Quest for Excellence

MAHARASHTRA INSTITUTE OF TECHNOLOGY, AURANGABAD

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

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

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Basic Sciences and Humanities

F. Y. B. Tech. Syllabus Structure w.e.f 2021-22 (with amendments)

Group B - (Computer Science and Engineering, Electrical Engineering, Electronics and Computer Engineering, Computer Science and Engineering, AI and Data Science, Computer Science and Design)

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	HSM	HSM101-A	Engineering Exploration-I	1	-	2	3	2	-	-	20	10	20	50
1.3	ESC	ESC101	C-Programming	3	-	-	3	3	15	15	10	10	50	100
1.4	ESC	ESC104 / ESC154	Basic Electrical Engineering / Basic Electronics Engineering	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	ESC207 / ESC254	Lab-II: Basic Electrical Engineering/Basic Electronics Engineering	-	-	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	ESC208	Lab-V: Simulation Lab	-	-	2	2	1	-	-	-	25	25	50
1.11	HSM	HSM201	Lab-VI: Communication Skills	-	-	2	2	1	-	-	-	25	-	25
1.12	HSM	HSM251	Lab-VII: Cognitive Aptitude	-	-	2	2	1	-	-	-	25	-	25
1.13	ESC	ESC206	Environmental Studies	2	-	-	2		Mandatory Non-Credit Course					
S1				15	0	16	31	21	60	60	60	175	295	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	ESC104 / ESC154	Basic Electrical Engineering / Basic Electronics Engineering	3	-	-	3	3	15	15	10	10	50	100
2.4	ESC	ESC155	Mobile Application Development	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	ESC207 / ESC254	Lab-II: Basic Electrical Engineering/Basic Electronics Engineering	-	-	2	2	1	-	-	-	-	25	25
2.8	ESC	ESC255	Lab-III: Mobile Application Development	-	-	2	2	1	-	-	-	-	25	25
2.9	BSC	BSC201 - BSC203	Lab-IV: Open Elective-II	-	-	2	2	1	-	-	-	25	-	25
2.10	HSM	HSM101-B	Engineering Exploration-II	-	-	2	2	1	-	-	20	10	20	50
2.11	HSM	HSM252 / HSM253	Language Proficiency-German Language/ Japanese Language	2	-	-	2	-	Mandatory Non-Credit Course					
S2				17	1	10	28	21	75	75	70	110	320	650

L-Lecture, P- Practical, T- Tutorial, MSE- Mid Semester Exam, CIE-Continuous Internal Evaluation, TA-Teacher Assessment, ESE- End Semester Examination

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Open Elective-I/II

BSC102	Engineering Physics
BSC103	Engineering Chemistry
BSC104	Biology for Engineers

BSC201	Lab-III/IV: Engineering Physics
BSC202	Lab-III/IV: Engineering Chemistry
BSC203	Lab-III/IV: Biology for Engineers

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. All Branches (Semester I)	
Course Code: BSC101 Course: Calculus and Differential Equations 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

Prerequisite	Students required the knowledge of all basic concepts related to calculus and differential equations.
Objectives	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.
Unit-I	**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)**
Unit-II	**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)**
Unit-III	**Differential Equations**: Solution of First Order and First Degree Differential Equation: Exact, Linear and Bernoulli's Equation (Reducible to Linear) **(6 Hrs)**
Unit-IV	**Application Of Differential Equations**: Application of First Order and First-Degree

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	Differential Equations: Electrical Circuit, Mechanics and Orthogonal Trajectories. **(6 Hrs)**
Unit-V	**Partial Differentiation**: Partial Derivatives - Introduction, Homogeneous Functions of Two Variables - Euler's Theorem, Implicit Functions, Total Derivative, Change of Variables. **(7 Hrs)**
Unit-VI	**Applications of Partial Differentiation**: Maxima and Minima of Functions of Two Variables, Jacobians and Its Properties. **(5Hrs)**

Textbooks/ Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Advanced Engineering Mathematics	LouisC.Barrett, C. Ray Wylie	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

