

**SONA COLLEGE OF TECHNOLOGY, SALEM-5**

**(An Autonomous Institution)**

**B.E-Computer Science and Engineering**

**CURRICULUM and SYLLABI**

**[For students admitted in 2019-2020]**

**B.E / B.Tech Regulation 2019**

**Approved by BOS and Academic Council meetings**

**Sona College of Technology, Salem**  
(An Autonomous Institution)

**Courses of Study for B.E/B.Tech. Semester I under Regulations 2019 (CBCS)**

**Branch: Computer Science and Engineering**

S.No	Course Code	Course Title	L	T	P	C	Category
<b>Theory</b>							
1	U19ENG101B	English for Engineers– I	1	0	2	2	HS
2	U19MAT102A	Linear Algebra and Calculus	3	1	0	4	BS
3	U19PHY103B	Engineering Physics	3	0	0	3	BS
4	U19CHE104B	Applied Chemistry -I	3	0	0	3	BS
5	U19PPR105	Problem Solving Using Python Programming	3	0	0	3	ES
6	U19BEE106A	Basic Electrical and Electronics Engineering	3	0	0	3	ES
<b>Practical</b>							
7	U19PCL108B	Physics and Chemistry Laboratory <sup>#</sup>	0	0	2	1	BS
8	U19BEEL113A	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	ES
9	U19PPL111	Python Programming Laboratory	0	0	2	1	ES
10	U19GE101	Basic Aptitude -I	0	0	2	0	EEC
<b>Total Credits</b>						21	
<b>Optional Language Elective*</b>							
11	U19OLE1101	French	0	0	2	1	HS
12	U19OLE1102	German					
13	U19OLE1103	Japanese					

\*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

# Laboratory classes on alternate weeks for physics and Chemistry. The lab examination will be conducted separately for 50 marks each with 2 hours duration

## **Approved By**

Chairperson,  
Science and  
Humanities BoS  
**Dr.M.Renuga**

Chairperson,  
Computer Science  
and Engineering BoS  
**Dr.B.Sathiyabhama**

Member Secretary,  
Academic Council  
**Dr.R.Shivakumar**

Chairperson,  
Academic Council  
& Principal  
**Dr.S.R.R.Senthil  
Kumar**

Copy to:-

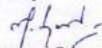
HOD/ Computer Science and Engineering, First Semester BE CSE Students and Staff,  
COE

Sona College of Technology, Salem  
(An Autonomous Institution)  
Courses of Study for B.E./B.Tech. Semester II under Regulations 2019 (CBCS)  
Branch: Computer Science and Engineering

S.No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Category
<b>Theory</b>							
1	U19ENG201B	English for Engineers – II	1	0	2	2	HS
2	U19MAT202B	Discrete Mathematics	3	1	0	4	BS
3	U19PHY203A	Material Science	2	0	0	2	BS
4	U19CHE204A	Applied Chemistry -II	2	0	0	2	BS
5	U19CS201	Programming in C	3	0	0	3	ES
6	U19EGR206A	Engineering Graphics	2	0	2	3	ES
<b>Practical</b>							
7	U19WPL212	Workshop Practice	0	0	2	1	ES
8	U19CS202	C Programming Laboratory	0	0	2	1	ES
9	U19GE201	Basic Aptitude -II	0	0	2	0	EEC
						<b>Total Credits</b>	18
<b>Optional Language Elective*</b>							
11	U19OLE1201	French	0	0	2	1	HS
12	U19OLE1202	German					
13	U19OLE1203	Japanese					

\*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

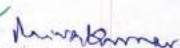
Approved by

  
Chairperson, Science and  
Humanities BoS

Dr.M.Renuga

  
Chairperson, Computer  
Science and Engineering  
BoS

Dr.B.Sathiyabhama

  
Member Secretary,  
Academic Council

Dr.R.Shivakumar

  
Chairperson, Academic  
Council & Principal

Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Computer Science and Engineering, Second Semester BE CSE Students and Staff, COE

13.12.2019

B.E/B.Tech Regulations-2019

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester III under Regulations 2019**  
**Branch: Computer Science and Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
<b>Theory</b>						
1	U19MAT301B	Probability and Statistics	3	1	0	4
2	U19CS301	Data Structures	3	0	0	3
3	U19CS302	Computer Architecture	3	0	0	3
4	U19CS303	Computer and Information Ethics	3	0	0	3
5	U19CS304	Object Oriented Programming	3	0	0	3
6	U19EC306	Communication Systems	3	0	0	3
7	U19GE302	<b>Mandatory Course</b> : Environment and Climate Science	2	0	0	0
<b>Practical</b>						
8	U19CS305	Data Structures Laboratory	0	0	4	2
9	U19CS306	Object Oriented Programming Laboratory	0	0	4	2
10	U19GE301	Soft Skills and Aptitude- I	0	0	2	1
<b>Total Credits</b>						<b>24</b>

**Approved By**

**Chairperson, Computer Science and Engineering BoS**

**Dr.B.Sathiyabhama**

**Member Secretary, Academic Council**

**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**

**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Computer Science and Engineering, Third Semester BE CSE Students and Staff, COE

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester IV under Regulations 2019**  
**Branch: Computer Science and Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
<b>Theory</b>						
1	U19MAT401A	Numerical and Regression Analysis	3	1	0	4
2	U19CS401	Operating Systems	3	0	0	3
3	U19CS402	Database Management Systems	3	0	0	3
4	U19CS403	Design and Analysis of Algorithms	3	0	0	3
5	U19GE405	Principles of Management	3	0	0	3
6	U19GE403	<b>Mandatory Course:</b> Essence of Indian Traditional Knowledge	2	0	0	0
<b>Practical</b>						
7	U19CS404	Operating Systems Laboratory	0	0	4	2
8	U19CS405	Database Management Systems Laboratory	0	0	4	2
9	U19GE401	Soft Skills and Aptitude -II	0	0	2	1
<b>Total Credits</b>						<b>21</b>

