

# Indian Institute of Information Technology, Nagpur

## Scheme 1 (SCH 1) for batches 2016

### Scheme for B. Tech. CSE

Year	Semester	Course Code	Course Name	Type	L	T	P	Credits
<b>BS YEAR</b>								
1 <sup>st</sup>	1 <sup>st</sup>	MAL 101	Mathematics-I	BS	3	1	0	4
1 <sup>st</sup>	1 <sup>st</sup>	BEL 102	Elements of Electrical Engineering	ES	3	0	2	4
1 <sup>st</sup>	1 <sup>st</sup>	BSL 101	Applied Sciences	BS	3	0	2	4
1 <sup>st</sup>	1 <sup>st</sup>	CSL 101	Computer Programming	DC	3	0	2	4
1 <sup>st</sup>	1 <sup>st</sup>	ECL 101	Analog Electronics	DC	3	0	2	4
1 <sup>st</sup>	1 <sup>st</sup>	SAP 101	Health, Sports & Safety	HU	0	0	2	0
1 <sup>st</sup>	1 <sup>st</sup>	HUL 102	Environmental Studies	HU	2	0	0	2
<b>Subtotal</b>					<b>17</b>	<b>1</b>	<b>10</b>	<b>22</b>
1 <sup>st</sup>	2 <sup>nd</sup>	MAL 102	Mathematics-II	BS	3	1	0	4
1 <sup>st</sup>	2 <sup>nd</sup>	ECL 102	Digital Electronics	DC	3	0	2	4
1 <sup>st</sup>	2 <sup>nd</sup>	CSL 102	Data Structures	DC	3	0	2	4
1 <sup>st</sup>	2 <sup>nd</sup>	CSL 103	Application Programming	DC	3	0	2	4
1 <sup>st</sup>	2 <sup>nd</sup>	HUL 101	Communication Skills	HU	2	0	2	3
1 <sup>st</sup>	2 <sup>nd</sup>	BEL 101	Mechanics & Graphics	ES	3	0	2	4
<b>Subtotal</b>					<b>17</b>	<b>1</b>	<b>10</b>	<b>23</b>
<b>Total</b>								<b>45</b>
<b>SECOND YEAR</b>								
2 <sup>nd</sup>	3 <sup>rd</sup>	MAL 201	Mathematics-III	BS	3	1	0	4
2 <sup>nd</sup>	3 <sup>rd</sup>	CSL 201	Advanced Data Structure	DC	3	1	2	5
2 <sup>nd</sup>	3 <sup>rd</sup>	CSL 202	Introduction to Object Oriented Programming	DC	3	0	2	4
2 <sup>nd</sup>	3 <sup>rd</sup>	CSL 203	Computer System Organization	DC	3	1	0	4
2 <sup>nd</sup>	3 <sup>rd</sup>	CSL 204	Discrete Maths and Graph Theory	DC	3	1	0	4
2 <sup>nd</sup>	3 <sup>rd</sup>	CSP 201	IT Workshop-I	DC	1	0	4	3

Year	Semester	Course Code	Course Name	Type	L	T	P	Credits
2 <sup>nd</sup>	3 <sup>rd</sup>	ECL 202	Microprocessors & Interfacing	DC	3	0	2	4
<b>Subtotal</b>					<b>19</b>	<b>4</b>	<b>10</b>	<b>28</b>
2 <sup>nd</sup>	4 <sup>th</sup>	CSL 205	Design and Analysis of Algorithms	DC	3	1	2	5
2 <sup>nd</sup>	4 <sup>th</sup>	CSL 206	Software Engineering	DC	3	1	0	4
2 <sup>nd</sup>	4 <sup>th</sup>	CSL 207	Operating Systems	DC	3	0	2	4
2 <sup>nd</sup>	4 <sup>th</sup>	CSL 208	Design Principles of Programming Languages	DC	3	0	2	4
2 <sup>nd</sup>	4 <sup>th</sup>	HUL 201	Human Values	HU	3	0	0	3
2 <sup>nd</sup>	4 <sup>th</sup>	CSP 202	IT Workshop-II	DC	1	0	4	3
<b>Subtotal</b>					<b>16</b>	<b>2</b>	<b>10</b>	<b>23</b>
<b>Total</b>								<b>51</b>
<b>THIRD YEAR</b>								
3 <sup>rd</sup>	5 <sup>th</sup>	CSL 301	Database Management Systems	DC	3	0	2	4
3 <sup>rd</sup>	5 <sup>th</sup>	HUL 301	Open Course - I	HU	3	0	0	3
3 <sup>rd</sup>	5 <sup>th</sup>	CSL 302	Computer Networks	DC	3	0	2	4
3 <sup>rd</sup>	5 <sup>th</sup>	CSL 303	Theory of Computation	DC	3	0	0	3
3 <sup>rd</sup>	5 <sup>th</sup>	CSL 306	Elective-I	DE	3	0	0	3
<b>Subtotal</b>					<b>15</b>	<b>0</b>	<b>4</b>	<b>17</b>
3 <sup>rd</sup>	6 <sup>th</sup>	CSL 304	Compilers	DC	3	0	2	4
3 <sup>rd</sup>	6 <sup>th</sup>	CSL 305	Cryptography and Network Security	DC	3	0	0	3
3 <sup>rd</sup>	6 <sup>th</sup>	HUL 302	Open course-II	HU	3	0	0	3
3 <sup>rd</sup>	6 <sup>th</sup>	CSL 307	Elective-II	DE	3	0	0	3
<b>Subtotal</b>					<b>12</b>	<b>0</b>	<b>2</b>	<b>13</b>
<b>Total</b>								<b>30</b>
<b>FINAL YEAR</b>								
4 <sup>th</sup>	7 <sup>th</sup>	CSL 309	Project	DE	0	0	4	6
4 <sup>th</sup>	7 <sup>th</sup>		Elective-III	DE	3	0	0	3

Year	Semester	Course Code	Course Name	Type	L	T	P	Credits	
4 <sup>th</sup>	7 <sup>th</sup>		Elective-IV	DE	3	0	0	3	
4 <sup>th</sup>	7 <sup>th</sup>		Elective-V	DE	3	0	0	3	
4 <sup>th</sup>	7 <sup>th</sup>		Elective-VI	DE	3	0	0	3	
4 <sup>th</sup>	7 <sup>th</sup>		OPEN/MOOC course	OC	3	0	0	3	
			<b>OR</b>						
4 <sup>th</sup>	7 <sup>th</sup>	CSL 314	Industry Internship Project	DE	0	0	4	6	
<b>Subtotal</b>						<b>15</b>	<b>0</b>	<b>10</b>	<b>21/6*</b>
<b>Total</b>								<b>27</b>	
<b>GRAND TOTAL</b>								<b>153</b>	
4 <sup>th</sup>	8 <sup>th</sup>	CSL 314	Industry Internship Project	DE	0	0	4	6	
			<b>OR</b>						
4 <sup>th</sup>	8 <sup>th</sup>	CSL 309	Project	DE	0	0	4	6	
4 <sup>th</sup>	8 <sup>th</sup>		Elective-III	DE	3	0	2	3	
4 <sup>th</sup>	8 <sup>th</sup>		Elective-IV	DE	3	0	0	3	
4 <sup>th</sup>	8 <sup>th</sup>		Elective-V	DE	3	0	0	3	
4 <sup>th</sup>	8 <sup>th</sup>		Elective-VI	DE	3	0	0	3	
4 <sup>th</sup>	8 <sup>th</sup>		OPEN/MOOC course	OC	3	0	0	3	
<b>Subtotal</b>						<b>15</b>	<b>0</b>	<b>10</b>	<b>6/21*</b>
<b>Total</b>								<b>27</b>	

Type	Credits
BS	16
ES	08
HU	14
OC	03
DE	30
DC	82
<b>TOTAL</b>	<b>153</b>

**1<sup>ST</sup> SEM**  
**SYLLABUS**  
**CSE**

## FIRST SEMESTER

<b>Course Code</b>	<b>Course Name</b>	<b>Type</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>MAL 101</b>	<b>Mathematics-I</b>	<b>BS</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>BEL 102</b>	<b>Elements of Electrical Engineering</b>	<b>ES</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>BSL 101</b>	<b>Applied Sciences</b>	<b>BS</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>CSL 101</b>	<b>Computer Programming</b>	<b>DC</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>ECL 101</b>	<b>Analog Electronics</b>	<b>DC</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>SAP 101</b>	<b>Health, Sports &amp; Safety</b>	<b>HU</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>
<b>HUL 102</b>	<b>Environmental Studies</b>	<b>HU</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>TOTAL</b>			<b>17</b>	<b>1</b>	<b>10</b>	<b>22</b>

<b>Course Code</b>	<b>MAL 101</b>	<b>Course Title:</b>	<b>Mathematics-I</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>Nil</b>	<b>Type of Course</b>	<b>Basic Science</b>			

**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.

**Course Contents:**

**Module I:**

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.

