ENERGY INSTITUTE, BENGALURU
Centre of
RAJIV GANDHI INSTITUTE OF PETROLEUM TECHNOLOGY, JAIS
(An Institute of National Importance Established Under Act of Parliament)

List of short-listed candidates for written test and/or interview for possible admission in M. Tech. Programmes at **Energy Institute, Bengaluru** in Odd Semester, Academic Session 2021-22

Discipline: Renewable Energy

S. NO	RGIPT REG NO	CANIDATE'S NAME	GATE / NON GATE
1	2117104	ABHISHEK RANJAN	NON GATE
2	2117335	ADITHYA VYASAN A	NON GATE
3	2117463	ADITYA KASHYAP	GATE
4	2117068	AKASH MANOHAR	NON GATE
5	2117282	ANISH ANAND	NON GATE
6	2117333	ANJANA SOMASUNDARAN	NON GATE
7	2117165	ARNAB PANDIT	NON GATE
8	2116031	AYESHA KHAN	NON GATE
9	2116670	B JASWANT	NON GATE
10	2117754	B NAGARJUNA VIJAY	NON GATE
11	2117700	BIRSAN BASUMATARY	NON GATE
12	2117109	CHIDAMBARAM C	NON GATE
13	2117227	DEBAYAN BHAUMIK	NON GATE
14	2116610	DEBMALYA SADHU	NON GATE
15	2116406	DEEPAK R	NON GATE
16	2117076	DEEPESH MARAM	NON GATE
17	2116619	DEVESH SINGH	NON GATE
18	2117093	DHRUV RAJ BAGRI	GATE
19	2116698	DIPANKAR SARKAR	NON GATE
20	2116740	FARHANA YASMIN AHMED	NON GATE
21	2117207	G RAVI	NON GATE
22	2115691	GOSWAMI MANU ADITYA	NON GATE
23	2117525	GRASHIN C JOY	NON GATE
24	2115998	HARSHVARDHAN ARYA	NON GATE
25	2116935	HRIDAY RAJ DEKA	NON GATE
26	2116793	JAANVI GARG	NON GATE
27	2116648	JIBAN NATH PRADHAN	NON GATE
28	2115952	KALIDAS P	NON GATE
29	2115763	KAMAROUTHU NAGA UPENDRA	GATE
30	2115684	KARAN KUMAR	NON GATE
31	2116959	KESANA PHANIDHAR	GATE

32	2117108	KUMARESH	NON GATE
33	2117244	KUSHAL N	NON GATE
34	2116454	LAXMIPRIYA SWAIN	NON GATE
35	2117689	MOHD NAQUEEB SHAAD JAGIRDAR	NON GATE
36	2117193	MOHITE AVADHOOT ABASO	NON GATE
37	2117829	MOUSUMI PRADHAN	NON GATE
38	2116704	PRADYUMN GUPTA	GATE
39	2115996	PRATIK KUMAR	NON GATE
40	2117153	PRATYUSH ANAND	GATE
41	2117968	RAMA VYSHNAVI	NON GATE
42	2116510	RAMACHANDRA K M	NON GATE
43	2116279	RAVI PRAKASH GAUTAM	NON GATE
44	2116870	RITIKA PATHANIA	GATE
45	2117967	S SURESH	NON GATE
46	2116498	SACHIN SURESH KARANT	NON GATE
47	2117249	SAGAR N K	NON GATE
48	2117150	SAIKAT CHAKRABORTY	NON GATE
49	2116919	SANDEEP KUMAR	NON GATE
50	2117056	SANGAMESH PANI	NON GATE
51	2117376	SANJAY KUMAR GUPTA	GATE
52	2117168	SATYAM KUMAR TIWARI	GATE
53	2116608	SHAIK ELIYAS BASHA	NON GATE
54	2116371	SHAYAN MAL	NON GATE
55	2116944	SHUBHANKAR SINGH	GATE
56	2116241	SIDDHANT PUJARI	GATE
57	2116462	SOUMAK BHATTACHARYA	NON GATE
58	2116939	SOUMYA MUKHERJEE	NON GATE
59	2117334	SREELAKSHMI E K	NON GATE
60	2116448	SRUTHAKEERTHI P	GATE
61	2116323	SUBASH SAHOO	NON GATE
62	2117857	SUNIL M S	NON GATE
63	2117698	SURAJ KONWAR	NON GATE
64	2117569	TARWATKAR RAJAT HARISHCHANDRA	GATE
65	2116002	TEJASWINI N V	NON GATE
66	2116199	THAMMADI STANLY RAHUL	GATE
67	2117629	TRISHILA PANIGRAHI	GATE
68	2117065	VISHWANATHA B V	NON GATE