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	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-A Course: Engineering Exploration-I Teaching Scheme: Theory: 01 Hr/week Practical: 02Hrs/week	Credits: 1-0-1 Teacher Assessment: 10 Marks Continuous Internal Evaluation: 20 Marks ESE: 20 Marks

Objectives	• To make student understand the role of an Engineer as a problem solver. • To enable students to build simple systems using engineering design process. • To introduce ethical perspectives. • To make students explore different aspects of engineering.
Unit-I	**Introduction to Engineering** Introduction to Engineering and Engineering Study: Difference between science and engineering, scientist and engineer needs and wants, various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer and Graduate Attributes. (3 Hrs)
Unit-II	**Engineering Ethics** Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers, Identifying Ethical Dilemmas in different tasks of engineering, Applying Moral Theories and codes of conduct for resolution of Ethical Dilemmas. (4 Hrs)
Unit-III	**Engineering Design** Engineering Design Process, Multidisciplinary facet of design, Pair wise comparison chart, Introduction to mechatronics system, generation of multiple solution, Pugh Chart, Motor and battery sizing concepts. (22 Hrs)
Unit-IV	**Mechanisms** Basic Components of a Mechanism, Difference between speed and torque,

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	concept of velocity ratio, Degrees of Freedom or Mobility of a Mechanism, Various mechanisms like 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism. (7 Hrs)				
Textbooks/ Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	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.	Manuals and datasheets of respective software and hardware tools			

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. All Branches (Semester I)	
Course Code: ESC101 Course: C-Programming 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	**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.

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	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	Yashwanth 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

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. Circuit Branches (Semester I)	
Course Code: ESC104 Course: Basic Electrical Engineering 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

Prerequisite	Knowledge of Physics and Mathematics of 12th Standard
Objectives	1. To introduce fundamental concepts, various laws-principles and theorems associated with electrical systems. 2. To impart basic knowledge of all electrical quantities such as current, voltage, power, energy, frequency. 3. To impart knowledge about fundamental parameters such as resistance, inductance and capacitance and magnetic circuits, AC and DC circuits. 4. To impart knowledge of the concepts of transformer, different energy conversions techniques
Unit-I	Introduction Effect of temperature on resistance, Resistance temperature coefficient, Work, Power energy and relationship between Thermal, mechanical, and electrical units. (Problems based on above topics) (6 Hrs)
Unit-II	D.C. Networks series-parallel combination of network, Star-delta transformation, Kirchhoff's law, Loop and nodal analysis, Superposition Theorem, The venin's, maximum power transfer theorem (6 Hrs)
Unit-III	Magnetic Circuits BH Curve, expression for eddy current loss, series magnetic circuits, Inductance, self-inductance, mutual inductance and emf induced due to

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	self and mutual inductance, coefficient of coupling energy stores. (6 Hrs)
Unit-IV	A.C. Circuits Sinusoidal voltage and current waveforms, RMS and average value, R-L, R-C, RLC series parallel circuits, phaser diagram, power and power factor, series, and parallel resonance. (6 Hrs)
Unit-V	Three Phase Balanced System, Three phase voltage generation and waveform star and delta balanced systems, Relationship between phase and line quantities, phaser diagram, power in a three-phase circuit (6 Hrs)
Unit-VI	Single phase transformer Construction, principle of operation, emf equation, Types, Ideal Transformer, Vector diagrams at no load, Turns /Voltage/ Current ratio, Efficiency and Regulation of Transformer, Applications in the field. (6 Hrs)

Textbooks/ Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Electrical Technology Vol.I&II	B. L. Thereja	S. Chand Publishing	24th Edition
2.	Basic Electrical Engineering	J.B. Gupta	Katsons Books,	14th Edition
3.	Basic Electrical Engineering	V.K.Mehta	S. Chand Publishing	2nd Edition
4.	ABC of Electrical Engineering	B.L.Thereja A.K.Thereja	S. Chand Publishing	1st Edition
5.	Basic Electrical Engineering	E.Huges	Mc-GrawHill	10th Edition