**Module II:**

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.

**Module III:**

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.

**Module IV:**

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.

**Text:**

1. Kreyszig, E., Advanced Engineering Mathematics, John Wiley & Sons
2. Piskunov, N., Differential and Integral calculus, Mir publishers Moscow (Vol. 1, Vol. 2)

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

<b>Course Code:</b>	<b>BEL 102</b>	<b>Course Title:</b>	<b>Elements of Electrical Engineering</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>Nil</b>	<b>Type of Course</b>	<b>Basic Engineering</b>			

**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:**

**Module I:**

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.

**Module II:**

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

**Module III:**

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

**Module IV:**

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

**Module V:**

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

**Module VI:**

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

**Module VII:**

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

<b>Course Code:</b>	<b>BSL 101</b>	<b>Course Title:</b>	<b>Applied Sciences</b>
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<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>Nil</b>	<b>Type of Course</b>	<b>Basic Science</b>			

**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

**Course Contents:**

**Module I:**

Quantum Mechanics-I: Dual nature of matter, de-Broglie Hypothesis, phase velocity and group velocity, their relations, wave function & its physical significance, probability density,

**Module II:**

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.

**Module III:**

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

**Module IV:**

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).

**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 of 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, 3rd edition, 1999.

**Reference:**

- 1) John A. Pelesko, David H. Bernstein, "Modelling MEMS and NEMS" CRC Press, 2002

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 „ $\alpha$ “ of transistor in common base mode
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.

<b>Course Code:</b>	<b>CSL 101</b>	<b>Course Title:</b>	<b>Computer Programming</b>
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<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>Nil</b>	<b>Type of Course</b>	<b>Computer Science Engineering</b>			

**Course Outcomes:**

- Appreciation and practice of structured programming
- Ability to formulate the problem, devise an algorithm and transform into code
- Understanding different programming 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.

**Course Contents:**

**Module I:**

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,

**Module II:**

Overview of arrays and array based algorithms - searching and sorting, Mergesort, Quicksort, Binary search, Introduction to Program complexity (Big Oh notation), Sparse matrices.

**Module III:**

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.

**Module IV:**

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.

**Module V:**

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.

**Module VI:**

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. Merge sort

**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) Aho, Hopcroft and Ullmann, —Data Structures and Algorithms, Addison Wesley, 1983.

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

<b>Course Code:</b>	<b>ECL 101</b>	<b>Course Title:</b>	<b>Analog Electronics</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>

			3	0	2	4
<b>Pre-Requisite (if Any)</b>	<b>Nil</b>	<b>Type of Course</b>	<b>Basic Science</b>			
<b>Course Outcomes:</b>						
<p>1. This course introduces the fundamentals of semiconductor devices, such as diode, BJT, DIAC, LED, UJT etc.</p> <p>2. To study the V-I characteristics, biasing, small signal analysis, etc. for various electronic devices.</p> <p>3. The student will be able to apply various devices into electronic circuits and can compute various parameters.</p> <p>4. At the end student will be able to study and design various power devices including applications of these devices in to power amplifications</p>						
<b>Course Contents:</b>						
<b>Module I:</b>						
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.						
<b>Module II:</b>						
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.						
<b>Module III:</b>						
Small Signal Analysis & High Frequency Analysis of BJT CE, CB, CC Amplifiers and Comparison.						
<b>Module IV:</b>						
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.						
<b>Module V:</b>						
Field Effect Transistor & MOSFET, Principle of Operation & Characteristic, Biasing Arrangement, Small Signal Analysis of CG, CD & CS, High Frequency.						
<b>Text:</b>						
<p>1)Milman and Halkias, "Integrated Electronics", Second Edition, 2011, McGraw Hill.</p> <p>2)Boylestad and Nashelsky, "Electronic Devices &amp; Circuit theory",2011, Tenth Edition,</p>						
<b>Reference:</b>						
<p>1) David A. Bell, "Electronic Devices and Circuits"</p> <p>2)Milman and Halkias, "Electronic Devices and Circuits", Second Edition, 2011, McGraw Hill.</p>						

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

- 1) Study of characteristics PN-junction and Zener diodes
- 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.

<b>Course Code:</b>	<b>SAP 101</b>	<b>Course Title:</b>	<b>Health, Sports &amp; Safety</b>
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<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>
<b>Pre-Requisite (if Any)</b>	<b>Nil</b>	<b>Type of Course</b>	<b>Basic Science</b>			
<b>Course Outcomes:</b>						
<p>1. To provide physical fitness and good health.</p> <p>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.</p> <p>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.</p>						
<b>Course Contents:</b>						
<b>Module I:</b>						
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						
<b>Module II:</b>						
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,						
<b>Module III:</b>						
Teaching and development of sports skills: Cognitive, Perceptual, Motor, Perceptual motor. First Aid training:						
<b>Module IV:</b>						
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.						
List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)						
<p>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.</p> <p>2)Personal Safety Skill Demonstration</p>						

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

**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:**

**Module I:**

Natural resources: Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources.

**Module II:**

Ecosystem: Concept of an ecosystem, Structure and functions of an ecosystem, Producers, consumers and decomposers, Ecological succession, Food chain, food webs and pyramids.

**Module III:**

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.

**Module IV:**

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.

**Module V:**

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. Raj gopalan R., Environmental Studies

**Reference:**

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





**2<sup>ND</sup> SEM**  
**SYLLABUS**  
**CSE**

## SECOND SEMESTER

Course Code	Course Name	Type	L	T	P	Credits
MAL 102	Mathematics-II	BS	3	1	0	4
ECL 102	Digital Electronics	DC	3	0	2	4
CSL 102	Data Structures	DC	3	0	2	4
CSL 103	Application Programming	DC	3	0	2	4
HUL 101	Communication Skills	HU	2	0	2	3
BEL 101	Mechanics & Graphics	ES	3	0	2	4
TOTAL			17	1	10	23

<b>Course Code:</b>	<b>MAL 102</b>	<b>Course Title:</b>	<b>Mathematics-II</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>MAL 101</b>	<b>Type of Course</b>	<b>Basic Science</b>			
<p><b>Course Outcomes:</b> To make students understand the basic importance of multi variable calculus (Differential calculus &amp; Integral calculus), Vector calculus and ordinary differential equations in engineering.</p> <p><b>Course Contents:</b></p> <p><b>Module 1:</b> 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.</p> <p><b>Module 2:</b> Multiple Integrals: Double and triple integrals, change of order of integration, change of variables, application to area, volumes, Mass, Centre of gravity.</p> <p><b>Module 3:</b> 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).</p> <p><b>Module 4:</b> 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.</p> <p><b>Text:</b> 1. Kreyszig, E., Advanced Engineering Mathematics, John Wiley &amp; 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.</p> <p><b>Reference:</b> 1. Michael D. Greenberg, Advanced Engineering Mathematics, Pearson Education Pvt. Ltd 2. Jain R.K., Iyengar S.R.K, Advanced Engineering Mathematics, Narosa Publishers.</p>						

<b>Course</b>	<b>ECL 102</b>	<b>Course Title:</b>	<b>Digital Electronics</b>
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<b>Code:</b>						
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>ECL 101</b>	<b>Type of Course</b>	<b>Core Engineering</b>			
<b>Course Outcomes:</b>						
<p>1) To understand the fundamentals of digital logic design  2) Applications of combinational and sequential logic circuits  3) To learn the HDL programming</p>						
<b>Course Contents:</b>						
<b>Module 1:</b>						
NUMBER SYSTEMS: Representations, signed, 1's complement, 2's complement, saturation and overflow in fixed point arithmetic.						
<b>Module 2:</b>						
BOOLEAN ALGEBRA: Axioms and theorems, DeMorgan's law, universal gate, duality, expression manipulation using axioms and theorems.						
<b>Module 3:</b>						
COMBINATIONAL LOGIC: Introduction to switching algebra, canonical forms, two-level simplification, Boolean cube, logic minimization using K-map method, Quine McCluskey 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-look ahead adder combinational multiplier.						
<b>Module 4:</b>						
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.						
<b>Module 5:</b>						
CONTROLLER DESIGN: Based on minimum number of flip-flops and shift register method. Multiple command responding register design. Conditional response controller design.						
<b>Module 6:</b>						
HARDWARE DESCRIPTION LANGUAGE: Programming and simulation, structural specification, behavioural specification, dataflow modelling, test bench, 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.						
<b>Text:</b>						
1. Digital Design, Morris Mano, Prentice Hall, 2002 2. Digital Fundamentals, 10 <sup>th</sup> , Floyd T L, Prentice Hall, 2009.						
<b>Reference:</b>						
1. Digital Design-Principles and Practices, 4 <sup>th</sup> , J F Wakerly, Prentice Hall, 2006. 2. Fundamentals of Digital Logic with Verilog Design, 2 <sup>nd</sup> Ed, S. Brownand Z. Vrsaniec, McGraw Hill, 2007						
<b>Course Code:</b>	<b>CSL 102</b>	<b>Course Title:</b>	<b>Data Structures</b>			

<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>CSL 101 (Computer Programing)</b>	<b>Type of Course</b>	<b>Computer Science &amp; Engineering</b>			

### Course Outcomes:

- Appreciation and practice of structured programming
- Ability to formulate the problem, devise an algorithm and transform into code
- Understanding different programming 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.

