B.Tech CSE Syllabus IIIT Nagpur

IIIT Nagpur
Scheme for B.Tech CSE

Year	Semester	Course Code	Course Name	Type	L	T	P	Credits
BS YEAR								
1ST	1ST	MAL 101	Mathematics-I	BS	3	1	0	4
1ST	1ST	BEL 102	Elements of Electrical Engineering	BS	3	0	2	4
1ST	1ST	BSL 101	Applied Sciences	BS	3	0	2	4
1ST	1ST	CSL 101	Computer Programming	DC	3	0	2	4
1ST	1ST	ECL 101	Analog Electronics	DC	3	0	2	4
1ST	1ST	SAP 101	Health, Sports & Safety		0	0	2	0
1ST	1ST	HUL 102	Environmental Studies	HU	2	0	0	2
Subtotal					**17**	**1**	**10**	**22**
1ST	2nd	MAL 102	Mathematics-II	BS	3	1	0	4
1ST	2nd	ECL 102	Digital Electronics	DC	3	0	2	4
1ST	2nd	CSL 102	Data Structures	DC	3	0	2	4
1ST	2nd	CSL 103	Application Programming	DC	3	0	2	4
1ST	2nd	HUL 101	Communication Skills	HU	2	0	2	3
1ST	2nd	BEL 101	Mechanics and Graphics	BS	3	0	2	4
Subtotal					**17**	**1**	**10**	**23**
Total								**45**
SECOND YEAR								
2nd	3rd	MAL 201	Mathematics-III(Statistics & Probability)	BS	3	1	0	4
2nd	3rd	CSL 202	Advanced Data Structures	DC	3	1	2	5
2nd	3rd		Introduction to Object Oriented Programming	DC	3	0	2	4
2nd	3rd		Computer System Organisation	DC	3	1	0	4
2nd	3rd		Discrete Maths and Graph Theory	DC	3	1	0	4
2nd	3rd		IT Workshop-I	DC	1	0	4	3
Subtotal					**16**	**4**	**8**	**24**
2nd	4th		Design and Analysis of Algorithms	DC	3	1	2	5
2nd	4th		Software Engineering	DC	3	1	0	4
2nd	4th		Operating Systems	DC	3	0	2	4
2nd	4th		Design Principles of Programming Languages	DC	3	0	2	4
2nd	4th		Human Values	HU	3	0	0	3
2nd	4th		IT Workshop-II	DC	1	0	4	3
Subtotal					**16**	**2**	**10**	**23**
Total								**47**

Year	Semester	Course Code	Course Name	Type	L	T	P	Credits
THIRD YEAR								
3rd	5th		Database Management Systems	DC	3	0	2	4
3rd	5th		Economics and Business Finance	HU	3	1	0	4
3rd	5th		Computer Networks	DC	3	0	2	4
3rd	5th		Theory of Computation	DC	3	1	0	4
3rd	5th		Elective-I	DE	3	1	0	4
3rd	5th		IT Workshop-III	DC	1	0	4	3
Subtotal					**16**	**3**	**8**	**23**
3rd	6th		Compilers	DC	3	0	2	4
3rd	6th		Cryptography and Network Security	DC	3	1	0	4
3rd	6th		Software Design Documentation	HU	3	0	0	3
3rd	6th		Elective-II	DE	3	0	2	4
3rd	6th		Elective –III	DE	3	0	2	4
			IT Workshop –IV	DC	1	0	4	3
Subtotal					**16**	**1**	**10**	**22**
Total								**45**
FINAL YEAR								
4th	7th		In-house Project	DE	0	0	4	8
4th	7th		Elective-V	DE	3	0	2	4
4th	7th		Elective-VI	DE	3	0	2	4
4th	7th		Elective-VII	DE	3	0	2	4
4th	7th		Elective-VIII	DE	3	0	2	4
4th	7th		Elective-IX	DE	3	0	0	3
Subtotal					**15**	**0**	**12**	**27**
4th	8th		Industry Internship Project	DE	0	0	4	6
Subtotal								**6**
Total								**33**
GRAND TOTAL								**170**

Type	Credits
BS	**24**
HU	**15**
DE	**45**
DC	**86**
TOTAL	**170**

<table>
<tr><td>Course Code:</td><td>MAL 101</td><td>Course Title:</td><td colspan="4">Mathematics-I</td></tr>
<tr><td rowspan="2">Category:</td><td rowspan="2">Core</td><td rowspan="2">Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>Nil</td><td>Type of Course</td><td colspan="4">Basic Science</td></tr>
<tr><td colspan="7">Course Outcomes:
1) To understand importance of calculus infinite series and matrix theory.
2) Applications of calculus infinite series and matrices.
3) Derivation and application of theorems of matrices.</td></tr>
<tr><td colspan="7">Course Contents:
Differential Calculus: Functions of single variable: Limit, continuity and differentiability. Mean value theorems: Rolle’s theorem, Lagrange’s theorem, Cauchy’s theorem, Taylor’s theorem with remainders, indeterminate forms, curvature, curve tracing.