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Syllabus of F. Y. B. Tech. Circuit Branches (Semester I)

Course Code: ESC154	Credits: 3-0-0
Course: Basic Electronics 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	Basic Sciences
Objectives	1. To give knowledge of some electronic devices and Rectifier circuits. 2. To understand configuration of operational amplifier and know its applications. 3. To study Logic gates and their usage in digital circuits. 4. To expose the students to working of transducers and their applications. 5. To introduce basic aspects of Electronic Communication Systems.
Unit-I	**Semiconductor Diodes and its Applications**: Semiconductor and its types, PN Junction Diode, Zener Diode, LED 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-II	**Semiconductor devices and its applications:** BJT:-Types, Configurations, characteristics and Applications as an amplifier and as a switch. FET- Types, characteristics, and applications MOSFET- Types, characteristics. (6 Hrs)
Unit-III	**Introduction to Operational Amplifier:** Block diagram of Operational Amplifier, Inverting and Non-Inverting Configuration and parameters, Ideal Characteristics, Op-Amp as Summing amplifier,

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	Difference amplifier, Integrator, Differentiator and Comparator (6 Hrs)
Unit-IV	**Digital Circuit:** Basic logic gates, Universal logic gates, Boolean algebra, Introduction to Combinational and Sequential Circuits, working of Half Adder, Full Adder, Multiplexer, De-multiplexer & basic memory element-SR-Flip-Flop. (6 Hrs)
Unit-V	**Transducers**: Definition, Classification of Transducers, Operation of Transducers –Temperature Measurement -RTD, Thermocouple, Thermistor, Pressure measurement-Strain Gauge, Displacement measurement - LVDT (6 Hrs)
Unit-VI	**Basics of Communication system:** The elements of a Communication System, Transmission Media, Need of Modulation & its types, Introduction to Mobile Communication (6 Hrs)

Textbooks/ Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Principles of Electronics	V.K. Mehta	S. Chand Publishing	12th Edition
2.	Modern Digital Electronics	R. P. Jain	Tata Mc-Graw Hill	3rd Edition
3.	Electronics Instrumentation	H. S. Kalasi	Tata Mc-Graw Hill	2nd Edition
4.	Linear Integrated Circuit and operational amplifier	Ramakant Gaikwad	Pearson Education	4th Edition.
5.	Electronics Communication System	George Kenedy	Tata Mc-Graw Hill	4th Edition.

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

Course Code: BSC102 Course: Open Elective-I: Engineering Physics 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 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 undergraduatesextensively 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)

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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

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	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 Textbook of Engineering Physics	M. N. Avadhanulu P. G. Kshirsagar	S. Chand & Co.	7th Edition
2.	A Textbook 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-	B. D. Cullity	Addison-Wesley	1st Edition

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		ray Diffraction		Metallurgy Series	
	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/			

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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

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	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	Shelly, Oberi and	Cingage	1st Edition

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		Chemistry	Malik	Publication	
	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/			

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. All Branches (Semester I)	
Course Code: BSC104 Course: Open Elective-I: Biology for Engineers 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	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

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	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

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. All Branches (Semester I)	
Course Code: ESC201 Course: Lab-I: C Programming Teaching Scheme: Practical:02Hrs/week	Credits: 0-0-1 End Semester Examination/Oral: 25 Marks

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

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	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.