**Approved By**

**Chairperson, Computer Science and Engineering BoS**  
**Dr.B.Sathiyabhama**

**Member Secretary, Academic Council**  
**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**  
**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Computer Science and Engineering, Fourth Semester BE CSE Students and Staff, COE

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester V Regulations 2019**  
**Branch: Computer Science and Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
<b>Theory</b>							
1	U19CS501	Computer Networks	3	0	0	3	45
2	U19CS502	Software Engineering	3	0	0	3	45
3	U19CS503	Theory of Computation	3	0	0	3	45
4	U19CS509	Embedded System Design	3	0	0	3	45
5	noc21-cs73	<b>Elective</b> NPTEL - Software Testing	3	0	0	3	45
6	U19CS901	<b>Elective-</b> Software Project Management	3	0	0	3	45
	U19CS902	<b>Elective-</b> Agile Methodologies					
<b>Practical</b>							
7	U19CS504	Computer Networks Laboratory	0	0	4	2	60
8	U19CS505	Software Development Laboratory	0	0	2	1	30
9	U19GE501	Soft Skills and Aptitude -III	0	0	2	1	30
<b>Total Credits</b>						<b>22</b>	

**Approved By**

**Chairperson, Computer Science and Engineering BoS**

Dr.B.Sathiyabhama

**Member Secretary, Academic Council**

Dr.R.Shivakumar

**Chairperson, Academic Council & Principal**

Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Computer Science and Engineering, Fifth Semester BE CSE Students and Staff, COE

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester VI Regulations 2019**  
**Branch: Computer Science and Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact hours
<b>Theory</b>							
1	U19CS914	<b>Elective-</b> Data Warehousing and Data Mining	3	0	0	3	45
	U19CS909	Machine Learning					
	U19CS908	Bigdata Analytics					
2	U19CS918	<b>Elective-</b> Cloud Computing	3	0	0	3	45
3	U19CS601	Principles of Compiler Design	3	0	0	3	45
4	U19CS602	Full Stack Development	2	0	1	3	45
5	U19CS603	Artificial Intelligence	3	0	0	3	45
<b>Open Elective</b>							
6	U19BM1001	Hospital Management	3	0	0	3	45
7	U19CE1001	Building Services And Safety Regulations					
8	U19CE1003	Energy Efficiency And Green Building					
9	U19EC1003	Sensors And Smart Structures Technologies					
10	U19EC1006	Mobile Technology And Its Applications					
11	U19EE1002	Energy Conservation And Management					
12	U19EE1003	Innovation, IPR and Entrepreneurship Development					
13	U19EE1004	Renewable Energy Systems					
14	U19FT1001	Fundamentals Of Fashion Design					
15	U19FT1002	Garment Manufacturing Technology					
16	U19MC1003	Smart Automation					
<b>Practical</b>							
17	U19CS604	Compiler Design Laboratory	0	0	4	2	60
18	U19CS605	Artificial Intelligence Laboratory	0	0	4	2	60
19	U19GE601	Soft Skills and Aptitude – IV	0	0	2	1	30
<b>Total Credits</b>						<b>23</b>	

**Approved By**

**Chairperson, Computer Science and Engineering BoS**

Dr.B.Sathiyabhama

**Member Secretary, Academic Council**

Dr.R.Shivakumar

**Chairperson, Academic Council & Principal**

Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Computer Science and Engineering, Sixth Semester BE CSE Students and Staff, COE



**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester VII under Regulations 2019**  
**Branch: Computer Science and Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
<b>Theory</b>							
1	U19CS701	Blockchain Technologies	3	0	0	3	45
2	U19CS702	Cryptography	3	0	0	3	45
3	U19CS703	Internet of Things	3	0	0	3	45
4	U19CS925	<b>Professional Elective</b> : Web Development	3	0	0	3	45
	U19CS934	<b>Professional Elective</b> : Cyber Law and Ethics					
5	U19GE702	<b>Professional Elective</b> : Professional Readiness for Innovation Employability and Entrepreneurship	0	0	6	3	90
6		<b>Open Elective</b>	3	0	0	3	45
	U19CE1004	Disaster Management					
	U19EE1004	Renewable Energy Systems					
	U19EE1003	Innovation, IPR and Entrepreneurship Development					
	U19FT1001	Fundamentals of Fashion Design					
	U19FT1002	Garment Manufacturing Technology					
	U19EC1002	Embedded and Real Time Systems					
	U19EC1001	Biomedical Instrumentation And Measurements					
	U19EE1005	Electrification In Building Construction					
	U19EE1001	Electric Mobility					
	U19EC1005	Signal and Image Processing					
	U19MC1004	Fundamentals of Robotics					
	U19MC1003	Smart Automation					
	U19EE1002	Energy Conservation and Management					
U19EC1003	Sensors and Smart Structures Technologies						

**Practical**

7	U19CS704	Internet of Things Laboratory	0	0	4	2	60
<b>Total Credits</b>						<b>20</b>	

**Approved By**

**Chairperson, Computer Science and Engineering BoS  
Dr.B.Sathiyabhama**

**Member Secretary, Academic Council  
Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal  
Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Computer Science and Engineering, Seventh Semester BE CSE Students and Staff, COE

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester VIII Regulations 2019**  
**Branch: Computer Science and Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
<b>Practical</b>							
1	U19CS801	Project Work	0	0	24	12	360
<b>Total Credits</b>						<b>12</b>	

**Approved By**

**Chairperson, Computer Science and Engineering BoS**  
**Dr.B.Sathiyabhama**

**Member Secretary, Academic Council**  
**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**  
**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Computer Science and Engineering, Eighth Semester BE CSE Students and Staff, COE