Integral Calculus: Fundamental theorem of Integral calculus, mean value theorems, evaluation of definite integrals, Applications in Area, length, volumes and surface of solids of revolutions, Improper integrals: Beta and Gamma functions, differentiation under integral sign.

Infinite series: Sequences, Infinite series of real and complex numbers, Cauchy criterion, tests of convergence, absolute and conditional convergence, improper integrals, improper integrals depending on a parameter, uniform convergence, power series, radius of convergence.

Matrices: Rank of matrix, consistency of a system of equations, linear dependence and independence, linear and orthogonal transformations, Eigen values and eigen vectors, Cayley – Hamilton theorem, reduction to diagonal form, Hermitian and skew Hermitian matrices, Quadratic forms.</td></tr>
<tr><td colspan="7">Text:
1. Kreyszig, E., Advanced Engineering Mathematics, John Wiley & Sons
2. Piskunov, N., Differential and Integral calculus, Mir publishers Moscow (Vol. 1, Vol. 2)</td></tr>
<tr><td colspan="7">Reference:
1. Thomas, G.B. and Finney, R.L, Calculus and Analytic Geometry, Addison Wesley Longman
2. Michael D. Greenberg, Advanced Engineering Mathematics, Pearson Education Pvt. Ltd
3. Jain R.K., Iyengar S.R.K, Advanced Engineering Mathematics, Narosa Publishers</td></tr>
<tr><td colspan="7">List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)
1)
2)</td></tr>
</table>

<table>
<tr><td>Course Code:</td><td>BSL 101</td><td>Course Title:</td><td colspan="4">Applied Sciences</td></tr>
<tr><td rowspan="2">Category:</td><td rowspan="2">Core</td><td rowspan="2">Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>Nil</td><td>Type of Course</td><td colspan="4">Basic Science</td></tr>
<tr><td colspan="7">Course Outcomes:
1) To understand the fundamentals of Quantum Mechanics

2) To understand the structure and properties of materials.

3) To know current trends and advances in NEMS and MEMS</td></tr>
<tr><td colspan="7">Course Contents:
Quantum Mechanics-I: Dual nature of matter, de-Broglie Hypothesis, phase velocity and group velocity, their relations, wave function & its physical significance, probability density, Schrodinger's wave equation, eigen values & eigen functions, applications. Electronic conduction in solids: Drude-Lorentz Theory, Drift velocity, relaxation time, mean collision time, mean free path, Electrical conductivity, Quantum free electron theory, density of energy states, Fermi energy, thermionic emission.

Structure of materials, Properties of materials, Transforming materials, Structure and transformation of materials, Electronic properties of materials, Mechanical properties, Engineering applications of materials.

Current trends in Engineering. applications : Quantum information & quantum computing, evolution of quantum theory, quantum computer, nanoscale systems and nanotechnology, nanoscience and technology, composite materials, smart materials and structures, nano and micromechanical systems (NEMS and MEMS).</td></tr>
<tr><td colspan="7">Text:

1. Resnick, Walker and Halliday, Fundamental of Physics, John Willey and Sons. Inc, 6th Edition, 2005.
2. Streetman B. G., Solid State Electronics, Prentice Hall India (2nd Edition) 1986.
3. Avadhanulu M. N. and P.G. Kshirsagar, A text Book of Engineering Physics, (7th Edition) 2004.
4. Dekkar A.J.; Electrical Engineering Materials; Prentice Hall og India Publication, 1992.
5. Kenneth Krane; Modern Physics; (2 nd Edition); John Wiley Eastern, 1998.
6. Pillai S. O., Solid State Physics, New Age International Publishers, 3 rd edition, 1999.</td></tr>
<tr><td colspan="7">Reference:

1) John A. Pelesko, David H. Bernstein, "Modeling MEMS and NEMS" CRC Press, 2002</td></tr>
<tr><td colspan="7">List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)
1. To study the characteristics of Photocell and to determine the work function of the cathode material.
2. To calibrate an electromagnet and to study the dependence of Hall voltage on magnetic field and current through the sample.
3. To study the I/P, O/P and transfer characteristics and to determine 'α' of transistor in common base mode.</td></tr>
</table>

4. To study the forward and reverse characteristics of semiconductor diode.

5. To determine the band-gap in a semiconductor using reverse biased p-n junction diode.

6. To determine e/m for an electron by Thomson's method.

7. To calibrate an audio frequency oscillator and to determine the unknown frequency and phase of RC network by using single trace CRO.

