape and chain (20 m & 30 m). ii) Angular Measurements: Use of prismatic compass, simple problems. iii) Level measurements: Use of dumpy level, simple problems on calculation of reduced levels. (6 Hrs)

	Sr. No.	Title	Author	Publication	Edition
Textbooks/ Reference Books	1.	Building Materials	S.K. Duggal	New Age International Publishers	5th Edition
	2.	Building Construction	B.C. Punmia	Laxmi Publication	11th Edition
	3.	Surveying And Levelling	N.N. Basak	McGraw Hill Education India	16th Edition
	4.	A Text Book of Surveying & Levelling	R. Agor	Khanna Publishers	5th Edition

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester I)	

Course Code: BSC102	Credits: 3-0-0
Course: Open Elective-I: Engineering Physics	Mid Semester Examination-I: 15 Marks
	Mid Semester Examination-II: 15 Marks
Teaching Scheme: Theory: 03 Hrs/week	Continuous Internal Evaluation: 10 Marks
	Teacher Assessment: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration):2 Hrs

Objectives	1. To let the engineering undergraduates study physical properties, concepts and physical quantities required for the solution of complex engineering problems 2. To make the engineering undergraduates learn basic principles of Physics and laws of scientific investigation to identify, formulate and analyse complex engineering problems 3. To equip engineering undergraduates with competencies of scientific methods required in engineering career by upgrading skills on the basis of learning achieved from physical science perspectives. 4. To engage engineering undergraduates extensively in scientific investigation for interdisciplinary graduate programs and a wide variety of other lifelong learning opportunities.
Unit-I	**Optics** The wave equation, Introduction to electromagnetic waves and electromagnetic spectrum, Newton's ring, Michelson interferometer, Applications of interference Diffraction of light, diffraction grating, resolving power of grating, Application of diffraction grating in spectroscopic devices. Polarization, Nicol prism, Laurent's half shade polarimeter, applications of polarization. (6 Hrs)
Unit-II	**Acoustics** Acoustic terminology and definitions, Acoustic Wave Equation and its Basic

	Physical Measures, Sabine's formula (derivation not necessary) acoustics factor in architectural design. **Ultrasonics** Properties, Production of ultrasonic waves by piezo-electric and magnetostriction generator, engineering applications of ultrasonic waves. (6 Hrs)
Unit-III	**Crystal Structure** Crystalline and amorphous material, lattice and unit cell, Miller indices, SC, BCC, FCC, diamond structure, NaCl structure, imperfections and defects in solids **X-Rays** Basics of X-Rays, Production and Detection of X-Rays, Continuous and characteristics spectrum, Bragg's law of X-ray diffraction, Bragg's spectrometer, Intensity of diffracted Beams, Particle Size Determination by XRD, Precise Lattice Parameter Determination (6 Hrs)
Unit-IV	**Nuclear Physics** Nuclear force, liquid drop model, shell model, Nuclear fission and fusion, Q-value of nuclear reaction, nuclear reactor, P-P cycle, C-N cycle, cyclotron, GM counter, applications of nuclear physics in various fields. **Modern Physics** Black body radiation, Planck's law, Photoelectric effect, Wave particle duality, De- Broglie's concept of matter wave, Davisson-Germer experiment, Scanning tunneling microscope, Time-dependent and time-independent Schrodinger equation for wave function, Quantum computing. (6 Hrs)
Unit-V	**Introduction to solids** Superconductivity: Superconductivity, effect of temperature and magnetic fields, Meissner effect, type I and II superconductors, BCS theory, Applications. Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic

		potential, Kronig-Penney model and origin of energy bands
		Magnetic Materials: Magnetic susceptibility and diamagnetic materials, paramagnetic, ferromagnetic, and, BH characteristics, applications.
		Nanomaterials and Nanotechnology: Properties of nanomaterials, 0 D, 1 D, 2 D and 3 D nanoparticle, various carbon allotropes, historical instances and day to day examples, Introduction to nanotechnology and applications in various engineering fields.
		(6 Hrs)
Unit-VI		**Laser** Einstein's theory of matter radiation interaction and A and B coefficients, Properties of laser, spontaneous and stimulated emission, ruby laser, He-Ne laser, CO_2 laser and semiconductor Laser, applications of lasers in science, engineering and medicine. **Fiber Technology** Propagation of light through optical fiber, acceptance angle and cone numerical aperture, Single and Multi-Mode Fibers, applications, sensors. (6 Hrs)

Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	A Text book of Engineering Physics	M. N. Avadhanulu P. G. Kshirsagar	S. Chand & Co.	7th Edition
	2.	A Text book of Engineering Physics	R. K. Gaur S. L. Gupta	Dhanpat Rai	3rd Edition
	3.	Fundamentals of Physics	David Halliday, Jearl Walker, and Robert Resnick	Wiley	6th Edition

	4.	Elements of X-ray Diffraction	B. D. Cullity	Addison-Wesley Metallurgy Series	1st Edition
	5.	Nuclear Physics	Irving Kaplan	Narosa Publishing house	2nd Edition
	6.	Introduction to Solid State Physics	C. Kittel	John Wiley & Sons, Inc	8th Edition
	7.	Lasers and Non-Linear Optics	B.B. Laud	New Age International	3rd Edition
Websites and online courses	1.	http://science.howstuffworks.com/laser1.htm			
	2.	http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html			
	3.	http://nptel.ac.in/courses/122107035/			
	4.	http://nptel.ac.in/courses/122104016/			
	5.	https://www.coursera.org/learn/intro-to-acoustics			
	6.	https://nptel.ac.in/courses/112/106/112106227/			
	7.	https://nptel.ac.in/courses/113/104/113104081/			
	8.	https://nptel.ac.in/courses/115/102/115102017/			

Faculty of Science & Technology	
Syllabus of F. Y. B. Tech. All Branches (Semester I)	
Course Code: BSC103 Course: Open Elective-I: Engineering Chemistry Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):2 Hrs
Objectives	1. To relate the concepts of Chemistry in all Engineering Disciplines. 2. To make the engineering undergraduates acquainted with modern techniques in engineering and industrial Chemistry. 3. To equip engineering undergraduates with the knowledge of advanced and existing Engineering Materials. 4. To develop the awareness about powering the future using advanced energy Storage Systems.
Unit-I	**Advanced Engineering Materials** **Industrial Polymers**: Thermoplastics (PVC) & Thermosetting polymers (Bakelite), Biodegradable polymers (PVa), Properties, Applications **Nanomaterials**: Preparation of nano materials by Laser method, properties and applications of CNTs. **Composite Materials**: Ceramic matrix composites, carbon- carbon composites **Reinforcements**: Silicon carbide, Fiber glass. (6 Hrs)
Unit-II	**Water Technology:** Water Parameters: Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), pH, Hardness of water: types and units, Estimation of hardness by EDTA method, numerical on hardness; Boiler troubles: scale, sludge, priming, foaming and caustic embrittlement; Water treatment: Ion exchange process, Ultra filtration, Nano filtration (6 Hrs)
Unit-III	**Fuels and Energy Storage Systems:** Fuels: Gross and net calorific value, Solid fuels: proximate analysis of coal &

	importance, gaseous fuels: composition properties and application of natural gases- CNG, LNG. Energy Storage Systems: Bio electrochemical batteries, lithium-ion battery, alkaline fuel cell (AFC) (6 Hrs)
Unit-IV	**Lubricants and Coolants** Lubricants: Introduction, Properties of liquid lubricants: viscosity and viscosity index, flash point and fire point, acid value. Numerical on viscosity index. Coolants: Introduction, properties and uses of water and ethylene glycol as coolant. (6 Hrs)
Unit-V	**Corrosion and its prevention** Definition, types, mechanism of dry and wet corrosion, Corrosion testing methods: ultrasonic testing, computed digital radiography, Prevention of corrosion: Methods- sacrificial anodic protection, Electroplating, Powder coating (6 Hrs)
Unit-VI	**Metallurgical processes** Calcination, smelting, ore dressing, roasting, refining of metals, Metalworking processes: casting, forging, rolling, machining, sintering, Laser cladding, 3D printing (6 Hrs)

Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Engineering Chemistry	B. Siva Shankar	Mc Graw Hills Publications	3rd Edition
	2.	Engineering Chemistry	Shelly, Oberi and Malik	Cingage Publication	1st Edition
	3.	Principles of Polymerization	Odian, G.G	John Wiley & Sons, Inc	4th Edition
	4.	Engineering Chemistry	Jain & Jain	Dhanpat Rai Publishing	16th Edition
	5.	Polymer Chemistry	Malcolm P. Stevens	Oxford University Press	3rd Edition

	6.	A Textbook of Engineering Chemistry	Shashi Chawla	Dhanpat Rai & CO	10th Edition
	7.	Material Science & Engineering	William Callister and V. Raghavan	Wiley	9th Edition
Websites and online courses	1.	Unit- I – https://onlinecourses.nptel.ac.in/noc21_ch49/preview https://www.explainthatstuff.com/composites.html			
	2.	Unit- II – https://nptel.ac.in/content/storage2/courses/116104045/lecture8.pdf https://nptel.ac.in/content/storage2/courses/116104045/lecture6.pdf			
	3.	Unit- III – https://nptel.ac.in/content/storage2/courses/121106014/Week12/lecture38.pdf https://www.sciencedirect.com/topics/engineering/proximate-analysis			
	4.	Unit- IV – https://nptel.ac.in/courses/112/102/112102014/ https://nptel.ac.in/content/storage2/courses/112105127/pdf/LM-12.pdf			
	5.	Unit- V - https://nptel.ac.in/courses/113/108/113108051/			
	6.	Unit- VI -https://nptel.ac.in/courses/112/107/112107144/			

Faculty of Science & Technology
Syllabus of F. Y. B. Tech. All Branches (Semester I)

Course Code: BSC104	Credits: 3-0-0
Course: Open Elective-I: Biology for Engineers	Mid Semester Examination-I: 15 Marks
	Mid Semester Examination-II: 15 Marks
Teaching Scheme: Theory: 03 Hrs/week	Continuous Internal Evaluation: 10 Marks
	Teacher Assessment: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration):2 Hrs

Objectives	To introduce students to modem biology with an emphasis on evolution of biology as a multi-disciplinary field, to make them aware of application of engineering principles in biology, and engineering robust solutions inspired by biological examples.
Unit-I	Introduction to Molecular Biology, Central Dogma of life, DNA replication, Translation and transcription, Introduction to Genetics, Phylogenetic analysis, Introduction to developmental biology, structure and functions of cell. (8 Hrs)
Unit-II	Introduction to immunology, components of the immune system, antigens and antibodies, B-cells and T- cells development, proliferation and differentiation, MHC Restriction, Complement system. (6 Hrs)
Unit-III	Infectious diseases, TB, HIV, Flue, COVID-19, response of host to infectious diseases. Vaccines, cancer biology. (4 Hrs)
Unit-IV	Introduction to bioinformatics, tools of bioinformatics, primary and secondary data bases, sequence alignments, methods of structure prediction of proteins, homology modeling (6 Hrs)
Unit-V	Introduction to Analytical Instrumentation, Electrophoresis techniques, Chromatography types and techniques, Isoelectric focusing, PCR and ELISA (6 Hrs)
Unit-VI	Environmental biosafety, bioresources, biodiversity, bioreactors, ethical aspects of plant and animal biotechnology, Engineering designs inspired by examples in biology, Engineering aspects of some Nobel Prizes in Physiology and Medicine & Chemistry / recent advances in Biology (6 Hrs)

Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Essentials of Genetics.	Miko, I. & Lejeune, L., eds.	Cambridge, MA: NPG Education	2009
	2.	Essentials of Cell Biology	O'Connor, C. M. & Adams, J. U.	Cambridge, MA: NPG Education	2010
	3.	Molecular Biology of the Gene	Warson JD, Baker, TA, Bell SP, Gann A, Levin M, Losick R,	Pearson Education	2004
	4.	The Greatest Show on Earth: The Evidence For Evolution	Dawkins, R	Bantam Press, Transworld Publishers	2009
	5.	The Blind Watchmaker	Dawkins, R	W. W. Norton & Co	1996
	6.	The Double Helix: A Personal Account of the Discovery of the Structure of DNA	Watson, J. D.	Simon & Schuster Inc.	2011

	Faculty of Science & Technology	
	Syllabus of F. Y. B.Tech. All Branches (Semester I)	
Course Code: ESC201		Credits: 0-0-1
Course: Lab-I: C-Programming		End Semester Examination/Oral: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week		
Objectives	1. Understand the syntax and construction of C code. 2. Know the steps involved in compiling, linking and debugging C code. 3. Understand how to use header files, library functions, user defined functions. 4. To impart the use of different data-structures like arrays, pointers, structures and files.	

List of Practical	1. If the marks obtained by a student in five different subjects are input through the keyboard, find out the aggregate marks and percentage marks obtained by the student. Assume that the maximum marks that can be obtained by a student in each subject is 100.
	
	2. If the ages of Ram, Shyam and Ajay are input through the keyboard, write a program to determine the youngest of the three.
	
	3. Any year is entered through the keyboard. Write a program to determine whether the year is leap or not using the logical operators.
	
	4. Write a program to print the multiplication table of the number entered by the user. The table should get displayed in the following form.
	5* 1 =5
	5 *2 = 10
	….
	
	5. Write a menu driven program which has the following options:
	   i) Addition of two integers
	   ii) Subtraction
	   iii)Multiplication
	   iv)Exit
	Make use of switch statement.
	6. Write a function power (a, b), to calculate the value of a raised to b.	

	7. Twenty-five numbers are entered from the keyboard into an array. The number to be searched is entered through the keyboard by the user. Write a program to find if the number to be searched is present in the array and if it is present, display the number of times it appears in the array.
	8. Write a program to demonstrate the following string handling functions strlen(), strcpy(), strcmp(), strcat(), strrev().
	9. Write a program to swap two numbers using call by reference method.
	10.Create a structure to specify data of customers in a bank. The data to be stored is: Account number, Name, Balance in account. Assume maximum of 200 customers in the bank. Write a function to print the Account number and name of each customer with balance below Rs. 100.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. Non-Circuit Branches (Semester I)	
Course Code: ESC202	Credits: 0-0-1
Course: Lab-II: Basic Mechanical Engineering	End Semester Examination/Oral: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	

List of Practical	**Any 10 practical to be conducted**
	1. Study and demonstration of low-pressure boiler (anyone)
	2. Study and demonstration of high-pressure boiler (anyone)
	3. Study and demonstration of 2 stroke and 4 stroke petrol engine
	4. Study and demonstration of 2 stroke and 4 stroke diesel engine
	5. Study and demonstration of domestic refrigerator
	6. Study and demonstration of window type air conditioner
	7. Study and demonstration of Lathe machine
	8. Study and demonstration of Milling machine
	9. Study and demonstration of Shaper machine
	10. Study and demonstration of Radial Drilling machine
	11. Assignment on Unit I, II, IV and VI (O*ne assignment on each of these units comprising theoretical concepts and numerical. Application of Excel / MATLAB for numerical examples.*) / Presentation on technical case studies
	12. Two MCQ Tests of 15 marks each based on course contents related to GATE Examination.
	Assessment will be based on:-
	1. Attendance
	2. Assignments
	3. MCQ Test/Presentation on technical case studies
	4. Viva-voce

The assessment of term work shall be done on the basis of the following.

- Continuous assessment

- Performing the experiments in the laboratory

- Oral examination conducted on the syllabus and term work mentioned above.

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Faculty of Science & Technology		
Syllabus of F. Y. B.Tech. Non-Circuit Branches (Semester I)		
Course Code: ESC203		Credits: 0-0-1
Course: Lab-II: Basics of Civil Engineering		End Semester Examination/Oral: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week		
Objectives	1. To learn basics of civil engineering will help the engineers to deal with the facts and applications to the real-life problems.	
List of Practical	1. To observe civil engineering materials in lab such as bricks, rubble, cement, sand, coarse aggregate, etc. 2. To study and write about foundation and its types, isolated footing, combined footing, cantilever footing and pile foundation. 3. To observe and study brick masonry and bonds in brick such as header bond, stretcher bond, English and Flemish bond. 4. To observe structural components such as lintels, definition of technical terms of doors and windows, study of battened, ledged and braced doors casement windows, glazed window, and metal windows. 5. To observe and study trussed roof, king post roof truss and queen post roof truss, flat RCC roof, components of floor, material for construction of floor. 6. To observe and study various surveying instruments.	