### Course Contents:

#### Module 1:

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),

#### Module 2:

Implementation of 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.

#### Module 3:

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

#### Module 4:

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.

#### Module 5:

Trees, binary trees, binary trees- basic algorithms and various traversals. Binary Search Trees (BSTs) and insertion, deletion in BSTs.

#### Module 6:

Generalization of trees to graphs – their representation & traversals. Directed Acyclic Graphs and topological sort, Dijkstra's shortest path algorithm,

### Text Books:

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) Aho, Hopcroft and Ullmann, —Data Structures and Algorithms, Addison Wesley, 1983.

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

<b>Course Code:</b>	<b>CSL 103</b>	<b>Course Title:</b>	<b>Application Programming</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>

		Assigned	3	0	2	4
<b>Pre-Requisite (if Any)</b>	<b>CSL 101 (Computer Programming)</b>	<b>Type of Course</b>	<b>Computer Science &amp; Engineering</b>			
<b>Course Outcomes:</b>						
<p>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.</p>						
<b>Course Contents:</b>						
<b>Module 1:</b>						
Internet fundamentals, LAN, WAN, Introduction to common Internet terms, www. Basics of networking, DNS, URL, firewall, proxy, Web protocols – http and https.						
<b>Module 2:</b>						
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.						
<b>Module 3:</b>						
Introduction to Web Server – Setting up and configuration of Apache Tomcat server, Accessing pages from another machine.						
<b>Module 4:</b>						
Server Side Programming: Introduction to web programming with PHP. Client side programming with Javascript.						
<b>Module 5:</b>						
Introduction to Python - Statements and Control Flow, Expressions, Methods, Typing, Libraries and Developmental Environment, Web Programming using Python.						
<b>Text:</b>						
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						
<b>Reference:</b>						
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.

<b>Course Code:</b>	<b>HUL 101</b>	<b>Course Title:</b>	<b>Communication Skills</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>

Pre-Requisite (if Any)	Nil	Type of Course	Humanities
<p><b>Course Outcomes:</b></p> <ol style="list-style-type: none"> <li>1. To impart to the students the skills that they need in their academic, and later in their professional pursuit.</li> <li>2. To train the students to adopt an innovative approach to English language teaching and learning.</li> </ol> <p><b>Course Contents:</b></p> <p>Importance of Effective Communication; Reading, Writing and oral communication Skills; Methods/ Modes of Communication , Choice of Media; Barriers to Communication, Role of Communication in Society, Reading Skills, Professional Speaking, Orientation in Literary and Scholarly Article, Business Correspondence</p> <p><b>Text:</b></p> <ol style="list-style-type: none"> <li>1. Orient Longman, A Textbook of English for Engineers and Technologists</li> <li>2. M. Ashraf Rizvi, Effective Technical Communication. Tata McGrwa-Hill Publishing Company Limited,2009</li> </ol> <p><b>Reference:</b></p> <ol style="list-style-type: none"> <li>1. Quirk R. and Greenbaum S., A University Grammar of English.</li> <li>2. Krishnaswamy N., English Grammar (Longman Publication) (Macmillan India Ltd)</li> <li>3. Sanjay Kumar and Pushp Lata. Communication Skills. Oxford Publication</li> <li>4. Meenakshi Raman and Sangita Sharma. Technical Communication. Second Edition. Oxford Publication,2011ts presentation</li> </ol> <p><b>List of Lab Assignments/Experiments</b></p> <ol style="list-style-type: none"> <li>1. Presenting a Book Chapter using PowerPoint slides</li> <li>2. Speaking Skills</li> <li>3. Presentation Skills</li> <li>4. SWOT Analysis</li> <li>5. Group Discussion</li> <li>6. Personal Interview</li> </ol>			

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

## Course Outcomes:

1. 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. Drawing isometric views from orthographic projection orthographic views.
2. 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,
3. 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)
4. 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

## Course Contents:

### Module I

#### Engineering Graphics

Engineering curves like cycloid, conic sections. Concept of scales, Representative factor. Orthographic projections of points, lines, plane. Projection of right regular solids inclined to both the planes. Conversion of isometric view to orthographic views. Isometric views. Development of surfaces. Introduction to CAD, applications, Softwares, AUTOCAD, Basic commands and problems in 2D and 3D.

### Module II

#### Applied Mechanics

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, Resultant and Equilibrium Analysis, Equilibrium of Planar and Spatial force system, friction. Internal forces in member (TRUSS): 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.

Kinetics of Particles (a) D'Alembert's principle applied to bodies having rectilinear motion. (b) Principle of work and Energy: General numerical applications (c) Principle of Impulse and momentum: General numerical applications

Centre of Gravity, Second moment of area, polar moment of inertia, radius of gyration, Parallel axis theorem, Product of inertia.

## 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 Materials, 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

**3<sup>RD</sup> SEM**  
**SYLLABUS**  
**CSE**

## THIRD SEMESTER

Course Code	Course Name	Type	L	T	P	Credits
MAL 201	Mathematics-III	BS	3	1	0	4
CSL 201	Advanced Data Structure	DC	3	1	2	5
CSL 202	Introduction to Object Oriented Programming	DC	3	0	2	4
CSL 203	Computer System Organisation	DC	3	1	0	4
CSL 204	Discrete Maths and Graph Theory	DC	3	1	0	4
CSP 201	IT Workshop-I	DC	1	0	4	3
ECL 202	Microprocessors & Interfacing	DC	3	0	2	4
<b>Total</b>			<b>19</b>	<b>4</b>	<b>10</b>	<b>28</b>

<b>Course Code:</b>	<b>MAL 201</b>	<b>Course Title:</b>	<b>Mathematics-III (Statistics and Probability)</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>Mathematics-I (101), Mathematics-II (102)</b>	<b>Type of Course</b>	<b>Basic Science</b>			

**Course Contents:**

**Probability**

Random Variable & Probability Distributions: Random Variables, Density function, distribution function for continuous and discrete random variables, Joint distributions. Mathematical Expectation: Mathematical Expectation, The variance and Standard deviation, Moment Generating Function, Characteristic Function. Special Probability Distributions: Some special probability distributions like Binomial Poisson, Geometric, Normal, Uniform, Exponential Gamma Beta, Chi-Square, Students't, F-distribution and Weibull Distribution.

**Statistics**

Moments, correlation, covariance and regression. Sampling Theory: Population Parameter, Sample Statistics, Sampling distributions, Sample mean, Sampling distribution of means, The Sample variance, and The sampling distribution of variance. Estimation Theory: Point estimate and Interval Estimates, Reliability, Confidence interval estimates of population parameters, confidence intervals for means, proportions and variance. Tests of Hypothesis and Significance: Statistical decisions, Tests of hypothesis and significance. Type I and Type II errors. Level of significance, one tailed and two tailed tests. Tests involving small samples and large samples. Fitting theoretical distributions to sample frequency distribution. The chi-square test for goodness of fit.

**Text:**

1. Paul L. Meyer, Introductory Probability and Statistical Applications, Addison Wesley.
2. Miller and Freund: Probability and Statistics for Engineers Eastern Economy Edition, PHI.
3. E.Parzen: Modern Probability Theory and Its Applications J. Wiley and Sons Inc., New York.

**Reference:**

1. M.R.Speigal: Probability and Statistics, McGraw-Hill, 1995.
2. V.K. Rohatgi and A.K.M. EhsanesSateh: An Introduction to Probabability and Statistics, John Wiley & Sons.