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Ad-hoc Board of Studies

Faculty of Science & Technology Syllabus of F. Y. B. Tech. Circuit Branches (Semester I)	
Course Code: ESC207 Course: Lab-II: Basic Electrical Engineering Teaching Scheme: Practical: 02Hrs/week	Credits: 0-0-1 End Semester Examination/Oral: 25 Marks

List of Practical	**Any 10 practical to be conducted** 1. To Study of the accessories to be used in house hold wirings and awisness of electric safety. 2. i)To understand the Concept of Phase, Neutral & Earthling in Electrical Installation. ii) Single Lamp controlled by singles witch circuit. 3. To Study & Demonstrate circuit of Fluorescent Tube Light. 4. To Study & Demonstrate Staircase Wiring. To study& understand the importance of Series Lamp. 5. To Verify Ohm's Law. 6. To verify Superposition Theorem. 7. To verify The venin's Theorem. 8. To study the R-L-C series circuit. 9. To verify the Voltage Ratio of single-phase Transformer. 10. To verify power in Star/Delta Circuits (resistive load) by measuring voltage and current by ammeter and voltmeter is same in both thecae. 11. To calculate Efficiency & Regulation of single-phase Transformer.

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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Syllabus of F. Y. B. Tech. Circuit Branches (Semester I)

Course Code: ESC254 Course: Lab-II: Basic Electronics Engineering Teaching Scheme: Practical: 02 Hrs/week	Credits: 0-0-1 End Semester Examination/Oral: 25 Marks

List of Practical	**Any 10 practical to be conducted** 1. To study characteristics of Semiconductor diode. 2. To study Half wave and Full Wave Rectifier. 3. To Plot the characteristics of BJT in CE configuration. 4. To study Application of Opamp as an adder. 5. To study Application of Opamp as a subtractor 6. To study Use of opamp as an integrator and differentiator. 7. To study logic gate application as a Half adder. 8. To study logic gate application as a Full adder 9. To study Multiplexer. 10. To study application of Strain gauge as a weighing machine. 11. To study use of LVDT for displacement measurement 12. Implementation and testing of circuits like amplifier, Power supply on bread board.

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

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. Polari meter: 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.

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

List of Practical	**Any 10 practical to be conducted** 1. Lab safety experiment (Only as introduction) 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.

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

List of Practical	1. Bio safety 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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Syllabus of F. Y. B. Tech. All Branches (Semester I)

Course Code: ESC204 Course: Lab-IV: Workshop Teaching Scheme: Practical: 02 Hrs /week	Credits: 0-0-1 Teachers Assessment: 25 Marks

Objectives	i) To have hands on practice and understanding of fitting process and tools. ii) To have hands on practice and understanding of smithy process and tools. iii) To have hands on practice and understanding of sheet metal process and tools.	
	Section	**Contents**
	Fitting	**i) Study of different tools of fitting & processes involved in fitting.** **Workshop Diary** – Draw sketches and description of fitting tools and sketches of the job. **Practical** - One composite job involving simple fitting operation like sawing, marking, filling & tapping operation: minimum one job. (Male – female fitting)
	Black Smithy	ii) **Study of different smithy tools & processes.** **Workshop diary** – Draw sketches and description of smithy tools and sketches of the job. **Practical** - Preparation of one job making round cross section to square bar.
	Sheet metal working	**iii) Study of different sheet metal tools.** **Workshop diary** - Sketches and description of sheet metal tools and sketches of the job. **Practical** - One job involving development of surfaces, marking on sheet metal cutting, bending, joint preparation by folding.

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

Course Code: ESC208	Credits: 0-0-1
Course: Lab-V: Simulation Lab	Teachers Assessment: 25 Marks
Teaching Scheme: Practical: 02 Hrs/week	End Semester Examination/Oral:25 Marks

1	Introduction to Simulation, Need of Simulation, Types of Simulation, Applications of Simulation. Execute a simulation of Dice Game between two players using Microsoft Excel. Hint: Step 1: Open Excel Step 2: use function rand() to generate a random number for player 1 Step 3: use function rand() to generate a random number for player 2 Step 4 : Declare the winner by finding highest number Tip: You can also use rand(x) to declare x random numbers and then make addition for each player.
2	To study the steps for building Simulation Model, Formulating the problem, developing a logical model, specifying probabilistic assumptions, Implementing the model Create a Forecast worksheet using Microsoft Excel to predict stock value of a share. Hint: Step 1: Open Excel Step 2: Type date series in one column Step 3: Type current share value for each date Step 4: Go to Data-> Forecast Sheet Step 5: Select the Date of Forecast Step 6: Note down Forecast, Lower Confidence Bound, Upper Confidence Bound.
3	To study the applications of simulation in Basic Sciences, Mathematics, Computer Engineering, Electronics & Electrical Engineering and Artificial Intelligence. Create different 3D animation models using Windows.10 built in 3D Viewer software for