Discipline: Electric Vehicle Technology

S. NO	RGIPT REG NO	CANIDATE'S NAME	GATE / NON GATE
1	2117615	ABHINAND N S	NON GATE
2	2116206	ABHINAY PANDEY	GATE
3	2117737	ABHISHEK CHAURASIA	NON GATE
4	2117874	ADITYA GUPTA	NON GATE
5	2117047	ADITYA SHARMA	NON GATE
6	2116283	AISWARYA S SHAJI	NON GATE
7	2116397	AJIN SAMUEL ROY	NON GATE
8	2117132	AKASH VIKRAM	GATE
9	2117826	AKSHAY BASTIN	NON GATE
10	2116412	ALOK KUMAR CHAUDHARY	NON GATE
11	2116352	ANANTHSHREE M	NON GATE
12	2116515	ANISH ANAND	NON GATE
13	2116553	ANKIT YADAV	NON GATE
14	2116363	ANOMITRA SARKAR	NON GATE
15	2117006	ARUN SANDWAL	NON GATE
16	2117606	ASWIN SIVADAS	NON GATE
17	2117599	ATHUL L	NON GATE
18	2116830	AVANISH PRATAP SINGH	NON GATE
19	2116053	AVIK MAJUMDER	NON GATE
20	2116339	BHABATOSH SENAPATI	NON GATE
21	2117859	BHARGAB NATH	NON GATE
22	2117771	BONASHREE GOGOI	NON GATE
23	2116930	BOYA VEERESH	NON GATE
24	2117032	BRAJESH KUMAR AHIRWAR	NON GATE
25	2117078	DEEPAK KUMAR	NON GATE
26	2117483	DEVANAND C T	NON GATE
27	2116880	DHANANJAY	GATE
28	2116989	DHONDDEV RUSHIKESH RATNAKARRAO	NON GATE
29	2116100	DIPYAMAAN MONDAL	GATE
30	2117425	DIWANSHU JAIN	NON GATE
31	2116964	G PONSANJAY	NON GATE
32	2116530	GAIKWAD SHUBHAM SURESH	GATE
33	2116950	GAURAV KUMAR SHARMA	NON GATE
34	2117403	GAUTAM PAUL	GATE
35	2117898	GAWADE SANKET SURESH	NON GATE
36	2117784	GIRBAN VACHYAS	NON GATE
37	2117772	GIRIRAJ KISHOR PATHAK	GATE
38	2116096	GUGULOTHU SAIKIRAN	NON GATE
39	2116898	HARSH RAJ	NON GATE