<b>Course Code:</b>	<b>CSL 201</b>	<b>Course Title:</b>	<b>Advanced Data Structure</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>1</b>	<b>2</b>	<b>5</b>
<b>Pre-Requisite (if Any)</b>	<b>Data Structure (CSL 102)</b>	<b>Type of Course</b>	<b>Computer Science &amp; Engineering</b>			
<b>Course Contents:</b>						
<b>Text:</b>						
<b>Reference:</b>						

<b>Course Code:</b>	<b>CSL202</b>	<b>Course Title:</b>	<b>Introduction to Object Oriented Programming</b>			
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<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>None</b>	<b>Type of Course</b>	<b>Computer Science</b>			
<b>Course Outcomes:</b>						
<ol style="list-style-type: none"> <li>1. Understand the necessity of encapsulation, data hiding, inheritance, and exception handling.</li> <li>2. Formulate a software application and propose an object oriented design.</li> <li>3. Write generic programs using the standard template library.</li> <li>4. Study and use design tools like UML, design patterns etc.</li> </ol>						
<b>Course Contents:</b>						
<ol style="list-style-type: none"> <li>1. Object Oriented Programming, Features of object oriented programming languages like data encapsulation, inheritance, polymorphism and late binding.</li> <li>2. Concept of a class, Access control of members of a class, instantiating a class, static and non-static members, overloading a method.</li> <li>3. Deriving a class from another class, access control of members under derivation, different ways of class derivation, overriding of a method, run time polymorphism.</li> <li>4. Concept of an abstract class. Concept of an interface. Implementation of an interface.</li> <li>5. Exception and exception handling mechanisms. Study of exception handling mechanisms in object-oriented languages</li> <li>6. Introduction to streams, use of stream classes. Serialization and de-serialization of objects.</li> <li>7. Templates, Implementation of data structures like linked lists, stacks, queues, trees, graphs, and hash table etc. using object oriented programming languages.</li> <li>8. Introduction to concept of refactoring, modelling techniques like UML, Design patterns.</li> </ol>						
<b>Text:</b>						
<ol style="list-style-type: none"> <li>1. Bjane Stroustrup, "The C++ programming language", Addison-Wesley</li> <li>2. Herbert Schildt, "C++: The Complete Reference", 4th Edition</li> <li>3. Arnold Ken, Gosling J, "The Java Programming Language", Addison Wesley</li> <li>4. Matt Weisfeld, "The Object-Oriented Thought Process", Pearson</li> <li>5. Cox Brad, "Object –Oriented Programming: An Evolutionary Approach", Addison – Wesley</li> </ol>						
List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)						
Practical's based on above mentioned syllabus						

<b>Course Code:</b>	<b>CSL 203</b>	<b>Course Title:</b>	<b>Computer System Organisation</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>None</b>	<b>Type of Course</b>	<b>Computer Science</b>			
<b>Course Outcomes:</b>						
<ol style="list-style-type: none"> <li>1. Students will learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design.</li> <li>2. Students will be able to identify where, when and how enhancements of computer Performance can be accomplished.</li> <li>3. Students will learn the sufficient background necessary to read more advance texts as well as journal articles on the field.</li> <li>4. Student will see how to use concepts of computer organization in real-life settings using various PC performance improvements.</li> <li>5. Students will also be introduced to more recent applications of computer organization in advanced digital systems.</li> </ol>						
<b>Course Contents:</b>						
<ol style="list-style-type: none"> <li>1. Addressing methods, their application in implementation of HLL constructs and data</li> <li>2. Structures, instruction formats, expanding opcode method, subroutine linkage in PDP-11 and 68000, zero address machine such as HP3000.</li> <li>3. Processing unit, bus architecture, execution of a complete instruction, sequencing of control signals, micro programmed control, microinstruction format, microinstruction sequencing, and bit slice concept.</li> <li>4. Arithmetic, number representations and their operations, design of fast address, signed multiplication, Booth's Algorithm, bit-pair recording, division , floating point numbers and Operations, guard bits and rounding.</li> <li>5. Main memory organization, various technologies used in memory design, higher order Memory design, multimodal memories and interleaving, cache memory, concept of cache memory, mapping functions, replacement algorithms. Input-output organization, I/O mapped I/O and memory mapped I/O, Direct Memory Access, interrupts and interrupt handling mechanisms, device identification, vectored interrupts, interrupt nesting, I/O Interfaces, synchronous vs. asynchronous data transfer, I/O channels.</li> <li>6. Computer peripherals, I/O devices such as video terminals, video displays, graphic input devices, printers, magnetic disk, magnetic tape , CDRom systems.</li> <li>7. RISC philosophy, pipelining, basic concepts in pipelining, delayed branch, branch prediction, data</li> <li>8. dependency, influence of pipelining on instruction set design, multiple execution units, performance</li> <li>9. considerations, basic concepts in parallel processing &amp; classification of parallel architectures</li> </ol>						
<b>Textbook:</b>						
<ol style="list-style-type: none"> <li>1. Computer Organization , Hamacher, Carl V. et al, McGraw Hill</li> <li>2. Structured Computer Organization , Tanenbaum A.S, Prentice Hall of India Ltd</li> <li>3. Computer Organization &amp; Design, The Hardware/ Software Interface, Patterson D. A J. L. Second Edition. Harcourt ,Hennessy Asia,</li> </ol>						

<b>Course</b>	<b>CSL 204</b>	<b>Course Title:</b>	<b>Discrete Maths and</b>			
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<b>Code:</b>			<b>Graph Theory</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>None</b>	<b>Type of Course</b>	<b>Computer Science and Engineering</b>			

### Course Outcomes:

1. Student should be able to use different proof techniques.
2. Students would be able to argue about limits by using Pigeon Hole principle.
3. Solve problems based on set theory, Permutations and Combinations, as well as Discrete Probability.
4. Students will be able to solve mathematical problems on partial orders, and group theory.
5. Students would be able to model and analyze computational problems in graph theoretical framework.

### Course Contents:

#### Module 1:

Set Theory: Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling problem.

#### Module 2:

Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.

#### Module 3:

Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers.

#### Module 4:

Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs. Graphs, hypergraphs, transitive closure, trees, spanning trees. Eulerian tours, Hamiltonian cycles, Planar Graphs, Connectivity, Colorability, Line Graphs

#### Module 5:

Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices.

Combinatorics: Introduction, Permutation and combination, Binomial Theorem, Multimonial Coefficients Recurrence Relation and Generating Function, Recurrence Relation and Recursive algorithms , Linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions .

**Text Books:**

1. C.L.Liu, "Elements of Discrete Mathematics" Tata Mc Graw-Hill Edition.
2. Trembley, J.P & Manohar; "Discrete Mathematical Structure with Application CS", McGraw Hill.
3. Kenneth H. Rosen, "Discrete Mathematics and its applications", McGraw Hill.
4. Lipschutz; Discrete mathematics (Schaum); TMH
5. Deo, Narsingh, "Graph Theory With application to Engineering and Computer Science.", PHI.

<b>Course Code:</b>	<b>CSP 201</b>	<b>Course Title:</b>	<b>IT Workshop-I</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>

		<b>Assigned</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>3</b>
<b>Pre-Requisite (If Any)</b>	<b>None</b>	<b>Type of Course</b>	<b>Computer Science and Engineering</b>			
<b>Course Outcomes:</b>						
<ol style="list-style-type: none"> <li>1. Effectively use the Unix programming environment - shell, file system, scripts, filters, program development tools.</li> <li>2. Automate tasks and write simple programs using scripting languages, such as Awk.</li> <li>3. Develop good programming style, organization, interface, and documentation habits.</li> <li>4. Use of effective procedures and tools for building, debugging, testing, tuning, and maintaining programs.</li> <li>5. Use of tools and write programs to assist in developing programs.</li> </ol>						
<b>Course Contents:</b>						
<b>Module 1:</b>						
Introduction to different tools for identification and possibility of errors in C program – gdb, concepts of “core dump”, backtracing using “bt”, using “info” to dump all registers, creating watch-list / watch variables. DDD (Data Display Debugger) – introduction and usage, debugging with ddd (step, step into, step over). Using DevCpp and/or VisualStudio b. Setting compiler options and linker options. Unix tools - Awk, sed, Emacs. Make files and automated builds.						
<b>Module 2:</b>						
Text editors. Users, files, permissions, and processes on Linux. Introduction to shell: Set and Unset a variable, Displaying – using echo, Using Expr & Test, Getting input – using read, Header files of shell script – using Shabang, Sample Shell script program. Assigning a command to a variable, Storing output to a variable, Assigning global value – using Export. Command Line Arguments, Conditional & Looping Statement, Functions.						
<b>Module 3:</b>						
Advanced Commands: SED, Replacing values in a file, STTY, TOP, Sending an email – using MAIL, HERE. Scheduler: Scheduling a job – using ‘Crontab’, ‘at’ and ‘nohup’. Shell Programming: Essential systems administration with shell scripting and elementary Python, Version control. Advanced Shell Scripting: Monitoring a file, Handling Shell Script Interrupts, Extracting data from HTML/XML file, Trapping Signals Database Connectivity, Connecting MYSQL to Shell, Running SQL queries from Shell Script.						
<b>Module 4:</b>						
Bash and Bash Scripting: Common shell programs, Advantages of BASH, Executing commands, Building blocks, developing good scripting, variables, conditionals, loops, finding logged in users. Writing and Debugging Scripts.						
<b>Module 5:</b>						
Bash Environment: Shell Initialization files, Quoting characters, Shell expansion, Aliases and More options in Bash. Regular Expressions: Meta characters, Extended regular expressions Using GREP, Pattern matching. Python Integration, Testing and Debugging with Software Development Practice.						
<b>Text Books:</b>						
<ol style="list-style-type: none"> <li>1. Christopher Negus “Linux Bible”, Wiley</li> <li>2. Steve Parker “Shell Scripting: Expert Recipes for Linux, Bash &amp; more” Wrox</li> <li>3. Richard Petersen “Linux: The Complete Reference”, TMH</li> <li>4. Robert Collins “Shell Programming and Bash Scripting: Ultimate Beginners Guide</li> </ol>						