8. To determine the radius of curvature of a plano- convex lens using Newton's Rings.

9. To determine the wavelength of sodium vapour lamp by plane transmission grating.

Course Code:	BEL 101	Course Title:	Mechanics and Graphics			
Category:	Core	Credit Assigned	L	T	P	C
			3	0	2	4
Pre-Requisite (if Any)	Nil	Type of Course	Basic Science			

Course Outcomes:

1. To enable the students understand the basic concepts of mechanics such as force, equilibrium, moment etc and to analyze simple determinate structures like beam, truss and frame.
2. To impart and include proper understanding of the theory of projection. Improve the visualization skills.
3. To enable the students with various concepts like dimensioning, conventions and standards related to working drawing in order to become professionally efficient.
4. To impart the knowledge on understanding and drawing of simple residential/ office building.

Course Contents:

Use of various drawing instruments , Concept of scales, Representative factor and dimensioning, Orthographic projections of points , lines, plane on principle planes/ Profile plane/ Auxiliary planes. Projection of right regular solids inclined to both the planes. Projection of right regular solids inclined to both the planes. Drawing isometric views from orthographic projection orthographic views.

Principles of Vector representation of force system, Moment of a force about a point and about an axis; couple moment; reduction of a force system to a force – a couple Wrench , Free Body Diagram, Reactions at supports, Equilibrium of Planar (including friction) and Spatial force system,

Internal forces in member: Determination of variation of Axial force (Axial Force Diagram), Shear force (Shear Force Diagram), Bending moment (Bending Moment Diagram) and twisting moment (Torque diagram)

Concept of stress and strain: Normal and shear stress and strain, State of stress at a point, Stress strain curve, Hook's law, Modulus of elasticity, Poisson's ratio, Modulus of rigidity, Bulk modulus, Transformation of stress.

Text:

1. Singer F.L. and Andrew Pytel, Strength of Material, Harper and Row Publishers, New York.

2. Bhatt N.D. and Panchal V.M., Elementary Engineering Drawing, Charotar Publishing House, 43rd edition.

Reference:

1. Hibbler, Engineering Mechanics, Pearson Education, Asia Pvt Ltd.

2. Beer F.P. and Johnston E.R., Vector Mechanics for Engineers: Statics and Dynamics, Tata McGraw-Hill

3. Irving H. Shames, Engineering Mechanics: Static and Dynamics, Pearson Education, Asia Pvt Ltd.

4. Meriam J.L. and Kraige L.G., Engineering Mechanics, John Wiley and Sons.

5. Stephen Timoshenko, Strength of Materaials, Part -1, CBS Publishers and Distributors, New Delhi.

6. Popov E.P., Mechanics of deformable bodies, Prentice-Hall

7. Beer F.P. and Johnston E.R., Mechanics of materials, McGraw-Hill International

8. Jolhe Dhananjay ,Engineering Drawing with an introduction to AutoCAD, Tata McGraw Hill Publishing Co.Ltd., 1st edition.
9. BIS-SP-46-1988, Handbook BIS SP -46-1988, BIS

List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)

1. Verification of equilibrium equation for coplanar forces.
2. Verification of Lami's theorem.
3. Verification of Law of parallelogram of forces.
4. Verification of Law of polygon of forces.
5. Verification of equilibrium equation for spatial forces.
6. Determination of coefficient of friction.
7. Analysis of truss (Analytical / Graphical method).
8. Determination of modulus of elasticity for copper wire.
9. Determination of modus of rigidity of material.
10. Flexural test on beam.

Projection of points and lines
Projections of planes
Projections of lines and planes using Auxiliary planes
Projections of solids
Isometric views

<table>
<tr><td>Course Code:</td><td>CSL 101</td><td>Course Title:</td><td colspan="4">Computer Programming</td></tr>
<tr><td rowspan="2">Category:</td><td rowspan="2">Core</td><td rowspan="2">Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>Nil</td><td>Type of Course</td><td colspan="4">Core Engineering</td></tr>
<tr><td colspan="7">Course Outcomes:
1) To understand importance of calculus infinite series and matrix theory.
2) Applications of calculus infinite series and matrices.
3) Derivation and application of theorems of matrices.</td></tr>
<tr><td colspan="7">Course Contents:

Introduction: Flow charts, data types and storage classes, scope of variables, arithmetic operators, assignment, conditional, arithmetic expressions, enumerated data types, decision making, branching, looping, Switch concept, function and parameter passing, recursive functions, macros.
Basic programming algorithms: Programs to illustrate basic language constructs in C like - Factorial, Sine/cosine and other mathematical series, Fibonacci series, calculating square-root of a number, calculating GCD of 2 integers (Euclid’s method and otherwise), Calculating LCM of 2 integers and similar such programs.
Arrays and applications: Introduction to one dimensional and 2-D array with examples. Representing a polynomial using 1-D array and polynomial operations, Use of 2-D array to represent a matrix and matrix operations. Character arrays (strings): String related functions (strlen, strcpy, strcat, strcmp, atoi, itoa, reverse, strstr etc) and their function definitions.
Searching and Sorting methods: Selection sort, Bubble sort, Insertion sort, Linear search, merging of 2 sorted arrays.
Structures and Unions: Basic concept, array of structures and its applications.
Pointers: Introduction (declaration and initialization), pointers and arrays, concept of dynamic memory allocation, use of pointers to represent variable-sized 1-D and 2-D arrays, pointers to structures.
File Management in C: Open, close, read and write operations, Sequential and text files.</td></tr>
<tr><td colspan="7">Text:
1. Kerninghan; Ritchie, “C programming Language”, PHI
2. Balguruswamy, “Programming in ANSI C”, Tata Mcgraw Hill Publishing</td></tr>
<tr><td colspan="7">Reference:
3. Kakde and Deshpande, “C and data Structure”, Charles River Media Publisher
4. Dromey R G, “How to Solve it by Computer”, PHI
5. Y. Kanetkar, “Let us C ”.</td></tr>
<tr><td colspan="7">List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)