**Sona College of Technology, Salem**  
(An Autonomous Institution)

**Courses of Study for B.E/B.Tech. Semester I under Regulations 2019 (CBCS)**

**Branch: Computer Science and Engineering**

S.No	Course Code	Course Title	L	T	P	C	Category
<b>Theory</b>							
1	U19ENG101B	English for Engineers– I	1	0	2	2	HS
2	U19MAT102A	Linear Algebra and Calculus	3	1	0	4	BS
3	U19PHY103B	Engineering Physics	3	0	0	3	BS
4	U19CHE104B	Applied Chemistry -I	3	0	0	3	BS
5	U19PPR105	Problem Solving Using Python Programming	3	0	0	3	ES
6	U19BEE106A	Basic Electrical and Electronics Engineering	3	0	0	3	ES
<b>Practical</b>							
7	U19PCL108B	Physics and Chemistry Laboratory <sup>#</sup>	0	0	2	1	BS
8	U19BEEL113A	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	ES
9	U19PPL111	Python Programming Laboratory	0	0	2	1	ES
10	U19GE101	Basic Aptitude -I	0	0	2	0	EEC
<b>Total Credits</b>						21	
<b>Optional Language Elective*</b>							
11	U19OLE1101	French	0	0	2	1	HS
12	U19OLE1102	German					
13	U19OLE1103	Japanese					

\*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

# Laboratory classes on alternate weeks for physics and Chemistry. The lab examination will be conducted separately for 50 marks each with 2 hours duration

## **Approved By**

Chairperson,  
Science and  
Humanities BoS  
**Dr.M.Renuga**

Chairperson,  
Computer Science  
and Engineering BoS  
**Dr.B.Sathiyabhama**

Member Secretary,  
Academic Council  
**Dr.R.Shivakumar**

Chairperson,  
Academic Council  
& Principal  
**Dr.S.R.R.Senthil  
Kumar**

Copy to:-

HOD/ Computer Science and Engineering, First Semester BE CSE Students and Staff,  
COE

**U19ENG101B - ENGLISH FOR ENGINEERS – I  
COMMON TO CSE, ECE, EEE, MCT, BME**

**L T P C  
1 0 2 2**

**Course Outcomes: At the end of course, the students will be able to**

1. Use grammatical components effectively in both written and spoken communication
2. Develop speaking skills for self-introduction, delivering speeches and technical presentation.
3. Speak effectively in real time and business situations
4. Write email, formal letters and descriptions of graphics
5. Develop skills for writing reports and proposals, and for general purpose and technical writing.

**UNIT I**

- General Vocabulary, Parts of speech
- Self-introduction – personal information, name, home background, study details, area of interest, hobbies, strengths and weaknesses, projects and paper presentations, likes and dislikes in food, travel, clothes, special features of home town.
- Instructions, Email – fixing an appointment, cancelling appointments, conference details, hotel accommodation, order for equipment, training programme details, paper submission for seminars and conferences
- Paragraph writing – Describing – defining – providing examples or evidences

**UNIT II**

- Tenses, active and passive voice
- Welcome address, vote of thanks, special address on specific topic.
- Checklists, letter writing – business communication, quotations, placing orders, complaints, replies to queries from business customers, inviting dignitaries, accepting and declining invitations

**UNIT III**

- Prefixes and Suffixes
- Mini presentation in small groups of two or three, on office arrangements, facilities, office functions, sales, purchases, training recruitment, advertising, applying for financial assistance, applying for a job, team work, discussion, presentation.
- Job application letter and resume, recommendations,

## UNIT IV

- Modal verbs and probability, concord
- Situational Role Play - between examiner and candidate, teacher and student, customer and sales manager, hotel manager and organiser, team leader and team member, bank manager and candidate, interviewer and applicant, car driver and client, industrialist and candidate, receptionist and appointment seeker, new employee and manager, employee and employee, p.a. and manager, schedule for training
- Note making, Proposal

## UNIT V

- If conditionals
- Situational Role Play - Asking for directions, seeking help with office equipment, clarifying an error in the bill, job details, buying a product, selling a product, designing a website, cancelling and fixing appointments, hotel accommodation, training facilities, dress code, conference facilities.
- Memo, technical report writing, feasibility reports, accident report, survey report

**TOTAL: 45 hours**

**Speaking test will be conducted for 20 marks externally and evaluated along with English for Engineers – I in the End Semester Valuation.**

### TEXT BOOK:

- Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016

### Extensive Reading

- The Story of Amazon.com- Sara Gilbert, published by Jaico
- The Story of Google – Sara Gilbert, published by Jaico

### Reference

- Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
- A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

**U19MAT102A - LINEAR ALGEBRA AND CALCULUS**  
**Common to CIVIL, MECH, EEE, CSE, IT and MCT**

**L T P C**

**3 1 0 4**

**Course Outcomes: At the end of the course, the students will be able to**

- find the rank of the matrix and solve linear system of equations by direct and indirect methods
- apply the concepts of vector spaces and linear transformations in real world applications
- apply the concepts of eigen values and eigen vectors of a real matrix and their properties in diagonalization and the reduction of a real symmetric matrix from quadratic form to canonical form
- find the Taylor's series expansion, Jacobians and the maxima and minima of functions of two variables
- apply appropriate techniques of multiple integrals to find the area and volume.

**UNIT I - LINEAR SYSTEM OF EQUATIONS**

**12**

Rank of a matrix – Solution of linear system of equations by matrix method, Gauss elimination, Gauss-Jordan, Gauss-Jacobi and Gauss-Seidel methods.

**UNIT II - VECTOR SPACES**

**12**

Vector Space – Linear independence and dependence of vectors – Basis – Dimension – Linear transformations (maps) – Matrix associated with a linear map – Range and kernel of a linear map – Rank-nullity theorem (without proof).

**UNIT III - EIGEN VALUES AND EIGEN VECTORS**

**12**

Eigen values and eigen vectors of real matrices – Properties of eigen values and eigen vectors – Cayley-Hamilton theorem – Diagonalization of real symmetric matrices – Reduction of quadratic form to canonical form.