<b>Course Code:</b>	<b>ECL202</b>	<b>Course Title:</b>	<b>Microprocessors &amp; Interfacing</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>Nil</b>	<b>Type of Course</b>				
<b>Course Outcomes:</b>						
<p>1. Through this course the students will be able to identify the internal registers and memory organization for assembly language programming.</p> <p>2. They are able to design interface circuits for microprocessors and also interface controlling devices and data acquisition systems.</p> <p>3. This course helps the students to develop assembly language codes for microprocessor-based systems.</p>						
<b>Course Contents:</b>						
<p><b>Intel's 8085 microprocessor:</b> Architecture, , timing diagrams, Machine cycle, T-states, Bus structure, Instruction set, Grouping of instructions, Instruction cycle and their timing diagrams, Assembly language programming. Stacks and sub routines, related instructions, Interrupts and associated instructions, Expanding interrupts, ALP for stacks and interrupt service routines. Memory Interfacing, I/O mapped and memory mapped modes, interfacing of input and output devices, Multiplexed and matrix interfacing. Study and Interfacing of (at least four of the following) peripherals with 8085: Peripherals: 8255, 8254, 8251, 8259, 8257/37, and 8279.</p> <p><b>8086 microprocessor:</b> Architecture, Instruction set, memory interfacing and programming, 8087 coprocessor interface</p>						
<b>Text:</b>						
<p>1. "Microprocessors Architecture, Programming and applications with 8085", Gaonkar R.S, Penram Publishing, Edition</p>						
<b>Reference:</b>						
<p>1. Microprocessors and Microcontrollers, Uffenbeck J, Prentice Hall of India Edition</p> <p>2. K M Bhurchandi, A K Ray, Advanced microprocessors and Peripherals, McGraw Hill Education India, 2012, 3rd ed</p>						
List of Lab Assignments / Experiments OR List of Tools on which the lab assignment should be based (If Any)						

**4<sup>th</sup> SEM**  
**SYLLABUS**  
**CSE**



## FOURTH SEMESTER

<b>Course Code</b>	<b>Course Name</b>	<b>Type</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>CSL 205</b>	<b>Design and Analysis of Algorithms</b>	<b>DC</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>5</b>
<b>CSL 206</b>	<b>Software Engineering</b>	<b>DC</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>CSL 207</b>	<b>Operating Systems</b>	<b>DC</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>CSL 208</b>	<b>Design Principles of Programming Languages</b>	<b>DC</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>HUL 201</b>	<b>Human Values</b>	<b>HU</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>CSP 202</b>	<b>IT Workshop-II</b>	<b>DC</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>3</b>
<b>Total</b>			<b>16</b>	<b>2</b>	<b>10</b>	<b>23</b>

<b>Course Code:</b>	<b>CSL 205</b>	<b>Course Title:</b>	<b>Design and Analysis of Algorithms</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>1</b>	<b>2</b>	<b>5</b>
<b>Pre-Requisite (if Any)</b>	<b>Advanced Data Structures , - Mathematics</b>	<b>Type of Course</b>	<b>Computer Science Engineering</b>			

**Course Contents:**

**Module 1:**

Mathematical foundations, summation of arithmetic and geometric series,  $n$ ,  $n^2$ , bounding summations using integration, recurrence relations, solutions of recurrence relations using technique of characteristic equation and generating functions.

**Module 2:**

Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, amortized analysis, sorting algorithms such as selection sort, insertion sort, bubble sort, heap sort, lower bound proof, elementary and advanced data structures with operations on them and their time complexity.

**Module 3:**

Divide and conquer basic strategy, binary search, quick sort, merge sort, Fast Fourier Transform etc. Greedy method - basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path etc.

**Module 4:**

Dynamic Programming basic strategy, multistage graphs, all pairs shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem.

**Module 5:**

Basic Traversal and Search Techniques, breadth first search and depth first search, connected components. Backtracking basic strategy, 8-Queen's problem, graph colouring, Hamiltonian cycles etc. NP-hard and NP-complete problems, basic concepts, nondeterministic algorithms, NP-hard and NP-complete, Cook's Theorem, decision and optimization problems, polynomial reduction.

**Text:**

1. Introduction to Algorithms : Cormen T.H. et.al : Prentice Hall of India
2. Computer Algorithms : Horowitz, Sahani, Rajsekharan , Galgotia Publications Pvt.Ltd
3. Fundamentals of Algorithms : Brassard, Bratley , Prentice Hall

<b>Course</b>	<b>CSL206</b>	<b>Course Title:</b>	<b>Software</b>
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<b>Code:</b>			<b>Engineering</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>Computer Programming(CSL 101)</b>	<b>Type of Course</b>	<b>Computer Science Engineering</b>			

**Course Outcomes:**

1. to look at the large scale software development from a broader perspective, and function in multidisciplinary teams
2. to apply knowledge gained in the course to practical software development situations in methodical way
3. to design software systems to meet desired needs with realistic constraints To communicate effectively in software development activities
4. to get an idea about contemporary issues in Software development and engage in life-long learning, understand professional and ethical responsibility

**Course Contents:**

**Module 1:**

Software Engineering Process & Management : Generic view, Capability Maturity Model, Process models-waterfall, evolutionary, incremental etc., unified process, agile view, project management, metrics estimation, project scheduling, risk management.

**Module 2:**

Software engineering Principles and Practice : Communication, planning and modelling practices, system engineering and modelling, business process engineering requirement analysis, system analysis- flow oriented and class oriented modelling using data modelling concepts.

**Module 3:**

Software Design Engineering : Design Concepts : Abstraction Architecture, pattern modularity, information hiding, design classes, refactoring etc., Design of web application, architectural design, component level design, user interface design.

**Module 4:**

Software Testing and Quality Management : Testing strategies, testing for object oriented software testing for web applications, validation testing etc. Black box testing, white box testing, Basis path testing. Testing for specialized environments, architectures and application. Quality concepts, quality assurance, software reviews, statistical quality assurance.

**Module 5:**

Software configuration management and advance topics : Elements of configuration management system, process configuration for web engineering, component-based development, clean room software engineering, formal methods, software reengineering, Software Maintenance

**Text:**

1. Software Engineering by Ian Sommerville ; Pearson Ed
2. Software Engineering: A Practitioner's Approach by Roger Pressman ; Tata-McGraw Hill

<b>Course Code:</b>	<b>CSL 207</b>	<b>Course Title:</b>	<b>Operating Systems</b>
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<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>Data Structures(CSL 102)</b>	<b>Type of Course</b>	<b>Computer Science Engineering</b>			

**Course Outcomes:**

1. Understand the structure and design issues of operating systems.
2. Learn about and understand theoretical concepts and programming constructs used for the operation of modern operating systems.
3. Understand concepts of OS management domains like process, memory, file systems, storage etc.
4. Familiarity with operating systems like Unix.
5. Gain practical experience with software tools available in modern operating systems such as semaphores, system calls, sockets and threads.

**Course Contents:**

**Module 1:**

Introduction, basic h/w support necessary for modern operating systems - Services provided by OS, system programs and system calls - brief discussions of evolution of OS - real time and distributed systems : a brief overview of issues.