1) Programs based on Conditional statements – eg. Maximum of two numbers, 2nd max, Roots of Quadratic Equations.
2) Program based on loops- GCD, LCM , Sine Series, Finding square root
3) Program based on Arrays – Finding max, Search of an element, Removal of duplicates etc.
4) Programs on sorting – Selection sort, Bubble sort, Insertion sort.
5) Program Files-Text and Binary files, searching in files.</td></tr>
</table>

6) Program on Strings – Concatenation, Substring, String Compare

<table>
<tr><td>Course Code:</td><td>ECL 101</td><td>Course Title:</td><td colspan="4">Analog Electronics</td></tr>
<tr><td rowspan="2">Category:</td><td rowspan="2">Core</td><td rowspan="2">Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>Nil</td><td>Type of Course</td><td colspan="4">Basic Science</td></tr>
<tr><td colspan="7">Course Outcomes:
1. This course introduces the fundamentals of semiconductor devices, such as diode, BJT, DIAC, LED, UJT etc.
2. To study the V-I characteristics, biasing, small signal analysis, etc. for various electronic devices.
3. The student will be able to apply various devices into electroniccircuits and can compute various parameters.
4. At the end student will be able to study and design various power devices including applications of these devices in to power amplifications.</td></tr>
<tr><td colspan="7">Course Contents:
P &N Type Semiconductors, Diodes and Power Supplies, Theory of P-N Junction Diode, Junction Capacitance,

Halfwave & Fullwave, Rectifiers, Filters, Ripple-Factor,

Characteristics & Applications of Following Diodes, Zener as Regulators, Schottkey, Photodiode, LED, LCD, Varactor Diode &Tunnel Diode

Junction Transistors Theory of Operation, Static Characteristics , Break Down Voltages, Current Voltage Power Limitations, Biasing of BJT Different Biasing Arrangements, Stability Factor, Thermal Runaway, Power Transistors

Small Signal Analysis & High Frequency Analysis of BJT CE, CB, CC Amplifiers and Comparison High Frequency Analysis Calculation of Frequency Response, Gain Bandwidth Product

Power Amplifiers Classification A, B, AB, C Classes, Efficiency, Push Pull Configuration, Complimentary Symmetry, Second Harmonic & Cross Over Distortion. Positive and Negative Feedback Amplifiers Classification, Practical Circuits, Applications, Advantages. Oscillators Stability, Barkhausen Criteria, RC, LC & Crystal Oscillators

Field Effect Transistor & MOSFET, Principle of Operation & Characteristic, Biasing Arrangement, Small Signal Analysis of CG, CD & CS, High Frequency</td></tr>
<tr><td colspan="7">Text:
1)Milman and Halkias, “Integrated Electronics”, Second Edition, 2011, McGraw Hill.
2)Boylestad and Nashelsky, “Electronic Devices & Circuit theory”,2011, Tenth Edition,</td></tr>
<tr><td colspan="7">Reference:
1) David A. Bell, “Electronic Devices and Circuits”

2)Milman and Halkias, “Electronic Devices and Circuits”, Second Edition, 2011, McGraw Hill.</td></tr>
<tr><td colspan="7">List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)</td></tr>
</table>

1)Study of characteristics PN-junction and Zenerdiodes

2) Study of PN-junction diode as full-wave and half wave rectifier

3) Study of Zener Diode as regulator

4) Input and output characteristics of NPN transistor under different configurations.

<table>
<tr><td>Course Code:</td><td>HUL 101</td><td>Course Title:</td><td colspan="4">Communication Skills</td></tr>
<tr><td rowspan="2">Category:</td><td rowspan="2">Core</td><td rowspan="2">Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>2</td><td>0</td><td>2</td><td>3</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>Nil</td><td>Type of Course</td><td colspan="4">Humanities</td></tr>
<tr><td colspan="7">Course Outcomes:
1. To impart to the students the skills that they need in their academic, and later in their professional pursuit.
2. To train the students to adopt an innovative approach to English language teaching and learning.</td></tr>
<tr><td colspan="7">Course Contents:

Importance of Effective Communication; Reading, writing and oral communication skills; Methods/Modes of communication, choice of media; Barriers to communication. Basics of Technical report Writing, Referencing methods, Visual communication and its impact, Hands-on-experiences and Case studies</td></tr>
<tr><td colspan="7">Text:
1. Orient Longman , A Textbook of English for Engineers and Technologists.</td></tr>
<tr><td colspan="7">Reference:
1. Quirk R.and Greenbaum S., A University Grammar of English.
2. Krishnaswamy N., English Grammar (Longman Publication) (Macmillan India Ltd)</td></tr>
<tr><td colspan="7">List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)
1. Presenting a book chapter using powerpoint slides
2. Data Analysis: Maintaining multiple results obtained over time and reporting them using charts and graphs
3. Technical Documentation – Requirement/specification documentation, Design documentation, Test-cases documentation, Use-cases documentation
4. Writing an installation/instruction manual
5. Writing an abstract of a technical article – summarizing an article in 300 words
6. Summarizing 3 papers into a report and its presentation</td></tr>
</table>

<table>
<tr><td>Course Code:</td><td>SAP 101</td><td>Course Title:</td><td colspan="4">Health, Sports & Safety</td></tr>
<tr><td rowspan="2">Category:</td><td rowspan="2">Core</td><td rowspan="2">Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>0</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>Nil</td><td>Type of Course</td><td colspan="4">Basic Science</td></tr>
<tr><td colspan="7">Course Outcomes:
1. To provide physical fitness and good health.
2. Create awareness among the students about their health status by conducting various tests and measurements and suggest them suitable remedial physical fitness program so that they can improve physical and physiological health status.
3. To improve productivity, foster social harmony, inculcate sense of discipline and dedication in general life, develop the spirit of team work, through various sports activities.</td></tr>
<tr><td colspan="7">Course Contents:

Development of components of fitness through conditioning exercises:
Strength: (Strength Endurance, Maximum Strength, explosive strength), Endurance: (aerobic endurance, anaerobic endurance, speed endurance and strength endurance), Speed, Co-coordinative ability, Flexibility
Physical Efficiency Test Level 1(Testing and Evaluation of Physical Fitness):
Cooper Test 12 minute run or walk test, Sit and reach test, 100 meter run, one minute sit up test, Push up/Bent knee push up test,
Teaching and development of sports skills: Cognitive, Perceptual, Motor, Perceptual motor.
First Aid training:
Intramural phase 1: Identification of sports talent through exposing students to inter-section tournament. Football, Volleyball, throw ball, table tennis & Chess.

Yoga, Meditation and Personal Safety.</td></tr>
<tr><td colspan="7">List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)
1) Physical Efficiency Test(Testing and Evaluation of Physical Fitness):1500 meter run, shuttle run, standing broad jump, one minute sit up test, flexibility test
Testing and assessment of selected Physiological parameters through Sports Medicine Research Lab: Total body fat analysis, Harvard step test, BMI, WHR, Back strength, Leg strength, grip strength, resting pulse rate, and resting respiratory rate. Intramural phase 2: Badminton, Basketball, Cricket, Kho-Kho, etc.
Yoga and Meditation.
2)Personal Safety Skill Demonstration</td></tr>
</table>

<table>
<tr><td>Course Code:</td><td>MAL 102</td><td>Course Title:</td><td colspan="4">Mathematics-II</td></tr>
<tr><td rowspan="2">Category:</td><td rowspan="2">Core</td><td rowspan="2">Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>MAL 101</td><td>Type of Course</td><td colspan="4">Basic Science</td></tr>
<tr><td colspan="7">Course Outcomes:
To make students understand the basic importance of multi variable calculus (Differential calculus & Integral calculus), Vector calculus and ordinary differential equations in engineering.</td></tr>
<tr><td colspan="7">Course Contents:

Calculus of Functions of Several Variables: Limit, continuity and differentiability of functions of several variables, partial derivatives and their geometrical interpretation, Tangent plane and normal line. Euler’s theorem on homogeneous functions, Total differentiation, chain rules, Jacobian, Taylor’s formula, maxima and minima, Lagrange’s method of undetermined multipliers.
Multiple Integrals: Double and triple integrals, change of order of integration, change of variables, application to area, volumes, Mass, Centre of gravity.
Vector Calculus: Scalar and vector fields, gradient of scalar point function, directional derivatives, divergence and curl of vector point function, solenoidal and irrotational motion. Vector integration: line, surface and volume integrals, Green’s theorem, Stoke’s theorem and Gauss divergence theorem (without proof).
Ordinary Differential Equations: First order differential equations: Exact equation, Integrating factors, Reducible to exact differential equations, Linear and Bernoulli’s form, orthogonal trajectories, Existence and Uniqueness of solutions. Picard’s theorem, Picard’s iteration method of
solution (Statements only). Solutions of second and higher order linear equation with constant coefficients, Linear independence and dependence, Method of variation of parameters, Solution of Cauchy’s equation, simultaneous linear equations</td></tr>
<tr><td colspan="7">Text:
1. Kreyszig, E., Advanced Engineering Mathematics, John Wiley & Sons
2. Piskunov, N., Differential and Integral calculus, Mir publishers Moscow (Vol. 1, Vol. 2)
3. Thomas, G.B. and Finney, R.L, Calculus and Analytic Geometry, Addison Wesley Longman.</td></tr>
<tr><td colspan="7">Reference:
1. Michael D. Greenberg, Advanced Engineering Mathematics, Pearson Education Pvt. Ltd
2. Jain R.K., Iyengar S.R.K, Advanced Engineering Mathematics, Narosa Publishers.</td></tr>
<tr><td colspan="7">List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)
1)
2)</td></tr>
<tr><td>Course Code:</td><td>BEL 102</td><td>Course Title:</td><td colspan="4">Elements of Electrical Engineering</td></tr>
</table>