40	2116857	HEMANT TAMANG	NON GATE
41	2116078	HIMANI TIWARI	NON GATE
42	2116471	HIMANSHU LADHIYA	NON GATE
43	2116444	JAANVI GARG	NON GATE
44	2117575	JAYASOORYA J S	NON GATE
45	2116649	JIT MONDAL	GATE
46	2115791	JOOPALLI AKHILESH	GATE
47	2117511	JOTISH JOHN A	NON GATE
48	2117945	JUGMITA PATGIRI	NON GATE
49	2116960	K HARIPRASAADH	NON GATE
50	2117780	KARTIK SURESH SHIGLI	NON GATE
51	2116247	KEERTHI NANDAN	NON GATE
52	2117128	KRISHNA KANHAIYA SINGH	GATE
53	2117360	KUSHAL N	NON GATE
54	2117807	MANISH	NON GATE
55	2117255	MAYANK BAGHEL	NON GATE
56	2116918	MOHAMED SAMEER PASHA	NON GATE
57	2116264	NAGAVELLI HEMANTH KUMAR	GATE
58	2115877	NAMANA A R	NON GATE
59	2117491	NEERAJ M M	NON GATE
60	2117761	NEKIB ALI	NON GATE
61	2117724	NILESH GUPTA	GATE
62	2116056	NOUSHAD HOSSAIN	NON GATE
63	2116893	POOJA VISHWAKARMA	NON GATE
64	2117748	PORATE AKSHAY AJAYRAO	GATE
65	2117630	PRADYUMN GUPTA	GATE
66	2117016	PRATEEK TRIPATHI	NON GATE
67	2117782	PREKSHA VERMA	NON GATE
68	2117614	RAJAT VERMA	NON GATE
69	2115714	RANJEET KUMAR	NON GATE
70	2117591	RATUL CHAKRABORTY	NON GATE
71	2116034	RITHIKA SHENOY	NON GATE
72	2116291	SALONI SURENDRA AWAGHADE	NON GATE
73	2117799	SANDESHA	NON GATE
74	2117140	SANGAMESH PANI	NON GATE
75	2117126	SARAN S NAIR	NON GATE
76	2117650	SAROJ KUMAR SAHOO	NON GATE
77	2116297	SARVESH S N	NON GATE
78	2117759	SHILPASHREE M A	NON GATE
79	2116721	SINGHAN GANGULY	NON GATE
80	2117750	SOUMEN HAZRA	NON GATE
81	2117105	SOURAV BANERJEE	GATE
82	2115750	SOWMYA POCHE	NON GATE
83	2116624	SRINIVAS SEN	NON GATE
84	2116493	SRUJAN UR	GATE

85	2117820	SUDHANSHU KUMAR	GATE
86	2117071	SUJEET KUMAR	NON GATE
87	2117130	SUNIL KUMAR KUSHWAHA	NON GATE
88	2116276	SWARANKAR ADITYA UMESHKUMAR	NON GATE
89	2116119	TALLURI ABHISHEK	NON GATE
90	2117149	TUSHAR V SAPATE	NON GATE
91	2116337	VEKA SRI G	NON GATE
92	2116897	VIKASH KUMAR	NON GATE
93	2117431	VISHNU LAL A M	NON GATE
94	2117143	VISHWANATHA B V	NON GATE

Discipline: Energy Science and Technology

S. NO	RGIPT REG NO	CANIDATE'S NAME	GATE / NON GATE
1	2116306	ADITI	NON GATE
2	2117410	AISHWARYA PRIYADARSINI	NON GATE
3	2116009	ALAGAMMAI PL	NON GATE
4	2116057	ALOK PRATAP SINGH	NON GATE
5	2116287	AMIT KUMAR	NON GATE
6	2115817	ANJALI CHAUHAN	NON GATE
7	2117657	ANKITHA K	NON GATE
8	2116567	ARSHAD AHAMED	NON GATE
9	2115890	ASHA RANI PATRA	NON GATE
10	2117953	B PADMAVATHY	NON GATE
11	2115742	B SANTHANA LAKSHMI	NON GATE
12	2117948	BENGULURI SURYA PRAKASH	NON GATE
13	2116938	CHOTIYAL MOHAMMED MAAZ BASHA	NON GATE
14	2117851	DEVANSH DATTATREYA	NON GATE
15	2116587	DINESH KUMAR K	NON GATE
16	2115754	GOMATHY K	NON GATE
17	2116518	HAMSA PRIYA S	NON GATE
18	2117307	KARAN KUMAR	NON GATE
19	2117852	KIRAN NAYAK	NON GATE
20	2115704	KM ARUNA PASWAN	NON GATE
21	2117387	KM MADHU PASWAN	NON GATE
22	2117171	KRISHNA PRIYA S	GATE
23	2115925	MANAS MISHRA	NON GATE
24	2117179	MANASH JYOTI DEKA	NON GATE
25	2117223	MANISH SINGH	GATE
26	2117884	MEGAVATH JAGADEESH NAIK	NON GATE
27	2116309	MOHAMMED FAREED RAHI	GATE
28	2117776	MOHIT DILIP BORSE	NON GATE