**Module 2:**

File systems, user interface - disk space management and space allocation strategies - examples from UNIX, DOS, Windows etc - directory structures - disk caching - file system consistency and logs - disk arm scheduling strategies.

**Module 3:**

Processes and 3 levels of scheduling - process control block and context switch - goals of scheduling and different scheduling algorithms - threads : user-level and kernel level.

**Module 4:**

Memory management techniques - contiguous and non-contiguous - paging and segmentation - translation look-aside buffers (TLB) and overheads - virtual memory and demand paging- page faults and instruction restart - problems of large address spaces – page replacement algorithms and working sets - miscellaneous issues.

**Module 5:**

Process cooperation and synchronization - mutual exclusion and implementation - semaphores, conditional critical regions and monitors - classical inter - process communication problems - message passing.

**Module 6:**

Deadlocks and strategies for handling them - protection and security issues - access lists, capabilities, cryptographic techniques - introduction to distributed systems.

**Module 7:**

Linker and Loader - Concept of static and dynamic relocation, external symbols, design of linker, design of object file for different loading schemes.

**Module 8:**

Common Object file format - Structure of object file and executable file, section or segment headers, symbol table, concept of storage class, string various, data types line insert, character, arrays structures.

**Module 9:**

Device Drivers - Device programming, system drivers, non system drivers, virtual drivers, Incorporation of driver routines, Basic device driver operation, character and block drivers.

**Text:**

1. Tanenbaum A, "Modern Operating Systems", PHI 2 nd Ed
2. Silberchatz & Galvin, "Operating System Concepts", Addison Wesley

<b>Course Code:</b>	<b>CSL 208</b>	<b>Course Title:</b>	<b>Design Principles of Programming Languages</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>

		<b>Assigned</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Pre-Requisite (if Any)</b>	<b>None</b>	<b>Type of Course</b>	<b>Computer Science Engineering</b>			
<b>Course Outcomes:</b>						
<ol style="list-style-type: none"> <li>1. To provide an overview of different programming paradigms</li> <li>2. Improve the background for choosing appropriate programming languages for certain classes of programming problems</li> <li>3. Understand the implementation aspects behind different programming constructs</li> <li>4. Be able in principle to program in an imperative (or procedural), an object-oriented, a functional, and a logical programming language</li> <li>5. Understand the significance of an implementation of a programming language in a compiler or interpreter</li> <li>6. Increase the ability to learn new programming languages</li> <li>7. Increase the capacity to express programming concepts and choose among alternative ways to express things</li> <li>8. Simulate useful features in languages that lack them</li> <li>9. Be able in principle to design a new programming language</li> <li>10. Make good use of debuggers and related tools</li> </ol>						
<b>Course Contents:</b>						
<b>Module 1:</b>						
Definition of Programming language . Syntax , semantics. High - level languages. Implementation of high-level languages, Compilers and Software interpreters. Data elements, identifiers binding, binding time, binding identifiers to names, binding of attributes, importance of binding time. Concept of r-value and l-value . Effect of environment on a language. Language paradigms.						
<b>Module 2:</b>						
Data type, elementary data type, structured data type, elements of specification and implementation of data type. Implementation of elementary data types : integer, real, character, Boolean and pointer.						
<b>Module 3:</b>						
Implementation of structured data types. Vectors & arrays, records and files. Type checking, type conversion and initialization.						
<b>Module 4:</b>						
Evolution of data type concept. Abstract data type, encapsulation. Design and implementation of new data types through subprograms. Subprogram definition and activation, their implementation, parameter passing, generic subprograms.						
<b>Module 5:</b>						
Sequence control structures used in expressions and their implementation. Sequence control structures used between statements or group of statements and their implementation.						
<b>Module 6:</b>						
Sequence control structures used between subprograms, recursive and non recursive subprogram calls. Data control, referring environment dynamic and static scope, static chain implementation and display implementation.						
<b>Module 7:</b>						
Type definition as mechanism to create new abstract data types, type equivalence, type definitions with parameters. Defining new abstracts data types Storage management issues, like static and dynamic allocation, stack based allocation and management, Heap						

based allocation and management

**Text:**

1. Pratt Terence, "Programming Languages, Design and Implementation", PHI
2. Sethi Ravi, "Programming Languages", Addison Wesley

<b>Course Code:</b>	<b>HUL 201</b>	<b>Course Title:</b>	<b>Human Values</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

Pre-Requisite (if Any)	Nil	Type of Course	Humanities
<p><b>Course Outcomes:</b></p> <ol style="list-style-type: none"> <li>1. To help the students appreciate the essential complementarity between VALUES and SKILLS to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.</li> <li>2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way</li> </ol> <p><b>Course Content:</b></p> <p>Course Introduction- What are the core values essential for students and professionals of tomorrow. ? Why is it important?  Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration- What is it?- its content and process, Understanding the core values essential for human development . Initiate the process to realize the same. Self appraisal to identify the existing shortcomings. Prepare a roadmap to fulfill the same.</p> <p>Implement the Roadmap to develop the core values within oneself Deep dive into seven core values essential for total development. These being –  1. Wisdom &amp; Purity 2. Creativity and Innovation 3. Peace and Satisfaction 4. Joy and Confidence 5. Teamwork and Communication 6. Respect and Humility 7. Integration and Inspiration.  Students assess their current state related to each value to further identify physical, mental and emotional activities to improve upon each.</p> <p>Understanding Harmony in the Family and Society  Harmony in Human-Human Relationship  Understanding Harmony in the Family – people who we know and are related to as well as Society – also consists of people who we may not know or not related to. How to enable these values within family and society using train the trainer approach. One lit candle can light thousands others. How ethical living exemplifies these values so others get inspired to pursue similar Practice Exercises and Case Studies will be taken up in Practice Sessions.</p> <p>Implications of the above Holistic Understanding of Harmony on Professional Ethics  Apply the seven values in professional environment for personnel development leading to overall organization growth. How ethical organizations are foundations of successful economies. Competence in Professional Ethics. Enabling Corporate Social Responsibility.  Developing organizations that actively contribute to the human and environmental development that enables even higher financial success.  Examples, case studies and practice session will be take up</p> <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. The Third Advent - Grégoire de Kalbermatten ( downloadable from Kindle, Google Books )</li> <li>2. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.</li> </ol> <p><b>References:</b></p>			



1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education.
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and the HarperCollins, USA
3. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. A. Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
5. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.
6. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
8. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
9. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth- Club of Rome's report, Universe Books.
10. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists and Engineers, Oxford University Press.
11. M Govindrajan, S Natrajan & V. S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

<b>Course Code:</b>	<b>CSP 202</b>	<b>Course Title:</b>	<b>IT Workshop-II</b>			
<b>Category:</b>	<b>Core</b>	<b>Credit Assigned</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>1</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>Pre-Requisite (if Any)</b>	<b>None</b>	<b>Type of Course</b>	<b>Computer Science and Engineering</b>			

## **Course Outcomes:**

1. Understand programming paradigm for JAVA language.
2. Understand the installation of JDK with web server and databases connectivity along with its configuration.
3. Understand commands for JAVA bases tasks inkling exception handling. The students should get understanding of the advanced features for database connectivity.
4. Get to know the necessary tools for JAVA administration and learn about special features offered by JAVA as J2EE.
5. Learn to use to software and debug them.
6. Build a mini project using the overall concepts learned.

## **Course Contents:**

### **Module 1:**

The Java Environment: Java Source File Structure, Compilation, Executions. Lexical Tokens, Identifiers, Keywords, Literals, Comments, Primitive Datatypes, Operators Assignments. Object Oriented Programming Class. Fundamentals including Object & Object reference, Object Life time & Garbage Collection, Creating and Operating Objects, Constructor & initialization code block, Access Control, Modifiers, methods Nested, Abstract Class & Interfaces Defining Methods, Argument Passing Mechanism, Method Overloading, Recursion, Dealing with Static Members, Finalize () Method, Use of “this” reference, Use of Modifiers with Classes & Methods.

### **Module 2:**

Package Organizing Classes and Interfaces, CLASSPATH Setting for Packages, Making JAR Files for Library Packages, Import and Static Import Naming Convention. Exception Handling: The Idea behind Exception, Exceptions & Errors, Types of Exception, Control Flow In Exceptions, JVM reaction to Exceptions, Use of try, catch, finally, throw, throws in Exception Handling, Checked and Un-Checked Exceptions.

### **Module 3:**

Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips.