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester I)	
Course Code: BSC201	Credits: 0-0-1
Course: Lab-III Open Elective-I: Engineering Physics	Teacher Assessment: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	

List of Practical	**Any 10 practical to be conducted** 1. Newton's ring: To determine wavelength of monochromatic light 2. G. M. Counter: dead time calculation 3. Grating: To determine wavelength of LASER light. 4. Polarimeter: To determine concentration of solution. 5. Reverberation time: To determine Reverberation time of a hall. 6. Characteristics of solar cell 7. Ultrasonic interferometer 8. Zener diode: To study characteristics of zener diode & to determine zener voltage. 9. Dielectric constant: to determine dielectric constant. 10. Forbidden gap: To determine forbidden gap of semiconductors. 11. Transistor Characteristics in CE Configuration. 12. To determine the Hall coefficient of a semiconductor material and then evaluate carrier type and its density of charge carrier. 13. Planck's Constant 14. To measure the divergence of the laser beam

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester I)	
Course Code: BSC202	Credits: 0-0-1
Course: Lab-III Open Elective-I: Engineering Chemistry	Teacher Assessment: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	

List of Practical	**Any 10 practical to be conducted** 1. Lab safety experiment 2. Preparation and standardization of analytical reagents 3. Analysis of Chemical parameters of water 4. Analysis of physical parameters of water 5. Determination of percentage of moisture and ash in given coal sample. 6. Determination of Acid value/ saponification value of lubricating oil. 7. Determination of viscosity of chemical compound 8. Preparation of polymer 9. Electro gravimetric Estimation of Metals (Virtual experiment) 10. Determination of chloride content of water by Mohr's method (Virtual experiment) 11. Determination of melting or boiling point of organic compound. (Virtual experiment) 12. Determination of rate of corrosion in different pH media. (Virtual experiment) 13. Preparation of nano materials 14. Determination of molecular weight of polymer using Ostwald's viscometer

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester I)	
Course Code: BSC203	Credits: 0-0-1
Course: Lab-III Open Elective-I: Biology for Engineers	Teacher Assessment: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	

List of Practical	1. Biosafety laboratory practices and biological waste disposal 2. Buffers in biology, buffering capacity and pKa 3. Observing cell surface and intracellular contents using light and/or fluorescence microscopy 4. Measuring mechanical strength of cells - osmolarity and elasticity of biological membranes 5. Protein and DNA isolation from plant cells, visualization of proteins and DNA 6. Microbial culture - growth curve and enumeration methods 7. Basic molecular biology techniques - including isolation of bacterial plasmids demos on Polymerase Chain Reaction and Restriction Fragment Length Polymorphism 8. Mammalian and plant cell culture methods

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

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Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester I)	
Course Code: ESC204	Credits: 0-0-1
Course: Lab IV: Workshop	Teacher Assessment: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	

Course Objectives	1. To have hands on practice and understanding of various manufacturing processes like Fitting, Turning, machining, Carpentry, Sheet metal work and welding. 2. To have understanding and practice of various measurement devices and Techniques. 3. To have hands understanding and practice of various cutting tools and machines used in manufacturing work.

List of Practical (Any Four)	1. Wood sizing exercises in planning, marking, sawing, chiseling, and grooving to makehalf lap joint and cross lap joint.
	 2. A job involving cutting, filing to saw cut, filing all sides and faces, corner rounding,drilling, and tapping on M. S. plates.
	 3. A job on use of plumbing tools and preparation of plumbing line involving fixing of water tap and use of elbow, tee, union and coupling, etc.
	 4. Making a small parts using GI sheet involving development, marking, cutting, bending,brazing, and soldering operations- i) Tray ii) Funnel and similar articles.
	 5. Exercise in Arc welding (MMAW) to make a square butt joint.
	 6. A job on turning of a Mild Steel cylindrical job using center lathe.
	 7. A job on turning of Mild steel on CNC turning machine.
	 Contents:
	   a) **Carpentry:** Technical Terms related to wood working, Types of wood, Joining materials, Types of joints - Mortise and Tenon, Dovetail, Half Lap, etc., Methods of preparation and applications, Wood working lathe, safety precautions.
	   b) **Welding:** Arc welding - welding joints, edge preparation, welding

tools and equipment, Gas welding - types of flames, tools and equipment, Resistance welding - Spot welding, joint preparation, tools and equipment, safety precautions.

c) **Fitting and Plumbing:** Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc., Fitting hand tools like vices, cold chisel, etc. Drilling machine and its operation, Different types of pipes, joints, taps, fixtures and accessories used in plumbing, safety precautions.

d) **Sheet Metal Work:** Simple development and cutting, bending, Beading, Flanging, Lancing and shearing of sheet metal, Sheet metal machines - Bending Machine, Guillotine shear, Sheet metal joints, Fluxes and their use.

e) **Machine shop**: Lathe machine, types of lathes, major parts, cutting tool, turning operations, safety precautions

f) **CNC machines**. Turning center and Vertical milling machines. Operating principals, major parts and various operations.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

Instruction to Students:

Each student is required to maintain a "workshop diary" consisting of drawing / sketches of the job sand a brief description of tools, equipment, and procedure used for doing the job.

Reference/Textbooks:

1. K. C. John, Mechanical Workshop Practice, Prentice Hall Publication, New Delhi,2010.
2. Hazra and Chaudhary, Workshop Technology-I, Media promoters & Publisher private limited.

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Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester I)	
Course Code: BSC205	Credits: 0-0-1
Course: Lab-V: Engineering Graphics	End Semester Examination/Oral: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	
Course Objectives	Following are the objectives of the course 1. To develop vision and imagination skill required for drawing engineering components. 2. Enable the students with various concepts like dimensioning, conventions and standards related to working drawings in order to become professionally efficient. 3. Develop the ability to communicate with others through the language of technical drawing and sketching. 4. Ability to read and interpret engineering drawings created by others.
List of Practical	**1. Introduction: -** Drawing Instruments and their uses. (Practice of drawing instruments) **2. Drawing standards and geometrical construction:** Types of lines, lettering, dimensioning, scaling conventions. Geometrical construction. Dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side. (Use A2 sheet and sketch book) **3. Projections of Planes** Projections of planes parallel and perpendicular to one or both planes, projection of planes inclined to one or both planes. (Minimum 4 problems on A2 sheet) **4 Projections of Solids** Types of solids, projections of solids like cube, Prism, Pyramid, Cone and Cylinder with its axis perpendicular to one reference plane and parallel to the other, Solids with axis inclined to one of the reference planes and parallel to the other. (Minimum 4 problems on A2 sheet)

		5. **Orthographic Projections** Introduction to orthographic projection, drawing of 2-D orthographic views of objects from their isometric views. (Minimum 4 problems on A2 sheet) 6. **Isometric Projections** Isometric projections: Isometric scale, drawing of isometric views and projections from given orthographic views. (Minimum 4 problems on A2 sheet)			

	Sr. No.	Title	Author	Publication	Edition
Textbooks/ Reference Books	1.	Engineering Drawing	N. D. Bhatt	Charotar Publishing House	46th Edition
	2.	A textbook of Engineering Graphic	K. V. Natarajan	Dhanalakshmi Publishers	31st Edition
	3.	Engineering Graphics	K. Venugopal and V. Prabhu Raja	New Age International (P) Ltd	1st Edition
	4.	Engineering Drawing with an Introduction to AUTOCAD	Dhananjay A. Jolhe	McGraw Hill Education	1st Edition

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

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Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester I)	
Course Code: HSM201	Credits: 0-0-1
Course: Lab-VI: Communication Skills	Teacher Assessment: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	

Course Objectives	1. To apply English Grammar in day to day communication. 2. To pronounce and articulate English words and sentences accurately 3. To communicate in English effectively by using updated vocabulary. 4. To apply Soft Skills from campus to corporate. 5. To exhibit etiquettes through their behavior from campus to corporate.				