29	2116827	MUKUL KUMAR	NON GATE
30	2116052	NAYAN KISHORRAO JANGALE	NON GATE
31	2116881	NEERAJ KUMAR NISHAD	GATE
32	2116723	PALURU ROHIT	NON GATE
33	2117267	PRADYUM AGRAHARI	NON GATE
34	2116958	PRAVEEN BHARATHWAJ R	GATE
35	2115743	PRIYANKA	NON GATE
36	2117482	PRIYESH RANJAN	NON GATE
37	2117694	RAGAV K	NON GATE
38	2116846	RESHMA DEVI G	NON GATE
39	2117053	RISHABH MUDGAL	NON GATE
40	2117375	ROHIT KUMAR AGARWAL	NON GATE
41	2115683	SANJAY LAKRA	NON GATE
42	2115756	SATISHRAJAN MUTHURAJAN	NON GATE
43	2116163	SAURABH	GATE
44	2116564	SIBICHACKRAVARTHY C	NON GATE
45	2115881	SOUMYAJIT GHOSH	NON GATE
46	2117251	SRINIVAS ANANT KULKARNI	NON GATE
47	2117300	SRUJAN U R	GATE
48	2116812	SUNIL	NON GATE
49	2117389	UTKARSH GUPTA	GATE
50	2117038	UTKARSH NATH GARG	NON GATE
51	2117209	VYKUNTA PAVANKUMAR	NON GATE

FULL TIME - EXTERNAL

S. NO	RGIPT REG. NO.	CANDIDATE'S NAME	GATE / NON GATE
1	2117152	SHASHIKANT CHATURVEDI	GATE

Discipline: Power and Energy Systems Engineering

S. NO	RGIPT REG NO	CANIDATE'S NAME	GATE / NON GATE
1	2116779	AKASH MANOHAR	NON GATE
2	2116758	AMAN NAFEES	GATE
3	2116307	AMBIKA PRASAD DWIBEDY	GATE
4	2116364	ANOMITRA SARKAR	NON GATE
5	2115713	ARKA BAIRAGI	NON GATE
6	2116436	ASHWATHI S	GATE
7	2115832	ATIB ALI	GATE
8	2116411	CHANDAN MISHRA	NON GATE
9	2117597	ELDHO NAVEEN JOSE	GATE

10	2117695	GHANSHYAM KUMAR	NON GATE
11	2117037	GYANENDRA KUMAR SINHA	NON GATE
12	2117052	JAYNENDRA KUMAR SINHA	NON GATE
13	2116747	KUSHAGRA KUMAR	NON GATE
14	2117230	LOKESH SONKAR	GATE
15	2117798	MAYANK KUMAR SRIVASTAVA	NON GATE
16	2117066	NANNAWARE AKSHAY ISHWAR	NON GATE
17	2117018	P V SNEAYUSHEE	NON GATE
18	2117398	PRADEEP KUMAR YADAV	NON GATE
19	2116142	PREMANKUR MANDAL	GATE
20	2115809	RAJ CHAWLA	NON GATE
21	2117574	RAJAT VERMA	NON GATE
22	2116799	RIYA MAJEED P	NON GATE
23	2116806	ROHIT VERMA	NON GATE
24	2116997	SANCHIT VERMA	NON GATE
25	2116245	SANDHRA C	NON GATE
26	2116888	SARAVANA KUMAR K	NON GATE
27	2117823	SHASHI DIWAKER	NON GATE
28	2116606	SHIVANI S	NON GATE
29	2116344	SOUMYAJIT GHOSH	NON GATE
30	2116120	SOUVICK GOSWAMI	NON GATE
31	2116620	SUDIPTA GHOSH	NON GATE
32	2117704	SWATI JAIN	NON GATE
33	2116463	TARKESH KUMAR MAHATO	NON GATE
34	2116712	VHANKADE DINESH JAYRAM	NON GATE
35	2116886	YOGESHWAR	NON GATE

The above short listing has been done on the basis of information provided by the applicant. If at any stage the information provided by the applicant is found incorrect, the application is liable to rejection.