### **Module 4:**

Concept of Threading, Needs of Multi-Threaded Programming, Thread Priorities, Synchronizing Threads, Inter Communication of Threads, Critical Factor in Thread and DeadLock. Event Handling, Two Event Handling Mechanisms, The Delegation Event Model, Events, Event Sources, Event Listeners, Event Classes, The MouseEvent Class. Database Programming using JDBC Introduction to JDBC, JDBC Drivers & Architecture, CURD operation Using JDBC, Connecting to non-conventional Databases. Module 5: Python for data Science: Python data types, Python Lists, Conditional Statements, Functions, packages, Numpy, matplotlib, control flow and pandas

## **Text Books:**

1. Naughton & Schildt “The Complete Reference Java 2”, Tata McGraw Hill
2. Deitel “Java- How to Program:” Pearson Education, Asia
3. Horstmann & Cornell “Core Java 2” (Vol I & II ) , Sun Microsystems
4. Ivor Horton’s “Beginning Java 2, JDK 5 Ed., Wiley India.
5. Java Programming for the absolute beginners By Russell, PHI Learning

6. Learning Python, 5th Edition by Mark Lutz, O'Reilly Media, 2013. ISBN 978-1-4493-5573-9

7. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython by Wes McKinney, O'Reilly Media, 2012. ISBN 978-1-4493-1979-3

**5<sup>TH</sup> SEM**  
**SYLLABUS**  
**CSE**

Course Code	Course Name	Type	L	T	P	Credits
CSL 301	Database Management Systems	DU	3	0	2	4
HUL 301	Open Course – I	HU	3	0	0	3
CSL 302	Computer Networks	DU	3	0	2	4
CSL 303	Theory of Computation	DU	3	0	0	3
	Elective-I	DE	3	0	0	3
			15	0	4	17

Course Code:	CSL 301	Course Title:	Data Management System			
Category :	CORE	Credit Assigned :	L	T	P	C

			<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Pre-Requisite (if Any) :</b>	<b>NONE</b>	<b>Type of Course :</b>	<b>Computer Science and Engineering</b>			
<b>Course Outcomes:</b>						
<ol style="list-style-type: none"> <li>1. To obtain sound knowledge in the theory, principles and applications of database management system.</li> <li>2. Design and develop data model given their specifications and within performance and cost constraints.</li> <li>3. Acquire and understand new knowledge, use them to develop data centric application and to understand the importance of lifelong learning.</li> <li>4. Perform experiments in different disciplines of database management system.</li> </ol>						
<b>Course Contents:</b>						
<b>Module 1:</b>						
Database system concepts and Architecture - concept of relational database, Relational data model, Relational algebra, SQL-the relational database standard, ER and EER model.						
<b>Module 2:</b>						
Database design theory - Functional dependencies and normalization, relational database design algorithms, practical database design and demoralization, Relational constants, programmatic ways for implementing constraints, triggers, Chase algorithm.						
<b>Module 3:</b>						
Physical database design - Concept of physical and logical hierarchy, storage structures like cluster, index organized table, partitions, various table storage parameters and block storage parameters, concept of index, B-trees, hash index, function index, bitmap index.						
<b>Module 4:</b>						
Process and memory management in database - Various types of tasks in database, database buffer management, log buffer management code reuse, concept of two tier and N-tier architecture, data dictionary and catalog information database recovery technique. Arier Algorithm for recovery.						
<b>Module 5:</b>						
Query optimization and performance tuning - Various techniques for query optimization, strong and weak equivalence, cost base optimization, Use of different storage structures in query optimization.						
<b>Module 6:</b>						
Transaction Processing - Transaction and system concepts, Desirable properties of transaction, Schedules and recoverability, serializability of schedules, concurrency control, lock base protocols and time stamp based protocols, read consistency.						
<b>Text Books:</b>						
1.Fundamentals of Database Systems : Elmasiri and Navathe, Addison Wesley, 2000						
2.Principles of Database Systems : Ullman , Golgotia Publications 1988						

<b>Course Code:</b>	<b>CSL 302</b>	<b>Course Title:</b>	<b>Computer Network</b>			
<b>Category :</b>	<b>CORE</b>	<b>Credit Assigned :</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

<b>Pre-Requisite (if Any) :</b>	<b>NONE</b>	<b>Type of Course :</b>	<b>Computer Science and Engineering</b>
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**Course Outcomes:**

1. Student will be able to Defining, using and implementing Computer Networks and the basic components of a Network system, explain the importance of data communications, how communication works in data networks and the internet, recognize the different internetworking devices and their functions.
2. Student will be able to Explain the role of protocols in networking, Analyze the role and services and features of the various layers of data networks, analyze the features and operations of various application layer protocols such as Http, DNS, Telnet, FTP and SMTP.
3. Student will be able to Knowing and Applying pieces of hardware and software to make networks more efficient, faster, more secure, easier to use, able to transmit several simultaneous messages, and able to interconnect with other networks, differentiating the various types of network configurations and applying them to meet the changing and challenging networking needs of organizations, defining and analyzing the
4. Student will be able to circuits available for voice and data networks, their t ransmission speeds (bandwidth), and how they are packaged for commercial use.
5. Student will be able to Defining the different protocols, software, and network architectures, defining the concept of local area networks, their topologies, protocols and applications , analyzing why networks need security and control, what errors might occur, and how to control network errors.

**Course Contents:**

**Module 1:**

Computer Networks, evolution of Computer Networks, application of Computer Networks. Layered Network Architecture: requirement for layered approach, basic concept of layering in the network model, define entities, protocols, interface in networking context, ISO's OSI Reference Model, functions of the seven layers of OSI Model , TCP/IP model, difference between OSI and TCP/IP model

**Module 2:**

Define data, signal. Time domain and frequency domain representation of signal, bandwidth of a signal and medium, Sources of impairment, Attenuation, distortion, noise, data rate Limits and Nyquist bit rate, between Bit Rate and Baud Rate, Sources of noise. FDM and TDM, synchronous and asynchronous TDM. Transmission Media: Various Transmission Media - guided and unguided media, characteristics of the popular guided transmission media: Twisted-pair, Coaxial cable, Optical fiber, Sources of transmission impairment, Shannon Capacity

**Module 3:**

what is network topology, characteristics of the following topologies: Mesh, Bus, Star, Ring, Tree, Unconstrained. Medium Access Control (MAC): goals and requirements of Medium Access Control (MAC) techniques, key issues related to MAC techniques, Classify various contention based techniques such as ALHOA, CSMA, CSMA/CD and CSMA/CA. MAC techniques: Polling, Token passing. FDMA, TDMA, CDMA. IEEE standards: IEEE 802 LANs - basic characteristics of LANs, operation of IEEE 802 LANs , 802.3 - CSMA/CD-based (Ethernet), 802.4 – Token bus-based, 802.5 – Token ring-based,

Compare performance of the three LANs. Introduction of High Speed LANs, Fast Ethernet and Gigabit Ethernet, wireless LANs. Need for wireless LAN, limitations and challenges of wireless LAN IEEE 802.11 WLAN -Transmission media, Topology, Medium Access Control, Security

#### **Module 4:**

Interfacing to the media and synchronization: modes of communication, Asynchronous and Synchronous modes of communication. Error Detection and Correction: need for error detection and correction, simple parity check, 2-D parity check, checksum, cyclic redundancy check, Hamming's code. Flow Control and Error Control : need for flow and error control, Stop-and-wait flow control, Sliding-window flow control, Stop-and-wait ARQ, Go-back-N ARQ, Selective-repeat ARQ, Selective-repeat ARQ. HDLC: how HDLC works, piggybacking in HDLC, data transparency in HDLC

#### **Module 5:**

Switching Techniques: Circuit Switching - need for circuit switching , how circuit switching takes place, space-division and time-division switching, Packet Switching - need for packet switching, how packet switching takes place, difference between virtual-circuit and datagram type packet switching, Message switching, Compare circuit switching, packet switching, message switching. Need for internetworking, Introduction of internetworking devices- Hubs, Switches, Bridges, Router, Gateways. Internet Protocol (IP): different classes of IP addresses, concept of subnet masking, sub-netting super-netting, network address translation table, ARP/RARP protocol, fragmentation and reassembly, ICMP protocols, key features of IPv6. Transport layer: Connection establishment and release – timer management - multiplexing - flow control working of TCP and UDP. QoS parameters. ATM network, ATM signaling, PNNI routing I ATM. Application Layer Protocols: DNS, Telnet, ICMP, RPC, SMTP, FTP, SNMP

#### **Module 6:**

Adaptive routing, Non-adaptive routing, Dijkstra's SP algo, flooding, flow based, distance vector routing, linked state routing, RIP- routing information protocol, OSPF - (Open shortest path first), BGP - Border gateway protocol: operation of the BGP protocol. Congestion Control: causes for congestion, effects of congestion , various open-loop and close-loop congestion control techniques: The leaky bucket algorithm , The token bucket algorithm, Choke packets, Load shedding, jitter control, distinguish between flow and congestion control