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	a Bee.
4	To study the application of simulation in Civil Engineering/ Architecture/ Home interior design modeling. Explore various methods to change texture/style/design and materials in simulation. Download and install any 2 Interior Designing freeware. Use given tools and menus for SweetHome3D-6.6-windows or similar software and design a room.
5	To create a graphical simulation model using Microsoft Windows tool Paint- 3D. Draw a real-world scenario using various objects and shapes.
6	To implement simulation of an electric circuit using Circuit Simulation Software. Hint: Step 1: go to https://www.circuitlab.com/editor/# Step 2: Drag and drop various components from the menu. Step 3: Design any simple circuit such as LED indicator or Switch alarm Step 4: Simulate the circuit Step 5: Export the designed circuit in .pdf format
7	Case Study : MATLAB 2021a SIMULINK Write in details the details of MATLAB Simulink including various features, functions, simulations and tools.
8	Case Study: GNU Octave. Write in details the details of GNU Octave including various features, functions, simulations and tools.
9	Case Study: Fusion 360. Write description of Fusion 360 simulator for electronics and CAD/CAM along with various features.
10	Mini-project: Plan, Design, Model and Simulate any one of the above tools to show simulation of any real life problem related to Electronics Engineering /Computer Engineering/ Mechanical Engineering/ Artificial Intelligence/ Civil Engineering/ Art Design and Graphics etc.

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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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Basic Sciences and Humanities

Faculty of Science & Technology

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

Course Code: HSM201 Course: Lab-VI: Communication Skills Teaching Scheme: Practical:02 Hrs/week	Credits: 0-0-1 Teacher Assessment: 25 Marks

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

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	2.	Professional Communication Skills	A. K. Jain, Pravin, S. R. Bhatia, A. M. Sheikh	S. Chand & Company Ltd.	2018
	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.

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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.

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

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

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. All Branches (Semester I)	
Course Code: ESC206 Course: Mandatory Non-Credit 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 (In exhaustive) 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

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	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)				
References	**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

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 II)

Course Code: BSC151 Course: Statistics and Integral Calculus Teaching Scheme: Theory: 03 Hrs/week Tutorial: 01 Hr/week	Credits: 3-1-0 Mid Semester Examination-I: 15 Marks 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	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**

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	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	7thEdition
7.	Advanced	C. R. Wylie &	Mc Graw Hill	6th Edition

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		Engineering Mathematics	Barrett	Publishing Company Ltd	
	8.	Advanced Engineering Mathematics	M. D. Greenberg	Pearson Education	2nd Edition

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. All Branches (Semester II)	
Course Code: ESC151 Course: Python Programming Teaching Scheme: Theory: 03 Hrs / week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks 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)

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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)

Textbooks/ Reference Books

Sr. No.	Title	Author	Publication	Edition
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

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. Circuit Branches (Semester II)	
Course Code: ESC104 Course: Basic Electrical Engineering 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

Prerequisite	Knowledge of Physics and Mathematics of 12th Standard
Objectives	5. To introduce fundamental concepts, various laws-principles and theorems associated with electrical systems. 6. To impart basic knowledge of all electrical quantities such as current, voltage, power, energy, frequency. 7. To impart knowledge about fundamental parameters such as resistance, inductance and capacitance and magnetic circuits, AC and DC circuits. 8. To impart knowledge of the concepts of transformer, different energy conversions techniques
Unit-I	Introduction Effect of temperature on resistance, Resistance temperature coefficient, Work, Power energy and relationship between Thermal, mechanical, and electrical units. (Problems based on above topics) (6 Hrs)
Unit-II	D.C. Networks series-parallel combination of network, Star-delta transformation, Kirchhoff's law, Loop and nodal analysis, Superposition Theorem, Thevenin's, maximum power transfer theorem (6 Hrs)
Unit-III	Magnetic Circuits BH Curve, expression for eddy current loss, series magnetic circuits, Inductance, self-inductance, mutual inductance and emf induced due to self and mutual inductance, coefficient of coupling energy stores. (6 Hrs)