The candidates will appear for written test on 22nd July 2021 and the candidates qualifying the written test will appear for the interview. The detailed schedule of the written test and interview will be communicated to you soon.

The final selection will be based on performance in GATE Score, written test & Interview.

Tentative Syllabus for M. Tech. Admission at Energy Institute, Bengaluru

The M. Tech. students will be selected based on written test and interview comprising of General Ability Test (Technical +Aptitude/Reasoning + English).

The syllabus of the Basic Engineering Subjects common for all disciplines of M. Tech. programmes is given below:

Common for all M. Tech. Programmes at EIB

Section 1: Elementary Concepts: Prerequisite: Concept of Potential difference. Current and resistance. Ohm's law, effect of temperature on resistance, resistance temperature coefficient, insulation resistance. SI units of work Power and Energy. Conversion of energy from one form to another in electrical and thermal systems. D. C. Circuits (Only Independent sources) Kirchhoff's law, ideal and practical voltage and current sources. Mesh and Nodal analysis (Super node and super Mesh excluded). Source transformation. Star delta transformation. Superposition theorem, Thevevnins's theorem Norton's theorem, maximum power transfer theorem (Source transformation not allowed for superposition theorem, Mesh and Nodal analysis. A.C. Fundamentals: Sinusoidal voltage and currents, their mathematical and graphical representation, concept of cycle period, frequency, instantaneous, peak, average, r.m.s. values, peak factor, and form factor, phase difference, lagging, leading and in phase quantities and phasor representation. Rectangular and polar representation of phasors. Study of A.C circuits of pure resistance, inductance and capacitance and corresponding voltage- current phasor diagrams, voltage – current and power waveforms. Single phase and poly phase A. C. circuits: A) Single phase AC Circuits: Study of series and parallel R-L, R-C, R-L-C circuits, concept of impedance and admittance for different combinations, wave form and relevant voltage current phasor diagrams. Concept of active, reactive, apparent, complex power and power factor, resonance in series and parallel RLC circuit. Q- factor and band B) Polyphase AC circuits: Concept of three phase supply and phase sequence. Balanced and unbalanced loads voltage current and power relations in three phase balance star and delta loads and their phasor diagrams. Electromagnetism: A) Magnetic effect of electrical current cross and dot convention, right hand thumb rule and cork screw rule, nature of magnetic field of long straight conductor, concepts of solenoid and torrid. Concepts of m.m.f, flux, flux density, reluctance, permeability and field strength, their units and relationship. Simple series and parallel magnetic circuits., comparison between electrical and magnetic circuits, force on current carrying conductor placed in magnetic field, Fleming's left hand rule. B) Faraday's law of electromagnetic induction, Fleming's right hand rule, statically and dynamically induced EMF's self and mutual inductance coefficient of coupling, energy stored in magnetic field. C) Introduction to electrical AC DC Machines: Principles of operation and applications. Single phase transformer and electrostatics: A) Single phase transformers: Construction, principle of working, e.m.f equations, voltage and current ratios, losses, definition of regulation and efficiency, determination of these by direct loading method. Descriptive treatment of autotransformer. B) B) Electrostatics: electrostatic field, electric flux density, electric field strength, absolute permittivity, relative permittivity and capacitance, composite dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors and concept of time constant.