Sr. No.	Section	Contents			
Unit-I	Grammar	Parts of Speech			
Unit-II		Tenses and the Concept of Time			
Unit-III		Transformation of sentences and Conditional Clauses			
Unit-IV	Vocabulary Enhancement	• Types of Vocabulary • Basic techniques to Enhance Vocabulary • Vocabulary Enhancing Activities			
Unit-V	Introduction to Phonetics	Phonetics and problems in learning and using pronunciation, • Vowel sounds & Consonant Sounds, • Articulation of Sounds • Word accent			
Unit-VI	Soft Skills	• Importance of Soft Skills in general, • Campus to Corporate Etiquettes: (Grooming, Mobile, Classroom)			
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	The Essence of Effective Communication	Adrian Budday, Ron Ludlow and Fergus' Panton	Prentice Hall of India- Private Ltd.	1992
	2.	Professional	A. K. Jain, Pravin,	S. Chand &	2018

		Communication Skills	S. R. Bhatia, A. M. Sheikh	Company Ltd.	
	3.	Business Communication	Urmila Rai, S. M. Rai	Himalya Publishing House	9th Edition
	4.	Technical Communication- Principles and Practice	Meenakshi Raman & Sangeeta Sharma	Oxford University Press	2nd Edition
	5.	A course in Phonetics & Spoken English	J. Sethi, P.V. Dharmatma	PHI Publication	2nd Edition
	6.	Communication Skills for Engineers	Sunita Mishra, C. Murli Krishna	Pearson Education	2nd Edition
	7.	Grammar of Spoken and Written English	Dauglas Biber, Geoffrey Leech	Longman	1st Edition
	8.	English Grammar and Composition	Wren and Martin,	S. Chand Publications	1st Edition
Mode of Conduct	Use of audio video sessions, demonstrations, group activities and games, simulation activities				

Classroom Activities:

1. Self- Introduction Use of Audio, video sessions, demonstrations, group activities and games, scene enactments.

2. Review a film clipping

3. Guess the word, Telephonic Conversations

4. Dumb Charades

5. Dialogues, Situational conversation, Relay conversation.

6. Analyse a newspaper article

7. Spot the error, clues.

8. Newspaper articles, Reports, Editorials.

9. Picture Composition

10. Paragraph Writing

11. Group Activity-follow instructions, enacting.

12. Crossword Puzzles, Scramble

13. Memory Games.

14. Chinese Whispers, Follow Instructions

The assessment of term work shall be done on the basis of the following.

- Continuous assessment

- Performing the experiments in the laboratory

- Online Examination conducted on the syllabus and term work mentioned above.

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester I)	
Course Code: ESC206	
Course: Non-Credits Mandatory course (Environmental Studies)	
Teaching Scheme: 02 Hrs./week	
Objectives	1. To raise the awareness, about the emerging environmental issues. 2. To study the implementation of environmental policies and practices. 3. To study environment as a whole with all the basic concepts related to it.
Unit-I	**Multidisciplinary nature of Environment:** Components of Environment, Structure of Atmosphere, Environmental Degradation, Sustainable development, Environmental ethics (4 Hrs)
Unit-II	**Natural Resources:** Conventional (Exhaustive) Resources - Forest, Water resources, Alternative (Inexhaustive) Resources i.e., Solar energy, Wind energy, Tidal energy etc. Role of individual in conservation of natural resources. (4 Hrs)
Unit-III	**Environment & Human health:** Water quality & health, Air quality & health, Industry and health, Energy & Health. Government organizations in the field of Environment, Institutions working in Environment and conservation, Environmentalists in Environment, and conservation**.** (4 Hrs)
Unit-IV	**Biodiversity and its conservation:** A. Conservation of wildlife, Forest conservation, Soil, Water and Energy Conservation. B. Solid waste management, Plastic waste management, E- waste management. (4 Hrs)
Unit-V	**Environmental Audit and legislations:** A. EIA in India, MoEF, ISO environmental standards, Environmental Management System (EMS), B. Power/ Functions of State Pollution Control Board and Central Pollution Control Board. (4 Hrs)

Unit-VI	Social Issues and Environmental laws:				
	Environmental Protection Act (1986), Air Act(1981), Water Act(1974), Forest Act(1980), Wildlife Protection Act. (4 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Handbook of Environmental Laws, Rules guidelines, compliances and standards Volume I and II	Dr. R. K. Trivedy	Enviro Media	3rd Edition
	2.	Textbook of environmental	Erach Bharucha	University Press	1st Edition
	3.	Environmental chemistry and pollution control	Dr. S. S Dara & Dr. D. D. Mishra	S. Chand	7th Edition
	4.	Environmental Biotechnology	S. N. Jogdand	Himalaya Publishing	1st Edition

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Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester II)	
Course Code: BSC151	Credits: 3-1-0
Course: Statistics and Integral Calculus	Mid Semester Examination-I: 15 Marks
Teaching Scheme:	Mid Semester Examination-II: 15 Marks
Theory: 03 Hrs/week	Teacher Assessment: 10 Marks
Tutorial: 01 Hr/week	Continuous Internal Evaluation: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration): 2 Hrs
Prerequisite	Students requires sufficient amount of knowledge of certain topics related to Statistics and Integral Calculus.
Objectives	1. To provide basic ideas of statistics including measures of central tendency and dispersion. 2. To develop mathematical skills and logical understanding of the subject. 3. To analyze and find solutions of problems in engineering. 4. To apply knowledge of mathematics in engineering and technology.
Unit-I	**Statistics-I** Introduction to Statistics, Measures of central tendency: Mean, Median and Mode. (5 Hrs)
Unit-II	**Statistics-II** Measures of dispersion: Quartiles, Quartile deviation, Coefficient of Quartile deviation, Mean deviation, Coefficient of Mean deviation, Standard deviation, Variance, Coefficient of variation, Skewness, Measures of Skewness: Karl Pearson's coefficient of skewness, Bowley's coefficient of skewness. (7 Hrs)
Unit-III	**Curve Tracing and Rectification** Tracing of curves in Cartesian form, Tracing of curves in Polar form, Rectification of plane curves (Cartesian and Polar) (6 Hrs)
Unit-IV	**Integral Calculus** Reduction Formulae, Beta Function, Gamma Function, Relation between Beta and Gamma Function (without proofs) (6 Hrs)
Unit-V	**Multiple Integrals** Double Integration in Cartesian and Polar co-ordinates, Change of order of Integration, Change to polar co-ordinates, Triple integral. (6 Hrs)

Unit-VI	**Applications of Multiple Integrals**				
	Application to areas, volumes, surfaces areas and volume of revolutions (6 Hrs)				

Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	A Text Book of Applied Mathematics Volume-I	P. N. Wartikar J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune	9th Edition
	2.	Advanced Engineering Mathematics	H. K. Dass.	S. Chand and Co. Ltd	18th Edition
	3.	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publishers	46th Edition
	4.	Higher Engineering Mathematics	B.V. Ramana	Tata McGraw-Hill Publishing Co. Ltd.	1st Edition
	5.	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley eastern Ltd. Mumbai	10th Edition
	6.	A Text Book of Engineering Mathematics	Peter O'Neil	Thomson Asia Pvt. Ltd., Singapore	7th Edition
	7.	Advanced Engineering Mathematics	C. R. Wylie & Barrett	Mc Graw Hill Publishing Company Ltd	6th Edition
	8.	Advanced Engineering Mathematics	M. D. Greenberg	Pearson Education	2nd Edition

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester II)	
Course Code: ESC151	Credits: 3-0-0
Course: Python Programming	Mid Semester Examination-I: 15 Marks
Teaching Scheme: Theory: 03 Hrs / week	Mid Semester Examination-II: 15 Marks
	Teacher Assessment: 10 Marks
	Continuous Internal Evaluation: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration): 2 Hrs