Category:	Core	Credit Assigned	L	T	P	C
			3	0	2	4
Pre-Requisite (if Any)	Nil	Type of Course	Basic Engineering			

Course Outcomes:

1. To enable the students understand the basic ideas and principles of Electrical Engineering.
2. To impart knowledge for understanding the details of electrical power systems, transformers, generators, motors etc.

Course Contents:

Electrical Circuit: Circuit Elements Resistance, Inductance & Capacitance, Kirchhoff's Laws, Voltage Source (Definition, Characteristics of Practical Source, and Equivalent Current Source), and Star-Delta Transformation.

Magnetic Circuit, Flux, MMF, Reluctance, Analogy with Electric Circuits. Simple Calculations for Composite Magnetic Circuits

AC Circuits: Periodic Function, Average & R.M.S., Values, Steady State Behavior With Sinusoidal Excitation, Phasor Representation, Reactance & Impedance, Series & Parallel Circuit, Power Factor, Principle of Generation of Single Phase & Three Phase Voltages, Power in Balanced Three Phase AC System

Electrical Measurements : Definition, Indicating, Integrating & Recording Instruments, Deflecting Controlling & Damping Mechanisms, Ammeter & Voltmeters, P.M.M.C. Type & Moving Iron Type, Electrodynamometer Type Wattmeters, Induction Type Single Phase Energy Meter

Transformers : Introduction, Basic Principles, Construction, Phasor Diagram for Transformer under No Load Condition Transformer On Load, Balance of MMF on Sides, Phasor Diagram, Equivalent Circuit, Open Circuit & Short Circuit Test, Voltage Regulation and Efficiency

Power Systems : Elementary Idea about Power Generation, Transmission and Distribution

Electric Machines :DC Shunt and Series Motor – Construction, Principle of Working, Characteristics, Speed Control and Applications

Induction Motors – Construction, Principle of Working of Single Phase and 3-Phase Motors. Torque Slip Characteristics

Text:

1. Hughes, Electrical Technology, Pearson Publishers
2. Theraja B.L., Electrical Technology, S. Chand Publishers

Reference:

3. Kothari D.P. and Nagrath I.J.,Theory And Problems Of Basic Electrical Engineering, Prentice Hall India
4. Kulshresta D.C., Basic Electrical Engineering, TMH India
5. Mittle and Mittal, Basic Electrical Engineering, TMH, 2005

List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)

1. Study and verification of Kirchhoff's laws applied to DC circuits
2. Study of AC series R-L-C circuits
3. Determination of B-H curve of a magnetic material
4. Study of AC parallel R-L-C circuits

5. Study of balanced 3-phase circuits

6. Determination of voltage regulation and efficiency of a single-phase transformer by direct loading

7. Study of speed control of a DC motor by field current control and by armature voltage control

8. Study of reversal of direction of rotation of a 3-phase induction motor

Course Code:	HUL 102	Course Title:	Environmental Studies			
Category:	Core	Credit Assigned	L	T	P	C
			2	0	0	2
Pre-Requisite (if Any)	Nil	Type of Course	Basic Science			

Course Outcomes:
1. Introduce to various natural resources, their importance and status.
2. Introduce to the concepts of ecosystem, their structure and functions.
3. Introduce to the concept of biodiversity conservation.
4. Introduce to possible causes of various forms of environmental pollution and their consequences, methods of prevention.
5. Introduce to various social and climatic changes due to pollution.

Course Contents:
Natural resources: Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources.
Ecosystem: Concept of an ecosystem, Structure and functions of an ecosystem, Producers, consumers and decomposers, Ecological succession, Food chain, food webs and pyramids.
Biodiversity and its conservation: Introduction, definitions: genetics, species and diversity, Value of biodiversity, Biodiversity at global, national and local level, India as a mega-diversity nation, Hot-spot of biodiversity, Threat to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Conservation of biodiversity: in-situ and ex-situ conservation.
Environmental pollution: Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes.
Social issues and environment: Sustainable development, Water conservation, Rain water harvesting, Watershed management, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accident, Holocaust, Environmental rules and regulations.
Human population and environment: Population growth, Environment and human health, Human rights, Value education, Role of information technology in environment and human health.