**UNIT IV - MULTIVARIABLE CALCULUS**

**12**

Functions of several variables – Partial differentiation – Total derivative – Jacobians – Taylor's theorem for function of two variables – Maxima and minima of function of two variables without constraints – Constrained maxima and minima by Lagrange's method of undetermined multipliers.



## **UNIT V - MULTIPLE INTEGRALS**

**12**

Double integrals – Change of order of integration – Change of variables from Cartesian to polar coordinates – Area as double integrals in Cartesian coordinates – Triple integrals – Volume as triple integrals in Cartesian coordinates.

**Theory: 45 hours; Tutorial: 15 hours**

**TOTAL: 60 Hours**

### **TEXT BOOKS**

1. T. Veerarajan, “Linear Algebra and Partial Differential Equations”, McGraw Hill Publishers, 1<sup>st</sup> Edition, 2018.
2. T. Veerarajan, “Engineering Mathematics for Semesters I & II”, McGraw Hill Publishers, 1<sup>st</sup> Edition, 2019.

### **REFERENCE BOOKS**

1. S. Lipschutz and M. L. Lipson, “Linear Algebra”, McGraw Hill Publishers, 6<sup>th</sup> Edition, 2018.
2. E. Kreyszig, “Advanced Engineering Mathematics”, Wiley Publishers, 10<sup>th</sup> Edition, Reprint, 2017.
3. C. Prasad and R. Garg, “Advanced Engineering Mathematics”, Khanna Publishers, 1<sup>st</sup> Edition, 2018.
4. B. V. Ramana, “Higher Engineering Mathematics”, McGraw Hill Publishers, 29<sup>th</sup> Reprint, 2017.
5. B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 44<sup>th</sup> Edition, 2018.

**U19PHY103B - ENGINEERING PHYSICS**  
**(For B.E Computer Science and Engineering)**

**L T P C**  
**3 0 0 3**

**Course Outcomes: At the end of the course, the students will be able to,**

1. Discuss the dual nature of matter and radiation and the application of wave nature of particles.
2. Describe the basic components of lasers.
3. Analyse the relation between arrangement of atoms and material properties.
4. Deduce Maxwell's equations using the fundamentals of electromagnetism.
5. Elucidate the different modes of heat transfer.

**UNIT I - QUANTUM PHYSICS**

**9**

Origin of quantum mechanics – Limitations of classical theory - Dual nature of matter and radiation.

**Particle nature of radiation** - Compton effect - Explanation based on quantum theory - Expression for Compton shift (no derivation).

**Wave nature of matter** - de Broglie waves - Schrödinger's time independent and time dependent wave equations - Physical significance of wave function - Energy and wave function of an electron trapped in one dimensional box.

**Application of wave nature of particles** - Electron microscope - Comparison of optical and electron microscope - Scanning electron microscope - Limitations of electron microscope.

**UNIT II - LASERS**

**9**

**Basic terms** - Energy level - normal population - induced absorption (pumping) - population inversion - meta stable state - spontaneous emission - stimulated emission.

**Basic components of a laser** - Active medium - pumping technique - optical resonator  
**Einstein's theory** - stimulated absorption - spontaneous emission and stimulated emission.

**Types of lasers** - Solid lasers ( Nd:YAG) - Gas lasers (CO<sub>2</sub> laser) - semiconductor laser (homojunction and hetero junction laser)

**Holography** - Construction and reconstruction of hologram.

**UNIT III - CRYSTAL PHYSICS**

**9**

Importance of crystals - Types of crystals - Basic definitions in crystallography (Lattice –space lattice - unit cell - lattice parameters – basis - crystallographic formula) - Seven crystal systems and fourteen Bravais lattices – Lattice planes and Miller indices – Interplanar distance - d spacing in cubic lattice - Calculation of number of atoms per

unit cell - Atomic radius - Coordination number and Atomic Packing factor for SC, BCC, FCC and HCP Structures - Polymorphism and allotropy.

**Crystal imperfections** - Point, line and surface defects - burger vector.

#### **UNIT IV – ELECTROMAGNETISM**

**9**

**Electrostatics** - Electric field - Electric field intensity – Field due to discrete and continuous charges – Electric lines of forces – Electric flux – Gauss’s law – Divergence of E – Applications of Gauss’s law – Curl of E.

**Magnetostatics** – Magnetic fields – Magnetic Lorentz force – Force experienced by current carrying conductor in magnetic field – Steady currents – Magnetic field due to steady current - Biot - Savart Law - Straight line currents – Ampere’s circuital law – Divergence and curl of B – Applications of Ampere’s circuital law - Comparison of Magneto statics and Electrostatics.

#### **UNIT V - THERMAL PHYSICS**

**9**

**Heat and temperature** - Modes of heat transfer (Conduction, convection and radiation) - Specific heat capacity - thermal capacity and coefficient of linear thermal expansion. **Thermal conductivity** - Measurement of thermal conductivity of good conductor - Forbe’s method - Measurement of thermal conductivity of bad conductor - Lee’s disc method - Radial flow of heat - Cylindrical flow of heat - Practical applications of conduction of heat.

**Thermal radiations** - Properties of thermal radiations - Applications of thermal radiations.

**TOTAL: 45 Hours**

#### **TEXT BOOKS**

- M.N.Avadhanulu, ‘Engineering Physics’ S.Chand & Company Ltd, New Delhi (2015)
- D. K. Bhattacharya, Poonam Tandon “Engineering Physics” Oxford University Press 2017.