Prerequisite	Basic Mathematics
Objectives	1. To introduce basic constructs of python programming language. 2. To make Engineering graduates learn python data types and their operations.
Unit-I	**Introduction to Python Programming** Python Language- history, features, advantages, Applications of Python , Comparison with other programming languages Installing python, installing Pycharm IDE. Getting python help online. Structure of Python Program, data types, simple arithmetic operations, Comments, Type Conversions, Flowchart, Algorithm (6 Hrs)
Unit-II	**Flow Control and Loops** Decision Making : if statement, if…else statement, if..elif ..else statement, Nested if statement, The Get construct (6 Hrs)
Unit-III	**Loops** While loop , for loop, nested loops, range() function, continue and break statement (6 Hrs)
Unit-IV	**Functions** Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The *return* Statement (6 Hrs)
Unit-V	**Lists & Sets** Python List- syntax: add-remove item, access, modify, slice, loop through list; predefined list methods with example, application

	Python Set- syntax: add-remove, item access, modify, predefined list methods, Compare list and set (6 Hrs)				
Unit-VI	**Tuples & Dictionary** Python Tuple- syntax: add-remove, access, change value, loop through tuple, predefined tuple methods Python Dictionary- syntax: add-remove, access, change value, loop through values, levels of dictionary, predefined dictionary methods, applications of dictionary (6 Hrs)				

	Sr. No.	**Title**	**Author**	**Publication**	**Edition**
Textbooks/ Reference Books	1.	Think Python	Allen B. Downey	O'Really	2nd Edition
	2.	Dive into Python 3	Mark Pilgrim	Apress	2nd Edition
	3.	Learning with Python	Allen B. Downey	Dreamtech	1st Edition
	4.	The Complete Reference Python	Martin C. Brown	Mc Graw Hill	4th Edition
	5.	Head First Python	Paul Barry	O'Really	2nd Edition

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. Non-Circuit Branches (Semester II)	
Course Code: ESC152	Credits: 3-0-0
Course: Engineering Mechanics	Mid Semester Examination-I: 15 Marks
Teaching Scheme:	Mid Semester Examination-II: 15 Marks
Theory: 03 Hrs/week	Teacher Assessment: 10 Marks
	Continuous Internal Evaluation: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration): 2 Hrs
Prerequisite	Introduction to basic terminologies involved in physics.
Objectives	1. To study the forces and their effects on the bodies in motion or at rest. 2. To study the mechanics of rigid bodies and deformed bodies. 3. To study the properties of plane surfaces, analysis of simple trusses and concept of friction.
Unit-I	**Force System:** Introduction, Fundamental concept, principle of superposition, fundamental laws of mechanics, coplanar force system, components, resultant, moment of a force, Varignon's Theorem, couple, Equivalent force couple system. **Equilibrium of forces:** Introduction, free body diagram, beam, Equilibrium of force system, Lami's Theorem. (10 Hrs)
Unit-II	**Friction:** Introduction, advantages and limitations of friction, characteristics of frictional force, Theory of friction, Types of friction, Laws of friction, Important definitions. **Plane Trusses:** Introduction, classification of trusses, assumption made in the analysis of truss, Analysis of statically determinate truss by method of joint and method of section. (8 Hrs)
Unit-III	**Properties of Plane Surfaces:** Introduction, Centroid, Centre of gravity, Important definitions, Determination of centroid, Positions of centroid, Moment of Inertia, Polar moment of inertia, Radius of gyration, Theorems of moment of inertia. (6 Hrs)

Unit-IV	**Kinematics of Particles:** Introduction, basic terms and definitions, Rectilinear motion of the particles, Motion curves under uniform acceleration, linear motion under gravity, linear motion under variable acceleration, motion curves under variable acceleration, Motion of projectiles, Relative motion. (6 Hrs)			
Unit-V	**Kinetics of Particles:** Introduction, important terms and definitions, linear motion of a particle by Newton's second law of motion and D'Alembert's principle. (3 Hrs)			
Unit-VI	**Impulse, Momentum and Impact:** Introduction of Impulse and Momentum, important terminologies, principle of impulse and momentum, law of conservation of linear momentum, Recoil of gun, Impact, types of central impact, loss of kinetic energy during impact. (3 Hrs)			

Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Engineering Mechanics	S.S. Bhavikatti	New Age International Publication	8th Edition
	2.	Engineering Mechanics	R. K. Bansal	Laxmi Publication	4th Edition
	3.	Engineering Mechanics	A. R. Basu	Dhanpat Rai	2nd Edition
	4.	Engineering Mechanics	Nelson and Mclean	Mc Graw HillBook, Inc	2nd Edition
	5.	Engineering Mechanics	B. Prasad	Khanna Publications	9th Edition
	6.	Engineering Mechanics: Principles of Statics and Dynamics	R.C. Hibbler	Pearson Education	14th Edition
	7.	A Textbook Of Engineering Mechanics	R.S. Khurmi	S. Chand	22nd Edition

Maharashtra Institute of Technology, Aurangabad
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Faculty of Science & Technology

Syllabus of F. Y. B.Tech. Non-Circuit Branches (Semester II)

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Course Code-: ESC153	Credits: 3-0-0
Course Title: Electrical and Electronics Engineering	Mid Semester Examination-I: 15 Marks
	Mid Semester Examination-II: 15 Marks
Teaching Scheme:	Teacher Assessment: 10 Marks
Theory: 03 Hrs/week	Continuous Internal Evaluation: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration): 2 Hrs

Objectives	1. To introduce fundamental concepts, various laws-principles, and Basic knowledge of Electrical quantities
	2. To impart knowledge related to electromagnetism for understanding basics of electrical machines.
	3. To provide knowledge of some electronic devices and rectifier circuits.
	4. To expose the students to working of digital circuits, transducers and their application
Unit-I	**AC and DC Fundamentals**
	Current, emf, Electric Potential, potential difference, Resistance, Work, power, Energy. Laws of resistance, resistivity, Concept of AC and DC, Ohms law Series and parallel combination of resistance, Kirchhoff's laws, Definition of Cycle, Time period, Frequency, Amplitude, Phase and Phase difference, Average value, R.M.S. value, and Power Factor. Advantages of three phases over single-phase (6 Hrs)
Unit-II	**Magnetism & Electromagnetic Induction**
	Flux, flux density, magnetic field strength, mmf, reluctance, permeability. Comparison between electric and magnetic circuits. Faraday's laws of electromagnetic induction, Lenz's law, Flemings's right-hand rule for Generators, Fleming's left-hand rule for motors. (6 Hrs)
Unit-III	**Electrical Machines**
	Construction, working and classification of the transformer, Significance of Emf equation (no derivation) Voltage ratio, three-phase induction motor

	Construction, types of Alternator: - construction and working principle and application. Single-phase Induction motors: Construction, applications of a) Split phase induction motor b) Capacitor start capacitor run induction motor, Universal motor (6 Hrs)
Unit-IV	**Semiconductor devices and its applications** Semiconductor and its types, PN Junction Diode, Zener Diode, LED,BJT, JFET **Rectifiers** Types Half wave, Full wave, Bridge rectifiers, Ripple factor, Efficiency and PIV, Comparison, Uses of filters in rectifier circuit, Basic blocks of Regulated Power Supply (6 Hrs)
Unit-V	**Digital Circuit** Basic logic gates, universal logic gates, Boolean algebra, Introduction to logic Families, Half Adder, Full Adder, Multiplexer, De-multiplexer, SR-Flip-Flop. (6 Hrs)
Unit-VI	**Transducers** Definition, Classification of Transducers, Operation of Transducers-Temperature Measurement -RTD, Thermocouple, Thermistor, Pressure Measurement-Strain Gauge, Displacement measurement- LVDT (6 Hrs)

Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	ABC of Electrical Engineering	B. L. Thereja A. K. Thereja	S. Chand Publishing	1st Edition
	2.	Basic Electrical Engineering	J.B. Gupta	S.K. Kataria & Sons	14th Edition
	3.	Basic Electrical Engineering	V. K. Mehta	S. Chand Publishing	2nd Edition
	4.	Principles of Electronics	V.K. Mehta	S. Chand Publishing	12th Edition
	5.	Modern Digital Electronics	R. P. Jain	Tata Mc-Graw Hill	3rd Edition
	6.	Electronics Instrumentation	H. S. Kalasi	Tata Mc-Graw Hill	2nd Edition