Text:
1. Rajgopalan R., Environmental Studies.

Reference:
1. Benny Joseph, Environmental Studies, McGraw Hill.
2. Erach Barucha Environmental Studies University press (UGC).

Course	CSL 102	Course Title:	Data Structures

<table>
<tr><td>Code:</td><td></td><td></td><td colspan="4"></td></tr>
<tr><td rowspan="2">Category:</td><td rowspan="2">Core</td><td rowspan="2">Credit Assigned</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td>Pre-Requisite (if Any)</td><td>CSL 101 (Computer Programming)</td><td>Type of Course</td><td colspan="4">Computer Science</td></tr>
<tr><td colspan="7">Course Outcomes:
• Appreciation and practice of structured programming
• Ability to formulate the problem, devise an algorithm and transform into code
• Understanding different programing techniques and make an informed choice amongst them
• Understanding different sorting algorithms, their advantages and disadvantages,
• Appreciation of concept of dynamic memory allocation and its utilization, dynamic data structures and implementation
• Understanding of concept of Abstract Data Type and implementations.</td></tr>
<tr><td colspan="7">Course Contents:

Types and operations, Iterative constructs and loop invariants, Quantifiers and loops, Structured programming and modular design, Illustrative examples, Scope rules, parameter passing mechanisms, recursion, program stack and function invocations including recursion, Overview of arrays and array based algorithms - searching and sorting, Mergesort, Quicksort, Binary search, Introduction to Program complexity (Big Oh notation), Sparse matrices.

Structures (Records) and array of structures (records). Database implementation using array of records. Dynamic memory allocation and deallocation. Dynamically allocated single and multi-dimensional arrays.

Concept of an Abstract Data Type (ADT), Lists as dynamic structures, operations on lists, implementation of linked list using arrays and its operations. Introduction to linked list implementation using self-referential-structures/pointers.

Stack, Queues and its operations. Implementation of stacks and queues using both array-based and pointer-based structures. Uses of stacks in simulating recursive procedures/ functions. Applications of stacks and queues.

Lists - Singly-linked lists, doubly linked lists and circular linked lists. List traversal, insertion, deletion at different positions in the linked lists, concatenation, list-reversal etc. Mergesort for linked lists.</td></tr>
<tr><td colspan="7">Text:
1) Data Structures & Program Design in C: Robert Kruse, G. L. Tondo and B. Leung PHI-EEE.
2) Fundamentals of Data Structures in C : E. Horowitz, S. Sahni, and S. Anderson-Freed, University Press</td></tr>
<tr><td colspan="7">Reference:
1) Aho, Hopcroft and Ullmann, —Data Structures and Algorithms,‖ Addison Wesley, 1983.</td></tr>
<tr><td colspan="7">List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)
1) Implementation of Binary search, Quick Sort, Merge Sort
2) Implementation of linked lists, insertion, deletion, finding an element.
3) Implementation of Sparse matrices, ADT and its Operation.</td></tr>
</table>

4) Implementation of Queue and its operations.
5) Implementation of Stacks and its operation.
6) Implementation of Priority Queues and its operations.

Course Code:	CSL 103	**Course Title:**	Application Programming			
Category:	Core	**Credit Assigned**	L	T	P	C
			3	0	2	4
Pre-Requisite (if Any)	CSL 101 (Computer Programming)	**Type of Course**	Computer Science			

Course Outcomes:

- Aware about different tools for Web Programming.
- Background of working on web.
- Construct efficient web pages with CSS and Javascript.
- Demonstrate competency in the use of common HTML code.
- Able to design efficient client as well as server side scripts.

Course Contents:

Internet fundamentals, LAN, WAN, Introduction to common Internet terms, www.

Basics of networking, DNS, URL, firewall, proxy, Web protocols – http and https.

Designing web pages: HTML, forms, DHTML, XML, CSS. Extensible Hypertext Mark up Language (XHTML): XHTML syntax, headings, linking, images, special characters and horizontal rules, lists, tables, forms, internal linking, meta elements.

Introduction to Web Server – Setting up and configuration of Apache Tomcat server, Accessing pages from another machine.

Server Side Programming: Introduction to web programming with PHP.

Client side programming with Javascript

Introduction to Python - Statements and Control Flow, Expressions, Methods, Typing, Libraries and Developmental Environment, Web Programming using Python.

Text:

1) Deitel H.M. and P. J. Deitel, Internet & World Wide Web - How to Program, Prentice-Hall.
2) Goodman D, Morrison M., JavaScript Bible; Wiley India
3) Lutz, Mark, Learning Python (4th ed.). O'Reilly Media

Reference:

1)Garfinkle S., Spafford G; Web Security, Privacy and Commerce; O'Reilly, 2002.
2) Atkinson L., Core PHP Programming, Prentice Hall.
3) N.P.Gopalan, Akilandeswari, Web Technology, Prentice-Hall.