#### **REFERENCES**

- Engineering Physics, Sonaversity, Sona College of Technology, Salem (Revised Edition 2018 ).
- B. K. Pandey and S. Chaturvedi, Engineering Physics , Cengage Learning India Pvt. Ltd., Delhi, 2019
- Rajendran, V, and Marikani A, ‘Materials science’ TMH Publications, (2004) New Delhi.
- Palanisamy P.K, ‘Materials science’, SciTech Publications (India) Pvt. Ltd., Chennai, Second Edition (2007)

## U19CHE104B - APPLIED CHEMISTRY- I

L	T	P	C
3	0	0	3

### Course Outcomes: At the end of the course, the students will be able to

1. Outline the principles and applications of electrochemistry to engineering and technology.
2. Analyze the types of corrosion and describe the methods of corrosion control.
3. Discuss the principle, applications of surface chemistry and catalysis in engineering and technology.
4. Describe the basics of nano chemistry, synthesis, properties and applications of nano materials in engineering and technology.
5. Analyze the types of polymers, methods of polymerization and methods of fabrication.

### UNIT I - ELECTROCHEMISTRY

9

Conductivity of Electrolytes – Kohlrausch’s Law of Independent Migration of Ions and Its Applications – Conductometric Titration (Acid-Base – HCl vs NaOH) – Electrode Potential – Nernst Equation – Derivation and Problems Based on Single Electrode Potential Calculation – Electrochemical Series – Significance – Reference Electrodes - Standard Hydrogen Electrode, Saturated Calomel electrode – Ion selective electrode - glass electrode - determination of pH for unknown solution – Electrochemical Cell – Emf of an Electrochemical Cell – Redox Reactions - Potentiometric Titrations (Redox – Fe<sup>2+</sup> Vs Dichromate).

### UNIT II - CORROSION AND ITS CONTROL

9

Dry or Chemical Corrosion - Pilling-Bedworth Rule – Wet or Electrochemical Corrosion – Mechanism of Electrochemical Corrosion – Galvanic Corrosion – Differential aeration Corrosion - Factors Influencing Corrosion – Corrosion Control - Cathodic Protection - Sacrificial Anodic Protection Method and Impressed Current Cathodic Protection – Protective Coatings – Metallic Coatings – Galvanizing process – Tinning process - Organic Coatings – Paints - Constituents and Functions.

### UNIT III - SURFACE CHEMISTRY AND CATALYSIS

9

Adsorption – types - Physical and chemical adsorption – adsorption of gases on solids - Adsorption isotherms - Freundlich and Langmuir isotherms - Adsorption of solutes from solution – Applications of adsorption - Role of adsorption in catalytic reactions – Adsorption in pollution abatement (granular activated carbon and powdered activated carbon) – Catalysis - Types - Characteristics of catalysts - Autocatalysis - Definition and examples – catalytic promoters – catalytic poisons.

## UNIT IV - NANOCHEMISTRY

9

Basics - Distinction between molecules, nanoparticles and bulk materials – Size-dependent properties – Nanoparticles: nano cluster, nano rod, nanotube (CNT) and nanowire – Synthesis: Precipitation – Thermolysis – Hydrothermal – Solvothermal – Electrodeposition - Chemical vapour deposition - Sol-gel technique – Properties and applications of nano materials.

## UNIT V - POLYMERS AND COMPOSITES

9

Nomenclature of Polymers – Functionality – Types of Polymerization-Addition-Condensation and Copolymerization – Classification of Polymers – Free Radical mechanism of Addition Polymerization – Properties of Polymers - Glass transition temperature – Tacticity - Methods of Polymerization – Bulk, solution, emulsion and suspension – Thermoplastic and Thermosetting Resins – Plastics – Moulding Constituents of Plastic – Moulding of Plastics into Articles-Injection - Compression and Blow Moulding – Composites - Constituents of Composites – Types of FRP Composites.

**TOTAL : 45 Hours**

### TEXT BOOKS

- P. C. Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi, 2010 (15<sup>th</sup> Edition).
- G. Shanthi *et al.*, “Applied Chemistry”, Sonaversity, Sona College of Technology, Salem, 2019.

### REFERENCE BOOKS

- H. K. Chopra, A. Parmer, “Chemistry for Engineers”, Narosa Publishing House, New Delhi, 110 002, 2016.
- Kannan P., Ravikrishnan A., “Engineering Chemistry”, Sri Krishna Hi-tech Publishing Company Pvt. Ltd., Chennai, 2009.
- B. Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 2008.
- Ozin G. A. and Arsenault A. C., “Nanotechnology: A Chemical Approach to Nanomaterials”, RSC Publishing, 2005.

## U19PPR105 - PROBLEM SOLVING USING PYTHON PROGRAMMING

L	T	P	C
3	0	0	3

### Course Outcomes: At the end of course, the students will be able to

1. Develop algorithmic solutions to simple computational problems
2. Write simple Python programs
3. Write programs with the various control statements and handling strings in Python
4. Develop Python programs using functions and files
5. Analyze a problem and use appropriate data structures to solve it.

### UNIT I - ALGORITHMIC PROBLEM SOLVING 9

Need for computer languages, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

### UNIT II - BASICS OF PYTHON PROGRAMMING 9

Introduction-Python Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, input function, print function, Formatting numbers and strings, implicit/explicit type conversion.

### UNIT III - CONTROL STATEMENTS AND STRINGS 9

Conditional (if), alternative (if-else), chained conditional (if-elif-else). Iteration-while, for, infinite loop, break, continue, pass, else. Strings-String slices, immutability, string methods and operations.

### UNIT IV - FUNCTIONS AND FILES 9

Functions - Introduction, inbuilt functions, user defined functions, passing parameters - positional arguments, default arguments, keyword arguments, return values, local scope, global scope and recursion. Files -Text files, reading and writing files.

### UNIT V - DATA STRUCTURES: LISTS, SETS, TUPLES, DICTIONARIES 9

Lists-creating lists, list operations, list methods, mutability list functions, searching and sorting, Sets-creating sets, set operations. Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Nested Dictionaries.