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Unit-IV	A.C. Circuits Sinusoidal voltage and current waveforms, RMS and average value, R-L, R-C, RLC series parallel circuits, phaser diagram, power and power factor, series, and parallel resonance. (6 Hrs)
Unit-V	Three Phase Balanced System ,Three phase voltage generation and waveform star and delta balanced systems, Relationship between phase and line quantities, phaser diagram, power in a three-phase circuit (6 Hrs)
Unit-VI	Single phase transformer Construction, principle of operation, emf equation, Types, Ideal Transformer, Vector diagrams at no load, Turns /Voltage/ Current ratio, Efficiency and Regulation of Transformer, Applications in the field. (6 Hrs)

Textbooks/ Reference Books

Sr. No.	Title	Author	Publication	Edition
6.	Electrical Technology Vol. I & II	B.L.Thereja	S. Chand Publishing	24th Edition
7.	Basic Electrical Engineering	J.B. Gupta	Katsons Books,	14th Edition
8.	Basic Electrical Engineering	V.K. Mehta	S.Chand Publishing	2nd Edition
9.	ABC of Electrical Engineering	B.L.Thereja A.K.Thereja	S.Chand Publishing	1st Edition
10.	Basic Electrical Engineering	E.Huges	Mc-GrawHill	10th Edition

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. Circuit Branches (Semester II)	
Course Code: ESC154 Course: Basic Electronics Engineering 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

Prerequisite	Basic Sciences
Objectives	6. To give knowledge of some Electronic devices and Rectifier circuits. 7. To understand configuration of operational amplifier and know its applications. 8. To study Logic gates and their usage in digital circuits. 9. To expose the students to working of transducers and their applications. 10. To introduce basic aspects of Electronic Communication Systems.
Unit-I	**Semiconductor Diodes and its Applications**: Semiconductor and its types, PN Junction Diode, Zener Diode, LED 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-II	**Semiconductor devices and its applications:** BJT:-Types, Configurations, characteristics and Applications as an amplifier and as a switch. FET- Types, characteristics, and applications MOSFET- Types, characteristics. (6 Hrs)
Unit-III	**Introduction to Operational Amplifier:** Block diagram of Operational Amplifier, Inverting and Non-Inverting Configuration and parameters, Ideal Characteristics, Op-Amp as Summing amplifier,

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	Difference amplifier, Integrator, Differentiator and Comparator (6 Hrs)				
Unit-IV	**Digital Circuit:** Basic logic gates, Universal logic gates, Boolean algebra, Introduction to Combinational and Sequential Circuits, working of Half Adder, Full Adder, Multiplexer, De-multiplexer & basic memory element-SR-Flip-Flop. (6 Hrs)				
Unit-V	**Transducers**: Definition, Classification of Transducers, Operation of Transducers –Temperature Measurement -RTD, Thermocouple, Thermistor, Pressure measurement-Strain Gauge, Displacement measurement - LVDT (6 Hrs)				
Unit-VI	**Basics of Communication system:** The elements of a Communication System, Transmission Media, Need of Modulation & its types, Introduction to Mobile Communication (6 Hrs)				
Textbooks/ Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1.	Principles of Electronics	V.K. Mehta	S.Chand Publishing	12th Edition
	2.	Modern Digital Electronics	R.P.Jain	TataMc-Graw Hill	3rd Edition
	3.	Electronics Instrumentation	H. S. Kalasi	TataMc-Graw Hill	2nd Edition
	4.	Linear Integrated Circuit and operational amplifier	Ramakant Gaikwad	Pearson Education	4th Edition.
	5.	Electronics Communication System	George Kenedy	TataMc-Graw Hill	4th Edition.