List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)

1) Creating an HTML Web page, forms.
2) Creating Home Page using HTML
3) Creating XHTML and CSS and understanding its use in creating Web pages.
4) Setting up and configuration of Apache Tomcat server.

5) Understanding modification of Web.XML
6) Creating Websites using PHP.
7) Understanding Javascript
8) Creating a Web page with back end in PHP and front end in Javascript and hosting it on Apache Tomcat Server.
9) Writing and understanding program in Python.
10) Use Python Libraries like Maths statistics to create programs for Scientific Computations.

Course Code:	ECL 102	**Course Title:**	Digital Electronics			
Category:	Core	**Credit Assigned**	L	T	P	C
			3	0	2	4
Pre-Requisite (if Any)	Nil	**Type of Course**	Core Engineering			

Course Outcomes:

1) To understand the fundamentals of digital logic design
2) Applications of combinational and sequentional logic circuits
3) To learn the HDL programming

Course Contents:

NUMBER SYSTEMS: Representations, signed, 1's complement, 2's complement, saturation and overflow in fixed point arithmetic.

BOOLEAN ALGEBRA: Axioms and theorems, DeMorgan's law, universal gate, duality, expression manipulation using axioms and theorems.

COMBINATIONAL LOGIC: Introduction to switching algebra, canonical forms, two-level simplification, boolean cube, logic minimization using K-map method, QuineMcCluskey tabular method, minimization for product-of-sum form, minimization for sum-of-product form, multiplexers, demultiplexers, decoders, encoders, hazard free synthesis, Arithmetic circuits, adders, half adder, full adder, BCD adder, ripple carry adder, carry-lookahead adder, combinational multiplier.

SEQUENTIAL LOGIC: Simple circuits with feedback, basic latches, clocks, R-S latch, master-slave latch, J-K flip flop, T flip-flop, D flip-flop, storage registers, shift register, ripple counter, synchronous counters, Finite State Machine (Moore/Mealy Machines), FSM with single/multiple inputs and single/multiple outputs etc.

CONTROLLER DESIGN: Based on minimum number of flip-flops and shift register method. Multiple command responsing register design. Conditional response controller design.

HARDWARE DESCRIPTION LANGUAGE: Programming and simulation, structural specification,
behavioral specification, dataflow modelling, testbench, testing using test vectors, testing using waveforms, design of basic blocks to build larger circuits, case studies, adder, ALU, counters, shift registers, register bank, FSM design example etc.

Text:

1. Digital Design, Morris Mano, Prentice Hall, 2002
2. Digital Fundamentals,10th Ed, Floyd T L, Prentice Hall, 2009.

Reference:

1. Digital Design-Principles and Practices, 4th Ed, J F Wakerly, Prentice Hall, 2006.
2. Fundamentals of Digital Logic with Verilog Design, 2nd Ed, S. Brown and Z. Vrsaniec, McGraw Hill, 2007

Course	CSL 202	Course Title:	Advance Data Structures

Code:						
Category:	Core	Credit Assigned	L	T	P	C
			3	1	2	5
Pre-Requisite (if Any)	CSL 102 (Data Structures)	Type of Course	Computer Science			

Course Outcomes:

• Appreciation of dynamic data structures, advantages and disadvantages.
• Ability to formulate the problem, devise an algorithm and transform into code.
• Ability to identify problem requirements, constraints to be satisfied and ability to select the best possible data structures to satisfy the constraints.
• Ability to analyze the complexity/efficiency of the algorithm and develop ability to improve the same
• Ability to understand how a newer data structure gets designed as per the requirements and constraints.
• Understanding of advantages and disadvantages of different data structures which may be used to solve the same problem
• Introduction to different algorithmic programing techniques like greedy algorithms, dynamic programming etc. and ability to make an informed choice amongst them
• Ability to communicate about program/algorithm/data-structure efficiency (time and space) and recognize a better solution

Course Contents:

Applications of lists in polynomial representation, multi-precision arithmetic, hash-tables etc. Multi linked structures and an example application like sparse matrices. Implementation of priority queues.

Trees, binary trees, binary trees- basic algorithms and various traversals. Binary Search Trees (BSTs) and insertion, deletion in BSTs. Height-balanced (AVL) trees, insertion/deletion and rotations. Heaps and heapsort. Splay trees.

Multi-way trees and external sorting - B-trees, Red-black trees. Introduction to B+ trees. Tries. Applications of the above mentioned trees.

Generalisation of trees to graphs – their representation & traversals. Dijkstra's shortest path algorithm, topological sort, all-pairs shortest paths, minimum spanning trees. Huffman coding. Introduction to network flow problem.

Introduction to Skip lists, data structures for disjoint set representation.

Text:

1) Data Structures & Program Design in C : Robert Kruse, G. L. Tondo and B. Leung PHI-EEE.
2) Fundamentals of Data Structures in C : E. Horowitz, S. Sahni, and S. Anderson-Freed, University Press

Reference:

1)
2)

List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)

1) List of general assignment based on above syllabus.