Section 2: Semiconductor Diode Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays. Bipolar Junction Transistor Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider

Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and analysis of single stage CE amplifier Field Effect Transistor Construction and Characteristic of JFETs. Transfer Characteristic. CS, CD, CG amplifier and analysis of CS amplifier MOSFET (Depletion and Enhancement) Type, Transfer Characteristic, Operational Amplifiers Introduction, Differential Amplifier Circuits, Op-Amp Basic, Practical Op-Amp Circuits (Inverting Amplifier, Noninverting Amplifier, Unit Follower, Summing Amplifier, Integrator, Differentiator). Differential and Common-Mode Operation Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage , current phase and frequency using CRO Fundamentals of Communication Engineering : Elements of a Communication System, Need of modulation, electromagnetic spectrum and typical applications, terminologies in communication systems, Basics of signal representation and analysis, Fundamentals of amplitude and angle modulation, modulation and demodulation techniques

Section 3: Thermodynamics: Nature and scope of thermodynamics; Basic concepts; Laws of thermodynamics- Discovery, Significance & Applications; Qualitative ideas on Entropy, Available energy, Irreversibility, Clausius Inequality, Principle of increase of entropy & Carnot engine; Limitations of Thermodynamics; Sources of power; history of power production;
power production in the future. **Thermal Engineering:** Historical development of steam engine, steam turbines, gas turbines and hydraulic turbines; Principle of turbomachinery; History of IC engines; two stroke and four strokeengines-working, applications; Air compressors- types and uses; Principles of Rocket propulsion, chemical rockets, Indian space programme. **Refrigeration & Air Conditioning:** History & scope of refrigeration; applications of refrigeration; Food preservation, refrigerated storage; applications in chemical and process industries; special applications; Air conditioning- Principles & systems; scope of air conditioning; Components of A/c systems, all-air and all-water A/c systems; Psychrometric properties of air; Human comfort; comfort standards. **Automobile & Aeronautical Engineering**: Introduction to an Automobile; history of the automobile; Indian Automobiles; Types of automobiles; Layout of an automobile; Major components and their functions; Manufacturers of motor vehicles in India; Fundamentals of aerodynamics; theory of lift and drag; aircraft engines-types and applications. **Mechanisms & Machines:** Introduction; Analysis and synthesis; terminology; definitions & assumptions; planar, spherical and spatial mechanisms, examples of mechanisms; mobility; classification of mechanisms; Grashof's law; mechanical advantage; Mechanical Engineering design; types of design; design considerations; types of loads; factor of safety; codes & standards; economics of design; reliability;
safety. **Manufacturing Engineering & Materials:** Introduction and history of materials and manufacturing; engineering materials; metals, alloys, composites, microstructures, heat treatment, physical properties of materials and material testing; methods of manufacturing; examples of manufactured products; Computer Integrated manufacturing; lean production & agile manufacturing; environmentally conscious design &
manufacturing; organization for manufacture.

Section 4: Relativistic Mechanics: Inertial & non-inertial frames, Michelson- Morley experiment, Einsteins postulates, Lorentz transformation equations, Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity, Mass energy equivalence. Modern Physics Wave Mechanics: Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation – particle in one dimensional potential box, Eigen values and Eigen function. Wave Optics Interference: Interference of light, Interference in thin films (parallel and wedge shaped film), Newton's rings. Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating. Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate. Modern Optics Laser: Spontaneous and stimulated

emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications. Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi-Mode Fibers Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography. Crystal Structures and X-ray Diffraction: Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Reciprocal Lattice, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Dielectric and Magnetic Properties of Materials: Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius MussotiEquation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications. Electromagnetic Theory Displacement Current, Equation of continuity, Maxwell's Equations (Integral and Differential Forms), Poynting theorem and Poynting vectors, EM - Wave equation and its propagation characteristics in free space, nonconducting and in conducting media, Skin depth. Physics of some Technologically important Materials Semiconductors: Band Theory of Solids, density of states, Fermi-Dirac distribution, free carrier density(electrons and holes), conductivity of semiconductors, Position of Fermi level in intrinsic and in extrinsic semiconductors. Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Superconductors. Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