**TOTAL: 45 Hours**

## TEXT BOOKS

- Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 2018.
- Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)

## REFERENCES

- Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 2018.
- Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
- Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
- Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
- Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2013.

## U19BEE106A - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P	C
3	0	0	3

**Course Outcomes: At the end of the course, the student will be able to,**

- Analyse the various DC circuits and find the circuit parameters.
- Describe the principles of AC fundamentals.
- Discuss the construction and working principle of DC machines and Transformer.
- Explain the basics of semiconductor devices and its applications.
- Discuss the various applications of operational amplifier and working principle of UPS.

### UNIT I - DC FUNDAMENTALS

9

Electrical components and parameters – Resistance, Conductance – Ohm’s law, limitations of Ohm’s law – Kirchhoff’s law – Power – Energy – resistors in series and parallel – comparison of series and parallel circuits – Star-Delta transformation – simple problems.

### UNIT II - AC FUNDAMENTALS

9

AC waveforms – standard terminologies – RMS and average value of Sinusoidal, Triangular and Square waveforms – form factor, peak factor – Resistance, Inductance, Capacitance in AC circuits – Impedance – RL, RC, RLC series circuits – series resonance – simple problems.

### UNIT III - ELECTRICAL MACHINES

9

**DC Generator:** construction of DC Machine – working principle of DC Generator – EMF equation – Types of DC Generator.

**DC Motor:** Working principle of DC Motor – Types of DC Motor.

**Transformer:** Working principle of Transformer – EMF equation – Transformation ratio.

### UNIT IV - SEMICONDUCTOR DEVICES

9

**BJT:** Operations of NPN and PNP Transistors – Characteristics of Transistors in CE, CB and CC configuration.

*Introduction to power semiconductors - SCR, MOSFET – V-I characteristics and applications.*



## UNIT V - OPERATIONAL AMPLIFIERS AND POWER SUPPLY

9

**Operational Amplifier:** Ideal characteristics of Op-Amp – Inverting amplifier, Non-Inverting amplifier – voltage follower – summing amplifier.

**Rectifiers:** working principle of half wave rectifier, full wave rectifier, bridge rectifier.

**UPS:** components of UPS – working principle of UPS.

**TOTAL: 45 Hours**

### TEXT BOOKS

1. B.L. Theraja, “Fundamentals of Electrical Engineering & Electronics”, S. Chand & Co Ltd, 2015.
2. Muthusubramanian R, Salivahanan S, “Basic Electrical and Electronics Engineering”, 3rd Edition 2007, Tata McGraw-Hill publishing company limited.

### REFERENCES

1. Mehta V.K, Rohit Mehta, “Principles of Electrical Engineering & Electronics”, S.Chand& Co. Ltd., 2011.
2. S.K. Bhattacharya, “Electrical Machines”, Tata MC Graw Hill Publishing company ltd., III edition, 2009.
3. Smarajit Ghosh, “Fundamentals of Electrical and Electronics Engineering”, II revised edition 2010, PHI publications.
4. D. Roy Choudhury and Shail Jain, “Linear Integrated Circuits”, First edition, New age international, 2011.
5. S. Padma, “Basic Electrical and Electronics Engineering”, Sonaversity, Revised edition 2016.

**U19PCL108B - PHYSICS AND CHEMISTRY LABORATORY**  
**PHYSICS PART**

(For Computer Science and Engineering)

**L T P C**  
**0 0 2 1**

**Course Outcomes: At the end of the course, the students will be able to,**

1. Apply the principle of spectrometry to determine the properties of a given prism.
2. Study the change in properties of ultrasonic waves in a liquid medium and determine the characteristics of the liquid.
3. Demonstrate the applications of a diode laser to determine the characteristics of a given optical fibre.
4. Determine the specific resistance of the given wire using Carey – Fosters bridge.
5. Determine the band gap of a semiconductor diode.
6. Demonstrate by means of an appropriate experiment the poor thermal conductivity of a given bad conductor

**LIST OF EXPERIMENTS (PHYSICS PART)**

1. Determination of dispersive power of the prism for various pairs of colors in the mercury spectrum using a spectrometer.
2. Determination of velocity of ultrasonic waves and compressibility of the given liquid using ultrasonic interferometer.
3. Determination of laser wavelength, particle size (lycopodium powder), acceptance angle and numerical aperture of an optical fibre using diode laser.
4. Determination of specific resistance of a given wire using Carey Foster's bridge.
5. Determination of band gap of the given semiconductor diode.
6. Determination of the thermal conductivity of a bad conductor using Lee's Disc apparatus.

(Any five experiments may be conducted from the above list)

**Total: 30 Hours**

**U19PCL108B - PHYSICS AND CHEMISTRY LABORATORY**  
**CHEMISTRY PART**

(For Computer Science and Engineering)

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Course Outcomes: At the end of the course, the students will be able to,**

- Estimate the amount of total, temporary and permanent hardness in the given water sample
- Analyse the different types of alkalinity and determine their amount in the given water sample
- Estimate the amount of hydrochloric acid present in the given solution using conductivity meter.
- Estimate the amount of hydrochloric acid present in the given solution using pH metry.
- Describe the estimation of ferrous iron present in the given solution using potentiometer.
- Evaluate the iron content of the water by spectrophotometry.

**List of Experiments (Chemistry part)**

1. Estimation of hardness of water sample by EDTA method.
2. Estimation of alkalinity of water sample by indicator method.
3. Estimation of HCl by conductometry. (HCl vs NaOH)
4. Estimation of HCl by pH metry.
5. Estimation of ferrous ion by potentiometric titration.
6. Determination of iron content in water by spectrophotometric method

(Any five experiments may be conducted from the above list)

**Total: 30 Hours**

**U19BEEL113A - BASIC ELECTRICAL AND ELECTRONICS  
ENGINEERING LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Course Outcomes: At the end of course, the students will be able to**

- Apply the basic circuit laws for calculating various parameters of DC and AC circuits
- Design the circuit for various applications using electronic devices.
- Analysis the performance characteristics of electronic devices such as SCR, MOSFET, BJT and op-amp.