#### **Text Books:**

1. Tanenbaum A. S, "Computer Networks", PHI 4th Edition
2. James F. Kurose and Keith W. Ross : Computer Networking A Top-Down Approach Featuring the Internet, 3rd Edition.
3. Peterson, Davie, "Computers Networks", Elsevier 3rd Edition
4. William Stallings, "Data and Computer Communications", PHI 6th Edition

#### **Reference Books:**

5. Simon Haykin, "Communication Systems", John Wiley 4th Edititon
6. Douglas Comer, "Computer Networks and Internets", Addison Wesley 2nd Edittion
7. Peterson, Simon, "Computer Networks: A Systems Approach", Pearson Education, Asia



8. Behrouz A Forouzan : Data Communication and Networking, 4th Edition.

<b>Course Code:</b>	<b>CSL 303</b>	<b>Course Title:</b>	<b>Theory of Computation</b>			
<b>Category :</b>	<b>CORE</b>	<b>Credit Assigned :</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Pre-Requisite (if Any) :</b>	<b>NONE</b>	<b>Type of Course :</b>	<b>Computer Science and Engineering</b>			

**Course Outcomes:**

1. Given a language the student can find the appropriate machine for recognition of that language.
2. The student is able to convert machine to grammar and vice versa.
3. The student gains knowledge about hierarchy of languages.
4. The student develops analytical thinking and intuition for problem solving.
5. The student is able to show whether a given problem is solvable or unsolvable.

**Course Contents:**

**Module 1:**

Preliminaries - Sets, operations, relations, transitive closure, countability and diagonalisation, induction and proof methods- pigeon-hole principle and simple applications - concept of language - grammars and production rules - Chomsky hierarchy.

**Module 2:**

Regular grammars, deterministic finite automata - non determinism, conversion to deterministic automata- e-closures, minimization of automata

**Module 3:**

regular expressions, regular sets, Pump lemma for regular sets- closure properties of regular sets, decision properties for regular sets,

**Module 4:**

Context - free languages, parse trees and ambiguity, reduction of CFGS, Chomsky and Griebach normal forms, push - down Automata (PDA), non determinism, acceptance by two methods and their equivalence, CFLs and PDAs – Pumping lemma for context free languages, Closure and decision properties of CFLs.

**Module 5:**

Turing Machines variants, recursively enumerable (r.e.) sets, recursive sets, TM as computer of function, decidability and solvability, Halting Problem, reductions, Post correspondence Problem (PCP) and unsolvability of ambiguity problem of CFGs.

**Module 6:**

primitive recursive and partial recursive functions Church -Turing thesis - convergence of view points of what “computability” is : Semi formal treatment.

**Text Books:**

1. Martin John, “Introduction to languages and the theory of computation”, TMH
2. Motwani Hopcroft, Ullman, “Introduction to Automata Theory, Languages and computation”, Pearson Education

**Reference Books:**

1. Michael Sipser, “Introduction to the theory of Computation”, 3 rd edition, Cengage Learning

# 6<sup>TH</sup> SEM

# SYLLABUS

# CSE

Course Code	Course Name	Type	L	T	P	Credits
CSL 304	Compilers	DU	3	0	2	4
CSL 305	Cryptography and Network Security	DU	3	0	0	3
HUL 302	Open Course – II	HU	3	0	0	3
	Elective-II	DE	3	0	0	3
			12	0	2	13

<b>Course Code:</b>	<b>CSL 304</b>	<b>Course Title:</b>	<b>Compiler</b>			
<b>Category :</b>	<b>CORE</b>	<b>Credit Assigned :</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>Pre-Requisite (if Any) :</b>	<b>(CSL 303) Theory of Computation</b>	<b>Type of Course :</b>	<b>Computer Science and Engineering</b>			

**Course Outcomes:**

1. Student will be able to know how a compiler translates the higher level language into machine language.
2. The student should be able to analyze issues associated with the implementation of higher-level programming languages.
3. To inform students about different parsing techniques, techniques to generate intermediate code and different optimization techniques. Understanding of compiler optimization techniques would enable students to write reasonably efficient programs.
4. The students will also appreciate the need of understandable error reports,

accurate and reliable object code, and efficient use of in-memory data structures.

## **Course Contents:**

### **Module 1:**

compilers and translators, phase structure of a typical compiler, Number of passes, ideas about lexical analysis, syntax analysis, code optimization and code generation, design of lexical analyzer.

### **Module 2:**

Lexical Analysis - Role of lexical analyzer, recognition of tokens, A language of specifying lexical analyzers, Design of a lexical analyzer generator and tool for study of lex.

### **Module 3:**

Syntax specification of programming languages, Design of top-down parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR, LR parsers. Dealing with ambiguity of the grammar. Study of syntax directed definitions and syntax directed translation schemes as notational frame work to specify the translations. Using syntax directed translation schemes for translation of expressions, controls structures, declarations, procedure calls.

### **Module 4:**

Storage allocation and run time storage administration, symbol table management, Error detection and recovery, error recovery in LR parsing, error recovery in LL parsing, Automatic error recovery in YACC.

### **Module 5:**

Introduction to Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, setting up data flow equations to compute reaching definitions, available expressions, Live variables. Problems in code generation , simple code generator code generation from DAG, Peephole optimization

### **Module 6:**

Assembler, Microprocessor - Concept of assembler, design of single pass and two pass assembler, forward reference, design of output file of assembler, concept of macro, macro call within macro, macro definition within macro, recursive macro calls, design of macro processor.

## **Text Books:**

1. Principles of Compiler Design: Aho A. V., Ullman J. D., Addison Wesley.

## **Reference Books:**

2. Principles and practice of compiler writing : Aho, Sethi , Ullman , Addison Wesley
3. Compiler Design in C : Alan Holub , PHI
4. Crafting a compiler : Fischer and LeBlanc , Addison Wesley

<b>Course Code:</b>	<b>CSL 305</b>	<b>Course Title:</b>	<b>Cryptography and Network Security</b>			
<b>Category :</b>	<b>CORE</b>	<b>Credit Assigned :</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Pre-Requisite (if Any) :</b>	<b>Computer Networks (CSL 302)</b>	<b>Type of Course :</b>	<b>Computer Science and Engineering</b>			

**Course Outcomes:**

1. Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
2. Gain familiarity with prevalent network and distributed system attacks, defences against them, and forensics to investigate the aftermath.
3. Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
4. Develop an understanding of security policies (such as authentication, integrity and Confidentiality), as well as protocols to implement such policies in the form of message

exchanges.

**Course Contents:**

**Module 1:**

Classical Ciphers: Affine, Playfair , Hill Cipher; Modern Block and Stream Ciphers: DES, AES, RC4, A5/1; Block Modes of Operation: ECB, CBC, CFB, OFB, CTR

**Module 2:**

Asymmetric Key Cryptosystems: RSA; Digital Signatures: DSS; Hash and MAC: SHA-512

**Module 3:**

Key Management: Digital Certificates, PKI; Authentication: One-Way Authentication, Mutual Authentication, Dictionary Attacks, Centralized Authentication, The Needham-Schroeder Protocol, Kerberos

**Module 4:**

Network Layer Security: IPSec; Transport Layer Security: SSL/TLS. Non-cryptographic Protocol Vulnerabilities: DoS and DDoS, Session Hijacking and Spoofing, ARP Spoofing and Attacks on DNS

**Module 5:**

Software Vulnerabilities: Phishing, Buffer overflow, cross site scripting and SQL injection. Viruses, Worms, and other Malware: Virus and Worm Features, Internet Scanning Worms, Mobile Malware and Botnets

**Module 6:**

Access Control in Operating Systems: Discretionary Access Control, Mandatory Access Control, Role Based Access Control, SELinux and Recent Trends. RFIDs and E-Passports, Electronic payment

**Text Books:**

1. Forouzan, Cryptography and Network Security, TMH
2. Bernard Menezes, Network Security and Cryptography, Cengage
3. Radia Perlman Network Security: Private Communication in a Public World, Prentice Hall 2002

**Reference Books:**

1. Bruce Schneier Applied Cryptography , 2nd Edition John Wiley & Sons 1996
2. Douglas Stinson Cryptography Theory and Practice CRC Press 1995
3. Alfred Menezes, Paul van Oorschot, Scott Vanstone Handbook of Applied Cryptography CRC Press 1997
4. Pfleeger and Pfleeger, Security in Computing, Pearson