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Faculty of Science & Technology Syllabus of F. Y. B. Tech Circuit Branches (Semester II)	
Course Code: ESC155 Course: Mobile Application Development 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. Student should be able to understand the basic concepts of Android Operating System. 2. Students should be able to develop App Developing Skills for mobiles, tablets
Unit-I	Introduction to Android Operating System, Open Handset Alliance, Android Ecosystem. Need and features of Android, tools and software required for developing an Android Application. Android Architecture (6 Hrs)
Unit-II	Java SDK, Android Development Tools, Android Virtual Devices, Emulators, Dalvik Virtual Machines, Steps to install Android Studio and SDK (6 Hrs)
Unit-III	Control Flow, Directory Structure, components of a screen, fundamental UI Design, Linear Layout, Relative Layout (6 Hrs)
Unit-IV	Text View, Edit Text, Button, Image Button, Radio Button and Radio Group, Progress Bar, Image View (6 Hrs)
Unit-V	Activity Lifecycle, Android System Architecture, Content Provider. Service: lifecycle. (6 Hrs)
Unit-VI	Declaring and using Permissions, Using Custom Permissions. Application Deployment: Signing of an Application, Deploying app on Google Playstore, Developer Console. (6 Hrs)

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Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Composing Mobile Apps	Anubhav Pradhan, Anil V Deshpande	Wiley	1st Edition
	2.	Android App Development for Dummies	Michael Burton	Wiley	3rd Edition
	3.	Head First Android Development: A Brain-Friendly Guide	Dawn Griffiths	O'Reilly	2nd Edition
Websites and online courses	1.	https://developer.android.com/			
	2.	https://www.coursera.org/learn/java-for-android			
	3.	https://www.youtube.com/channel/UCkCaPptq2BUjlkAfnmaY8Nw			

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. All Branches (Semester II)	
Course Code: BSC102 Course: Open Elective-I: Engineering Physics 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 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 undergraduatesextensively 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)

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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

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	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)

References

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	B. D. Cullity	Addison-	1st

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		Diffraction		Wesley Metallurgy Series	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/			

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. All Branches (Semester II)	
Course Code: BSC103 Course: Open Elective-II: 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

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	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

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	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/			

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. All Branches (Semester II)	
Course Code: BSC104 Course: Open Elective-I: Biology for Engineers 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	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

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	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

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. All Branches (Semester II)	
Course Code: ESC251 Course: Lab-I: Python Programming Teaching Scheme: Practical: 02Hrs/week	Credits: 0-0-1 Teacher Assessment: 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 to be conducted** 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.

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Basic Sciences and Humanities

Faculty of Science & Technology Syllabus of F. Y. B. Tech. Circuit Branches (Semester II)	
Course Code: ESC207 Course: Lab-II: Basic Electrical Engineering Teaching Scheme: Practical: 02Hrs/week	Credits: 0-0-1 End Semester Examination/Oral: 25 Marks

List of Practical	**Any 10 practical to be conducted** 1. To Study of the accessories to be used in house hold 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 circuit of Fluorescent Tube Light. 4. To Study & Demonstrate Staircase Wiring. To study & understand the importance of Series Lamp. 5. To Verify Ohm's Law. 6. To verify Super position Theorem. 7. To verify the venin's Theorem. 8. To study the R-L-C series circuit. 9. To verify the Voltage Ratio of single-phase Transformer. 10. To verify power in Star/ Delta Circuits (resistive load) by measuring voltage and current by ammeter and voltmeter is same in both the case. 11. To calculate Efficiency & Regulation of single-phase Transformer.