**LIST OF EXPERIMENTS**

1. Verification of Ohm's Law.
2. Verification of Kirchhoff's Law.
3. Measurement of power and power factor for RLC circuit.
4. Frequency response of RLC resonance circuit.
5. V-I characteristics of BJT in CB configuration.
6. V-I characteristics of BJT in CE configuration.
7. V-I characteristics of BJT in CC configuration.
8. V-I characteristics of MOSFET.
9. V-I characteristics of SCR.
10. Characteristics of operational amplifier as inverting and non-inverting amplifiers.
11. Measurement of ripple factor for half wave and full wave rectifier circuits.

**TOTAL: 30 Hours**

## U19PPL111 - PYTHON PROGRAMMING LABORATORY

L	T	P	C
0	0	2	1

### Course Outcomes: At the end of course, the students will be able to

1. Implement the algorithms using basic control structures in Python
2. Develop Python programs to use functions, strings and data structures to solve different types of problems
3. Implement persistent storing information through file operations

### LIST OF EXPERIMENTS

1. Draw flowchart using any open source software.
2. Implement programs with simple language features.
3. Implement various branching statements in python.
4. Implement various looping statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, indexing.
6. Implement user defined functions using python.
7. Implement recursion using python.
8. Develop python programs to perform operations on list and tuples
9. Implement dictionary and set in python
10. Implement python program to perform file operations.

**TOTAL: 30 Hours**

**U19GE101 - BASIC APTITUDE – I**  
**(Common to All Departments)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>

**Course Outcomes: At the end of course, the students will be able to**

1. Solve fundamental problems in specific areas of quantitative aptitude
2. Solve basic problems in stated areas of logical reasoning
3. Demonstrate rudimentary verbal aptitude skills in English with regard to specific topics

**1. Quantitative Aptitude and Logical Reasoning**

**Solving simple problems with reference to the following topics:**

- a. Numbers – HCF & LCM
- b. Decimal fractions
- c. Square roots & cube roots
- d. Surds & Indices
- e. Logarithms
- f. Percentage
- g. Averages
- h. Coding and Decoding & Visual language

**2. Verbal Aptitude**

**Demonstrating plain English language skills with reference to the following topics:**

- a. Synonyms
- b. Antonyms
- c. Verbal analogy
- d. Editing passages
- e. Sentence filler words

**TOTAL: 30 hours**

Sona College of Technology, Salem  
(An Autonomous Institution)  
Courses of Study for B.E./B.Tech. Semester II under Regulations 2019 (CBCS)  
Branch: Computer Science and Engineering

S.No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Category
<b>Theory</b>							
1	U19ENG201B	English for Engineers – II	1	0	2	2	HS
2	U19MAT202B	Discrete Mathematics	3	1	0	4	BS
3	U19PHY203A	Material Science	2	0	0	2	BS
4	U19CHE204A	Applied Chemistry -II	2	0	0	2	BS
5	U19CS201	Programming in C	3	0	0	3	ES
6	U19EGR206A	Engineering Graphics	2	0	2	3	ES
<b>Practical</b>							
7	U19WPL212	Workshop Practice	0	0	2	1	ES
8	U19CS202	C Programming Laboratory	0	0	2	1	ES
9	U19GE201	Basic Aptitude -II	0	0	2	0	EEC
						<b>Total Credits</b>	18
<b>Optional Language Elective*</b>							
11	U19OLE1201	French	0	0	2	1	HS
12	U19OLE1202	German					
13	U19OLE1203	Japanese					

\*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved by

Chairperson, Science and Humanities BoS

Dr.M.Renuga

Chairperson, Computer Science and Engineering BoS

Dr.B.Sathiyabhama

Member Secretary, Academic Council

Dr.R.Shivakumar

Chairperson, Academic Council & Principal

Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Computer Science and Engineering, Second Semester BE CSE Students and Staff, COE

13.12.2019

B.E/B.Tech Regulations-2019

## U19ENG201B - ENGLISH FOR ENGINEERS – II

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

### **Course Outcome: At the end of the course, the students will be able to**

1. frame sentences correctly, both in written and spoken forms of language with accuracy and fluency.
2. develop and demonstrate listening skills for academic and professional purposes.
3. draw conclusions on explicit and implicit oral information.
4. develop effective reading skills and reinforce language skills required for using grammar and building vocabulary.
5. read for gathering and understanding information, following directions and giving responses.

### **UNIT - I**

- Cause and effect expressions, adjectives, comparative adjectives
- Listening to conversations, welcome speeches, lectures and description of equipment
- Listening to different kinds of interviews (face-to-face, radio, TV and telephone interviews)
- Understanding notices, messages, timetables, advertisements, graphs, etc.
- Reading passages for specific information transfer

### **UNIT - II**

- Prepositions and dependent prepositions
- Understanding short conversations or monologues,
- Taking down phone messages, orders, notes etc
- Listening for gist, identifying topic, context or function
- Reading documents for business and general contexts and interpreting graphical representations

### **UNIT - III**

- Collocations
- Listening comprehension, entering information in tabular form
- Error correction, editing mistakes in grammar, vocabulary, spelling, etc.
- Reading passage with multiple choice questions, reading for gist and reading for specific information, skimming for comprehending the general idea and meaning and contents of the whole text



## **UNIT - IV**

- Articles, adverbs
- Intensive listening exercises and completing the steps of a process.
- Listening exercises to categorise data in tables.
- Short reading passage: gap-filling exercise related to grammar, testing the understanding of prepositions, articles, auxiliary verbs, modal verbs, pronouns, relative pronouns and adverbs, short reading passage with multiple choice questions.