Maharashtra Institute of Technology, Aurangabad
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Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester II)	
Course Code: BSC102	Credits: 3-0-0
Course: Open Elective-II: Engineering Physics	Mid Semester Examination-I: 15 Marks
	Mid Semester Examination-II: 15 Marks
Teaching Scheme:	Continuous Internal Evaluation: 10 Marks
Theory: 03 Hrs/week	Teacher Assessment: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration):2 Hrs
Objectives	1. To let the engineering undergraduates study physical properties, concepts and physical quantities required for the solution of complex engineering problems 2. To make the engineering undergraduates learn basic principles of Physics and laws of scientific investigation to identify, formulate and analyse complex engineering problems 3. To equip engineering undergraduates with competencies of scientific methods required in engineering career by upgrading skills on the basis of learning achieved from physical science perspectives. 4. To engage engineering undergraduates extensively in scientific investigation for interdisciplinary graduate programs and a wide variety of other lifelong learning opportunities.
Unit-I	**Optics** The wave equation, Introduction to electromagnetic waves and electromagnetic spectrum, Newton's ring, Michelson interferometer, Applications of interference Diffraction of light, diffraction grating, resolving power of grating, Application of diffraction grating in spectroscopic devices. Polarization, Nicol prism, Laurent's half shade polarimeter, applications of polarization. (6 Hrs)

Unit-II	**Acoustics**
	Acoustic terminology and definitions, Acoustic Wave Equation and its Basic Physical Measures, Sabine's formula (derivation not necessary) acoustics factor in architectural design.
	Ultrasonics
	Properties, Production of ultrasonic waves by piezo-electric and magnetostriction generator, engineering applications of ultrasonic waves.
	(6 Hrs)
Unit-III	**Crystal Structure**
	Crystalline and amorphous material, lattice and unit cell, Miller indices, SC, BCC, FCC, diamond structure, NaCl structure, imperfections and defects in solids
	X-Rays
	Basics of X-Rays, Production and Detection of X-Rays, Continuous and characteristics spectrum, Bragg's law of X-ray diffraction, Bragg's spectrometer, Intensity of diffracted Beams, Particle Size Determination by XRD, Precise Lattice Parameter Determination (6 Hrs)
Unit-IV	**Nuclear Physics**
	Nuclear force, liquid drop model, shell model, Nuclear fission and fusion, Q-value of nuclear reaction, nuclear reactor, P-P cycle, C-N cycle, cyclotron, GM counter, applications of nuclear physics in various fields.
	Modern Physics
	Black body radiation, Planck' s law, Photoelectric effect, Wave particle duality, De- Broglie's concept of matter wave, Davisson-Germer experiment, Scanning tunneling microscope, Time-dependent and time-independent Schrodinger equation for wave function, Quantum computing.
	(6 Hrs)
Unit-V	**Introduction to solids**
	Superconductivity: Superconductivity, effect of temperature and magnetic fields, Meissner effect, type I and II superconductors, BCS theory, Applications.

	Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands Magnetic Materials: Magnetic susceptibility and diamagnetic materials, paramagnetic, ferromagnetic, and, BH characteristics, applications. Nanomaterials and Nanotechnology: Properties of nanomaterials, 0 D, 1 D, 2 D and 3 D nanoparticle, various carbon allotropes, historical instances and day to day examples, Introduction to nanotechnology and applications in various engineering fields. (6 Hrs)
Unit-VI	**Laser** Einstein's theory of matter radiation interaction and A and B coefficients, Properties of laser, spontaneous and stimulated emission, ruby laser, He-Ne laser, CO_2 laser and semiconductor Laser, applications of lasers in science, engineering and medicine. **Fiber Technology** Propagation of light through optical fiber, acceptance angle and cone numerical aperture, Single and Multi-Mode Fibers, applications, sensors. (6 Hrs)

Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	A Text book of Engineering Physics	M. N. Avadhanulu P. G. Kshirsagar	S. Chand & Co.	7th Edition
	2.	A Text book of Engineering Physics	R. K. Gaur S. L. Gupta	Dhanpat Rai	3rd Edition
	3.	Fundamentals of Physics	David Halliday, Jearl Walker, and Robert Resnick	Wiley	6th Edition

	4.	Elements of X-ray Diffraction	B. D. Cullity	Addison-Wesley Metallurgy Series	1st Edition
	5.	Nuclear Physics	Irving Kaplan	Narosa Publishing house	2nd Edition
	6.	Introduction to Solid State Physics	C. Kittel	John Wiley & Sons, Inc	8th Edition
	7.	Lasers and Non-Linear Optics	B.B. Laud	New Age International	3rd Edition
Websites and online courses	1.	http://science.howstuffworks.com/laser1.htm			
	2.	http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html			
	3.	http://nptel.ac.in/courses/122107035/			
	4.	http://nptel.ac.in/courses/122104016/			
	5.	https://www.coursera.org/learn/intro-to-acoustics			
	6.	https://nptel.ac.in/courses/112/106/112106227/			
	7.	https://nptel.ac.in/courses/113/104/113104081/			
	8.	https://nptel.ac.in/courses/115/102/115102017/			

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester II)	
Course Code: BSC103	Credits: 3-0-0
Course: Open Elective-II: Engineering Chemistry	Mid Semester Examination-I: 15 Marks
	Mid Semester Examination-II: 15 Marks
Teaching Scheme:	Continuous Internal Evaluation: 10 Marks
Theory: 03 Hrs/week	Teacher Assessment: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration):2 Hrs
Objectives	1. To relate the concepts of Chemistry in all Engineering Disciplines. 2. To make the engineering undergraduates acquainted with modern techniques in engineering and industrial Chemistry. 3. To equip engineering undergraduates with the knowledge of advanced and existing Engineering Materials. 4. To develop the awareness about powering the future using advanced energy Storage Systems.
Unit-I	**Advanced Engineering Materials** **Industrial Polymers**: Thermoplastics (PVC) & Thermosetting polymers (Bakelite), Biodegradable polymers (PVa), Properties, Applications **Nanomaterials**: Preparation of nano materials by Laser method, properties and applications of CNTs. **Composite Materials**: Ceramic matrix composites, carbon- carbon composites **Reinforcements**: Silicon carbide, Fiber glass. (6 Hrs)
Unit-II	**Water Technology:** Water Parameters: Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), pH, Hardness of water: types and units, Estimation of hardness by EDTA method, numerical on hardness; Boiler troubles: scale, sludge, priming, foaming and caustic embrittlement; Water treatment: Ion exchange process, Ultra filtration, Nano filtration (6 Hrs)

Unit-III	**Fuels and Energy Storage Systems:** Fuels: Gross and net calorific value, Solid fuels: proximate analysis of coal & importance, gaseous fuels: composition properties and application of natural gases- CNG, LNG. Energy Storage Systems: Bio electrochemical batteries, lithium-ion battery, alkaline fuel cell (AFC) (6 Hrs)
Unit-IV	**Lubricants and Coolants** Lubricants: Introduction, Properties of liquid lubricants: viscosity and viscosity index, flash point and fire point, acid value. Numerical on viscosity index. **Coolants**: Introduction, properties and uses of water and ethylene glycol as coolant. (6 Hrs)
Unit-V	**Corrosion and its Prevention** Definition, types, mechanism of dry and wet corrosion, Corrosion testing methods: ultrasonic testing, computed digital radiography, Prevention of corrosion: Methods- sacrificial anodic protection, Electroplating, Powder coating (6 Hrs)
Unit-VI	**Metallurgical Processes** Calcination, smelting, ore dressing, roasting, refining of metals, Metalworking processes: casting, forging, rolling, machining, sintering, Laser cladding, 3D printing (6 Hrs)

Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Engineering Chemistry	B. Siva Shankar	Mc Graw Hills Publicat ions	3rd Edition
	2.	Engineering Chemistry	Shelly, Oberi and Malik	Cingage Publication	1st Edition
	3.	Principles of Polymerization	Odian, G.G	John Wiley & Sons, Inc	4th Edition