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Faculty of Science & Technology Syllabus of F. Y. B. Tech. Circuit Branches(Semester II)	
Course Code: ESC254 Course: Lab-II: Basic Electronics Engineering Teaching Scheme: Practical: 02 Hrs/week	Credits: 0-0-1 End Semester Examination/Oral: 25 Marks

List of Practical	**Any 10 practical to be conducted** 13. To study characteristics of Semiconductor diode. 14. To study Halfwave and Full Wave Rectifier. 15. To Plot the characteristics of BJT in CE configuration. 16. To study Application of Opamp as an adder. 17. To study Application of Opamp as a subtractor 18. To study Use of opamp as an integrator and differentiator. 19. To study logic gate application as a Half adder. 20. To study logic gate application as a Full adder 21. To study Multiplexer. 22. To study application of Strain gauge as a weighing machine. 23. To study use of LVDT for displacement measurement 24. 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.

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Faculty of Science & Technology Syllabus of F. Y. B. Tech Circuit Branches (Semester II)	
Course Code: ESC255 Course: Lab-III: Mobile Application Development Teaching Scheme: 02 Hrs/week	Credits: 0-0-1 End Semester Examination/Oral: 25 Marks

List of Practical	**Any 10 practical to be conducted** 1. Compare various Operating System with Android Operating System 2. Install Java Development Kit (JDK), Android Studio and Android SDK 3. Develop an application to display HelloWorld 4. Develop an application to implement Text View, Button and Edit Text 5. Develop an application to implement Radio Button & Progress Bar 6. Develop an application to implement Linear Layout and Relative Layout 7. Develop an application to implement Date and Time Picker 8. Develop an application to implement custom Toast Alert 9. Develop an application to implement Calculator 10. Develop an application to implement Content Provider 11. Develop an application to Send SMS 12. Develop an application with login module to check username and password. On successful login open another activity with welcome message otherwise show invalid login.

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

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

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

List of Practical	**Any 10 practical to be conducted** 1. Lab safety experiment (Only as introduction) 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.

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

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 II)	
Course Code: HSM101-B Course: Engineering Exploration-II Teaching Scheme: Practical: 02Hrs/week	Credits: 0-0-1 Teacher Assessment: 10 Marks Continuous Internal Evaluation: 20 Marks Oral Examination (Project): 20 Marks

Objectives	• To make student understand the role of an Engineer as a problem solver. • To introduce sustainability perspectives. • To get students familiar with engineering project management skills. • To make students explore different aspects of platform-based development.
Unit-I	**Platform based development** Introduction to various platforms, platform-based development (Arduino) programming and its essentials, Introduction to sensors, transducers and actuators and its interfacing with Arduino microcontroller. (16 Hrs)
Unit-II	**Project Management** Introduction to Agile practices, Significance of team work, Importance of communication in engineering profession, Project management tools: Checklist, Timeline, Gantt Chart, Significance of documentation. (3 Hrs)
Unit-III	**Data Acquisition and Analysis** Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of Microsoft Excel tool for descriptive statistics, Data Acquisition (Temperature and humidity) using Sensors interfaced with Arduino, Exporting acquired data to Microsoft Excel and analysis using visual representation. (4 Hrs)

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Unit-IV	**Sustainability in Engineering** Introduction to sustainability, Sustainability leadership, Life cycle assessment, carbon foot print. (1 Hr)				
Textbooks/ Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	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	5thEdition
	3	Theory of Machines	S. S. Rattan	McGraw Hill Publication	4thEdition
	4	Getting Started with Arduino	Massimo Banzi	O'Reilly	1stEdition
	5	Project Management Methodologies and Framework	-	Active.collab	1stEdition
	6	Manuals and datasheets of respective software and hardware tools			

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

Course Code: HSM252

Course: Mandatory Non-Credit Course (Language Proficiency-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

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		- 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

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

Code No.: HSM253

Course: Mandatory Non-Credit Course (Language Proficiency-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)

	Sr. No.	Title	Author	Publication	Edition
List of Reference Books	1	Japanese Kanji for Beginners	Timothy G. Stout and Kaori Hakone	Tuttle Publishing	2017

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	2	Essential Japanese Grammar: A Comprehensive Guide to Contemporary Usage	Masahiro Tanimori and Eriko Sato Ph.D.	Tuttle Publishing	2012
	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

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