Section 5: Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers. Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types. Number system : Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic. Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker. Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity. Fundamentals of C programming: Structure of C program, writing and executing the first C program, components of C language. Standard I/O in C. Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements. Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions. Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Structure, union, enumerated data types Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Section 6: Molecular orbital theory and its applications in diatomic molecules. Band theory of solids. Lequid crystals. Application of liquid crystals. Types of unit cell, space lattice (only cubes), Bragg's equation. Calculation of density of unit cell. One and two dimensional imperfections in solids. Structure and applications of Graphite and Fullerenes. Polymers, its classification and their applications. Chain and Step growth polymerization. Thermoplastic and Thermosetting resins. Elastomers and synthetic

fibres. Conducting and biodegradable polymers. General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization and catalysis. Stereochemistry with special reference to optical isomerism. Types of organic reactions with special reference to elimination and substitution reaction. Elementary ideas and simple applications of UV, Visible, IR and 1HNMR spectral Techniques. Hardness of water. Disadvantage of hard water. Techniques for water softening; Calgon, Zeolite, Lime-Soda, Ion exchange resin, Reverse osmosis. Water treatment method for boiler feed by internal process. Phase Rule and its application to one component system (water and sulphur). Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values. Biogas and Biomass. Cement and its application. Plaster of paris. Lubricant. Corrosion; causes and prevention.

Section 7: Differential Calculus - I Leibnitz's theorem, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates. Differential Calculus - II Taylor's and Maclaurin's Theorems, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications). Linear Algebra Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution,. Characteristic equation, Eigen values and eigen vectors, Cayley-Hamilton Theorem,A brief introduction to Vector Spaces,Subspaces. Rank & Nullity. Linear transformations. Multiple Integrals Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Volumes and Surface areas – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and applications. Vector Calculus Point function, Gradient,Divergence and Curl and their physical interpretations, Vector identities, Directional derivatives. Line,Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proofs). Differential Equations Linear differential equations of nth order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Normal form, Method of variation of parameters, Applications to engineering problems (without derivation). Series Solution and Special Functions Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials. Laplace Transform Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations. Fourier Series and Partial Differential Equations Periodic functions, Fourier series of period 2π, Euler's Formulae, Functions having arbitrary periods, Change of interval, Even and odd functions, Half range sine and cosine series, Harmonic analysis. Solution of first order partial differential equations by Lagrange's method, Solution of second order linear partial differential equations with constant coefficients. Applications of Partial Differential Equations Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Section 8: Nature of Environment Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle. Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel Impact of Human Activity on Environment Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth Social Issues Related to Environment– Sustainable development,

urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics Environmental Changes and Human Health Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution, Climate change– Greenhouse effect and global warming, acid rain, ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards Environmental Protection through Assessment and Education Indicators and Impact Assessment – Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring Environmental Protection– Role of individuals, organizations and government in pollution control Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection Environmental education–women and value education.

Section 9: General introduction to Civil Engineering - History of Civil Engineering- Relevance of Civil Engineering in the overallinfrastructural development of the country. Types and classification of structures - buildings, towers, chimneys, bridges, dams, retaining walls, water tanks, silos, roads, railways, runways and pipelines (Brief description only) Definition and types of buildings as per National Building Code of India (brief description only). Selection of site - Components of a building and their functions - Setting out of a building. Stones: Classification of stones - Qualities of good building stones -Quarrying - Dressing - Tests - Specifications - Uses of common building stones. Bricks: Composition of good brick earth - Classification - Qualities of good bricks - Field and laboratory tests - Specifications. Tiles: Classification - Manufacture - Properties - Tests – Specifications, Cement: Basic Ingredients – Manufacturing process - Grades - Properties - Tests - Specifications. Aggregates: Fine and coarse aggregate - Properties - Uses - Tests. Cement Mortar: Types and preparation. Stone Masonry: Types - Details of Ashlar, Random Rubble, Coarse Rubble and Dry Rubble Masonry. Brick Masonry: Types - Bond - Introduction to all types of bonds -English bond in detail (1, 1½ and 2 brick walls) - Comparison of stone and brick masonry. Timber: Properties - Uses - Classification - Seasoning - Defects - Preservation - Tests; Hard board and Particle board - Manufacture anduse. Steel: Structural steel and steel as reinforcement - Types - Properties - Uses - Market forms. Floors and Flooring materials: Different types and selection of floors and floor coverings. Roofs and roof coverings: Different types of roofs - Suitability – Types and selection of roofing materials.