	4.	Engineering Chemistry	Jain & Jain	Dhanpat Rai Publishing	16th Edition
	5.	Polymer Chemistry	Malcolm P. Stevens	Oxford University Press	3rd Edition
	6.	A Textbook of Engineering Chemistry	Shashi Chawla	Dhanpat Rai & CO	10th Edition
	7.	Material Science & Engineering	William Callister and V. Raghavan	Wiley	9th Edition

Websites and online courses	1.	Unit- I – https://onlinecourses.nptel.ac.in/noc21_ch49/preview https://www.explainthatstuff.com/composites.html
	2.	Unit- II – https://nptel.ac.in/content/storage2/courses/116104045/lecture8.pdf https://nptel.ac.in/content/storage2/courses/116104045/lecture6.pdf
	3.	Unit- III – https://nptel.ac.in/content/storage2/courses/121106014/Week12/lecture38.pdf https://www.sciencedirect.com/topics/engineering/proximate-analysis
	4.	Unit- IV – https://nptel.ac.in/courses/112/102/112102014/ https://nptel.ac.in/content/storage2/courses/112105127/pdf/LM-12.pdf
	5.	Unit- V - https://nptel.ac.in/courses/113/108/113108051/
	6.	Unit- VI -https://nptel.ac.in/courses/112/107/112107144/

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester II)	
Course Code: BSC104	Credits: 3-0-0
Course: Open Elective-I: Biology for Engineers	Mid Semester Examination-I: 15 Marks
	Mid Semester Examination-II: 15 Marks
Teaching Scheme:	Continuous Internal Evaluation: 10 Marks
Theory: 03 Hrs/week	Teacher Assessment: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration):2 Hrs
Objectives	To introduce students to modem biology with an emphasis on evolution of biology as a multi-disciplinary field, to make them aware of application of engineering principles in biology, and engineering robust solutions inspired by biological examples.
Unit-I	Introduction to Molecular Biology, Central Dogma of life, DNA replication, Translation and transcription, Introduction to Genetics, Phylogenetic analysis, Introduction to developmental biology, structure and functions of cell. (8 Hrs)
Unit-II	Introduction to immunology, components of the immune system, antigens and antibodies, B-cells and T- cells development, proliferation and differentiation, MHC Restriction, Complement system. (6 Hrs)
Unit-III	Infectious diseases, TB, HIV, Flue, COVID-19, response of host to infectious diseases. Vaccines, cancer biology. (4 Hrs)
Unit-IV	Introduction to bioinformatics, tools of bioinformatics, primary and secondary data bases, sequence alignments, methods of structure prediction of proteins, homology modeling (6 Hrs)
Unit-V	Introduction to Analytical Instrumentation, Electrophoresis techniques, Chromatography types and techniques, Isoelectric focusing, PCR and ELISA (6 Hrs)
Unit-VI	Environmental biosafety, bioresources, biodiversity, bioreactors, ethical aspects of plant and animal biotechnology, Engineering designs inspired by examples in biology, Engineering aspects of some Nobel Prizes in Physiology and Medicine & Chemistry / recent advances in Biology (6 Hrs)

Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Essentials of Genetics.	Miko, I. & Lejeune, L., eds.	Cambridge, MA: NPG Education	2009
	2.	Essentials of Cell Biology	O'Connor, C. M. & Adams, J. U.	Cambridge, MA: NPG Education	2010
	3.	Molecular Biology of the Gene	Warson JD, Baker, TA, Bell SP, Gann A, Levin M, Losick R,	Pearson Education	2004
	4.	The Greatest Show on Earth: The Evidence For Evolution	Dawkins, R	Bantam Press, Transworld Publishers	2009
	5.	The Blind Watchmaker	Dawkins, R	W. W. Norton & Co	1996
	6.	The Double Helix: A Personal Account of the Discovery of the Structure of DNA	Watson, J. D.	Simon & Schuster Inc.	2011

Faculty of Science & Technology
Syllabus of F. Y. B.Tech. All Branches (Semester II)

Course Code: ESC251	Credits: 0-0-1
Course: Lab-I: Python Programming Teaching Scheme: Practical: 02 Hrs/week	End Semester Examination/Oral: 25 Marks

Objectives	Course will enable students to develop programs in python programming language and identify use of various data structures available in python.
List of Practical (Any 10 Practical)	1. Installation of Python and IDE for Python Programming – Pycharm 2. Using flowchart and algorithm for problem solving 3. Develop program using arithmetic operations in python 4. Develop program using conditional statements (if-else) and logical operators in python 5. Develop program using conditional statements (if-elif-else) and relational operators in python 6. Develop program using conditional statements (nested-if) in python 7. Develop program using loops in python 8. Develop program using nested loops in python 9. Develop program using function in python. 10. Develop program to demonstrate operations on python lists 11. Develop program to demonstrate operations on python sets 12. Develop program to demonstrate operations on python tuple 13. Develop program to demonstrate operations on python dictionary

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Faculty of Science & Technology

Syllabus of F. Y. B.Tech. Non-Circuit Branches (Semester II)

Course Code: ESC252	Credits: 0-0-1
Course: Lab-II: Engineering Mechanics	Teacher Assessment: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	

Objectives	A Knowledge of Engineering Mechanics help the engineers to deal with the facts, laws, principles and applications to the real life problems through which the creation of new systems by way of research, design and developments in engineering practices.
List of Practical	**Part I: Graphical Solutions: (Two problems each)** 1. Resultant of Concurrent and Non- Concurrent Coplanar Force System 2. Problems on Beam Reaction 3. Problems on Analysis of Pin-jointed Trusses **Part II: Laboratory Experiments: (Any Six)** 1. Parallelogram Law of Forces 2. Lami's Theorem 3. Beam Reactions 4. Member Forces in Trusses 5. Jib Crane 6. Moment of Inertia of Fly Wheel 7. Simple Screw Jack 8. Differential Axle and Wheel 9. Belt Friction

The assessment of term work shall be done on the basis of the following.

- Continuous assessment

- Performing the experiments in the laboratory

- Oral examination conducted on the syllabus and term work mentioned above.

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. Non-Circuit Branches (Semester II)	
Course code- ESC253	Credits: 0-0-1
Course Title: Lab III: Electrical and Electronics Engineering	Teacher Assessment: 25 Marks
	End Semester Examination/Oral: 25
Teaching Scheme: Practical: 02 Hrs/week	Marks

List of Practical (Any 5 practical from each section)	**Electrical Engineering**
	1. To study the accessories to be used in household wirings and awareness of electric safety
	2. i) To understand the concept of Phase, Neutral & Earthling in Electrical Installation.
	ii) Single Lamp controlled by single switch circuit.
	3. To study & Demonstrate Staircase Wiring.
	4. To study & understand the importance of Series Lamp.
	5. To Verify Ohm's Law.
	6. To verify the Voltage Ratio of Single-Phase Transformer.
	Electronics Engineering
	7. To study characteristics of Semiconductor diode.
	8. To study Half Wave and Full Wave Rectifier.
	9. To plot the characteristics of BJT in CE configuration.
	10. To study logic gate application as a Half Adder
	11. To study use of LVDT for displacement measurement
	12. Implementation and testing of circuits like amplifier, Power supply on bread board.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment

- Performing the experiments in the laboratory

- Oral examination conducted on the syllabus and term work mentioned above.

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester II)	
Course Code: BSC201	Credits: 0-0-1
Course: Lab-IV Open Elective-II: Engineering Physics	Teacher Assessment: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	
List of Practical	**Any 10 practical to be conducted** 1. Newton's ring: To determine wavelength of monochromatic light 2. G. M. Counter: dead time calculation 3. Grating: To determine wavelength of LASER light. 4. Polarimeter: To determine concentration of solution. 5. Reverberation time: To determine Reverberation time of a hall. 6. Characteristics of solar cell 7. Ultrasonic interferometer 8. Zener diode: To study characteristics of zener diode & to determine zener voltage. 9. Dielectric constant: to determine dielectric constant. 10. Forbidden gap: To determine forbidden gap of semiconductors. 11. Transistor Characteristics in CE Configuration. 12. To determine the Hall coefficient of a semiconductor material and then evaluate carrier type and its density of charge carrier. 13. Planck's Constant 14. To measure the divergence of the laser beam

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester II)	
Course Code: BSC202	Credits: 0-0-1
Course Lab-IV Open Elective-II: Engineering Chemistry	Teacher Assessment: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	

List of Practical	**Any 10 practical to be conducted** 1. Lab safety experiment 2. Preparation and standardization of analytical reagents 3. Analysis of Chemical parameters of water 4. Analysis of physical parameters of water 5. Determination of percentage of moisture and ash in given coal sample. 6. Determination of Acid value/ saponification value of lubricating oil. 7. Determination of viscosity of chemical compound 8. Preparation of polymer 9. Electro gravimetric Estimation of Metals (Virtual experiment) 10. Determination of chloride content of water by Mohr's method (Virtual experiment) 11. Determination of melting or boiling point of organic compound. (Virtual experiment) 12. Determination of rate of corrosion in different pH media. (Virtual experiment) 13. Preparation of nano materials 14. Determination of molecular weight of polymer using Ostwald's viscometer

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester II)	
Course Code: BSC203	Credits: 0-0-1
Course: Lab-IV Open Elective-II: Biology for Engineers	Teacher Assessment: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	
List of Practical	1. Biosafety laboratory practices and biological waste disposal 2. Buffers in biology, buffering capacity and pKa 3. Observing cell surface and intracellular contents using light and/or fluorescence microscopy 4. Measuring mechanical strength of cells - osmolarity and elasticity of biological membranes 5. Protein and DNA isolation from plant cells, visualization of proteins and DNA 6. Microbial culture - growth curve and enumeration methods 7. Basic molecular biology techniques - including isolation of bacterial plasmids demos on Polymerase Chain Reaction and Restriction Fragment Length Polymorphism 8. Mammalian and plant cell culture methods

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Faculty of Science & Technology	
Syllabus of F. Y. B.Tech. All Branches (Semester II)	
Course Code: HSM251	Credits: 0-0-1
Course: Lab-V: Cognitive Aptitude	Teacher Assessment: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	

Objectives	1. To improve cognitive aptitude skills. 2. To improve thinking ability of students
Unit-I	Introduction to aptitude assessment, Classification, Numbers, Applications of HCF and LCM Variation, Linear Equations, Number Systems, Ages, Averages, Percentage, Ratio and Proportion, Simple Interest, Compound Interest, Mensuration. (4 Hrs)
Unit-II	Divisibility Rules, Time & Work, Pipes and Cisterns, Boats and Streams, Partnerships, Problems on Trains, Working with different efficiencies, Work equivalence, Division of wages. (4 Hrs)
Unit-III	Relative Speed, Problems based on Races, Percentages as Fractions and Decimals, Fundamental Counting principle, Basics of Permutation and Combination, Probability. (4 Hrs)
Unit-IV	Coding Decoding, Direction Sense, Blood Relations, Analogy (word, letter, number, mixed), Ranking and Ordering, Eligibility Testing, Syllogism, Inequaliies. (4 Hrs)
Unit-V	Sitting Arrangements, Clock and Calendar, Statements & Arguments, Statements & Course of Action, Cause and Effect, Cubes and Dice, Image Analysis (mirror & water images) (4 Hrs)
Unit-VI	Cubes and Cuboid, Error Detection, Grammar, Cloze Test, Comprehension, Double Fillers, Para jumbled sentences, One-word substitution (4 Hrs)

Textbooks/ Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1.	Quantitative Aptitude for Competitive	Dr. R. S. Aggarwal	S. Chand Publications	2017

		Examinations			
2.	A Modern Approach to Logical Reasoning	Dr. R. S. Aggarwal	S. Chand Publications	2018
3.	The Hands-on Guide to Analytical Reasoning and Logical Reasoning	Peeyush Bhardwaj	Arihant Publication	2015
4.	Quantitative Aptitude for Campus Interview Vol I	Dinesh Khattar	Pearson	4th Edition
5.	How to Prepare for Logical Reasoning	Arun Sharma	McGraw Hill Publication	5th Edition
6.	Logical Reasoning and DI	Nishit Sinha	Pearson Publication	7th Edition
7.	Critical Thinking	Moore, Parker	McGraw Hill Publication	13th Edition
8.	How to Prepare for Quantitative Aptitude	Arun Sharma	Tata McGraw Hill	5th Edition

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Examination conducted on the syllabus.

Faculty of Science & Technology

Syllabus of F. Y. B.Tech. All Branches (Semester II)

Course Code: HSM252

Course: Non-Credit Mandatory Course (German Language)

Teaching Scheme: Practical: 02 Hrs./week

Objectives	- Students will be able to apply communicative German Grammar in communication. - Students will be able to enhance the level of German vocabulary. - Students will be able to pronounce and articulate words as well as sentences accurately. - Students will be able to understand and apply German language eventually. - Students will be able to develop German language skills. - Students will be able to manage situational communication in German.

Unit-I :	**Introduction**
	
	   - Self –Introduction
	   - Nos. up to 10,000
	   - Weekdays, Months
	   - Date and Time
	   - Greetings (6 Hrs)

Unit-II :	**Vocabulary**
	
	   - My house
	   - My family
	   - Daily routine
	   - Hobbies
	   - Food (6 Hrs)

Unit-III :	**Grammar**
	
	   - Verb forms (Present Tense)
	   - Articles
	   - Possessive pronouns

		- Auxiliary verbs			
		- Wh-Questions / Yes-No Questions			
		- Past-Tense of haben and sein			(12 Hrs)
Textbooks/ Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1.	German Made Simple: Learn to speak and understand German quickly and easily	Arnold Leitner	Crown	2006
	2.	The Everything Learning German Book: Speak, write, and understand basic German in no time	Edward Swick	Adams Media	2nd Edition
	3.	Langenscheidt German in 30 Days	Von Angelika G. Beck	Langenscheidt	2007
	4.	Complete German Beginner to Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself	Heiner Schenke	The McGraw Hill	1st Edition
	5.	German: How to Speak and Write It (Beginners' Guides)	Joseph Rosenberg	BN Publishing	2011
	6.	Collins Easy Learning – Collins Easy Learning German Grammar and Practice	Collins	Collins	2016

		Faculty of Science & Technology			
		Syllabus of F. Y. B.Tech. All Branches (Semester II)			
Course Code: HSM253					
Course: Non-Credit Mandatory Course (Japanese Language)					
Teaching Scheme: Practical: 02 Hrs./week					
Objectives		1. Students will be able to apply communicative Japanese Grammar in communication. 2. Students will be able to enhance the level of Japanese vocabulary. 3. Students will be able to pronounce and articulate words as well as sentences accurately. 4. Students will be able to understand and apply Japanese language eventually. 5. Students will be able to develop Japanese language skills. 6. Students will be able to manage situational communication in Japanese.			
Unit-I	**:**	**Introduction** - Introduction - Numbers - Days, Months, Dates (8 Hrs)			
Unit-II	**:**	**Grammar** - Verb and verb forms - Present and Past Tense (8 Hrs)			
Unit-III	**:**	**Communication** - Introduction of Japanese script - Dialogues (Shopping, in the restaurant) - Themes: Family, my city, my country, my friend (8 Hrs)			
Textbooks/ Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1.	Japanese Kanji for Beginners	Timothy G. Stout and Kaori Hakone	Tuttle Publishing	2017
	2.	Essential Japanese Grammar: A	Masahiro Tanimori and Eriko	Tuttle Publishing	2012

		Comprehensive Guide to Contemporary Usage	Sato Ph.D.		
	3.	15-Minute Japanese: Learn in Just 12 Weeks	D.K. Goel and Rajesh Goel	DK	2019
	4.	Oxford Japanese Grammar and Verbs (Dictionary)	Bunt Jonathan	Oxford University Press	2003
	5.	Read and write Japanese scripts: Teach yourself	Helen Gilhooly	Teach Yourself	1st Edition
	6.	Complete Japanese Beginner to Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself	Helen Gilhooly	Teach Yourself	3rd Edition