## **UNIT - V**

- Pronouns
- Listening to extended speech for detail and inference
- Listening and developing hints
- Gap-filling exercise testing the knowledge of vocabulary, collocations, dependent prepositions
- Short reading passages for sentence matching exercises, picking out specific information in a short text

**TOTAL: 30 Hours**

**The listening test will be conducted for 20 marks and reading for 20 marks internally and evaluated along with English for Engineers II in the End Semester Valuation.**

## **TEXT BOOK**

1. Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016

## **EXTENSIVE READING**

1. Who Moved my Cheese? – Spencer Johnson-G. P. Putnam's Sons
2. Discover the Diamond in You – Arindham Chaudhari – Vikas Publishing House Pvt. Ltd

## **REFERENCES**

1. Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
2. A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

## U19MAT202B - DISCRETE MATHEMATICS

L T P C

3 1 0 4

### **Course Outcomes: At the end of the course, the students will be able to**

1. check the validity of the arguments in the field of data base and artificial intelligence using the rules of logic.
2. apply the concept of logical theory to validate the correctness of software specifications.
3. interpret and analyze the ordered structure using the concepts of relations and lattices.
4. produce an output for each input in computer programming and Turing machine.
5. apply the concepts of group theory in the field of coding theory and cryptography.

### **UNIT I - PROPOSITIONAL CALCULUS**

12

Propositions – Logical connectives – Compound propositions – Conditional and biconditional propositions – Truth tables – Tautology and contradiction – Contrapositive – Logical equivalences and implications – De Morgan's laws – Normal forms – Principal conjunctive and disjunctive normal form - Rules of inference – Arguments – Validity of arguments.

### **UNIT II - PREDICATE CALCULUS**

12

Predicates – Statement function – Variables – Free and bound variables – Quantifiers – Universe of discourse – Logical equivalences and implications – Implications for quantified statements – Theory of inference – The rules of universal specification and generalization – Validity of arguments.

### **UNIT III - RELATIONS AND LATTICES**

12

Relations - Types of relations and their properties – Equivalence relations – Partial order relation – Equivalence Classes – Partition of a set – Matrix representation of a relation – Representation of relations by graphs – Poset – Hasse diagram – Lattices and their properties.

#### **UNIT IV - FUNCTIONS**

**12**

Definition – Classification – Types of functions – Examples – Compositions of functions – Inverse functions – Characteristic function of a set – Permutation functions.

#### **UNIT V - GROUPS AND GROUP CODES**

**12**

Algebraic systems – Groups – Cyclic groups – Subgroups – Group homomorphism – Cosets – Lagrange’s theorem – Normal subgroups – Rings (Definition and examples only) – Codes and group codes – Basic notions of error detection and error correction.

**TOTAL: 60 Hours**

#### **TEXT BOOK**

1. T. Veerarajan, “Discrete Mathematics”, McGraw Hill Publishers, 1<sup>st</sup> Edition, 21<sup>st</sup> Reprint, 2015.

#### **REFERENCES**

1. J. P. Tremblay and R. Manohar, “Discrete Mathematical Structures with Applications to Computer Science”, McGraw Hill Publishers, 1<sup>st</sup> Edition, 2017.
2. K. H. Rosen, “Discrete Mathematics and Its Applications”, McGraw Hill Publishers, 7<sup>th</sup> Edition, 2017.
3. B. Kolman, R. C. Busby and S. C. Ross, “Discrete Mathematical Structures”, Pearson Publishers, 6<sup>th</sup> Edition, 2006.

## U19PHY203A - MATERIALS SCIENCE

L T P C

2 0 0 2

**Course Outcomes: At the end of the course, the students will be able to**

1. differentiate the electrical and thermal conductivity of metals.
2. elucidate the classification and theory of semiconducting materials.
3. distinguish the types of magnetic materials.
4. explain the optical data storage techniques.
5. discuss the novel properties of metallic glasses and nanomaterials.

### UNIT I - CONDUCTING MATERIALS

6

**Classical free electron theory of metals** - Postulates of classical free electron theory - Electrical conductivity - definition and expression for electrical conductivity - thermal conductivity - definition and expression for thermal conductivity - Wiedemann - Franz law and Lorentz number.

**Quantum free electron theory** - Drawbacks of quantum free electron theory - origin of energy bands - Fermi energy and Fermi distribution function - Effect of temperature on Fermi function - Density of energy states - carrier concentration in metals.

### UNIT II - SEMICONDUCTING MATERIALS

6

**Intrinsic semiconductor** - Energy band diagram of intrinsic semiconductors (at  $T=0$  K and  $T > 0$  K) - Expression for number of electrons in conduction band - Expression for number of holes in valence band (no derivation) - Law of mass action and intrinsic carrier concentration - Fermi level - Variation of Fermi level with temperature - electrical conductivity - band gap determination.

**Extrinsic semiconductors** - Draw backs of intrinsic semiconductors – Types of extrinsic semiconductors – ‘n’-type and ‘p’-type semiconductors – Energy band diagram of ‘n’ type and ‘p’ type semiconductors (at  $T=0$  K and  $T > 0$  K) – Carrier concentration of extrinsic semiconductors (Qualitative Treatment only) – Hall effect – Determination of Hall coefficient – Applications.

### **UNIT III - MAGNETIC MATERIALS**

**6**

**Basic definitions** - Magnetic moment - Magnetic field - Magnetic field intensity - Magnetic permeability - Magnetization - Intensity of magnetization - Magnetic susceptibility.

**Types of magnetic materials** - Dia , Para , and Ferromagnetic materials - Domain theory and origin of domains – Anti ferromagnetic materials - Ferrimagnetic materials or Ferrites - Structure, properties and applications - hysteresis - Hard and soft magnetic materials.

### **UNIT IV - OPTOELECTRONIC DEVICES AND OPTICAL DATA STORAGE TECHNIQUES**

**6**

**Optoelectronic devices** - LED - Organic LED - Polymer light emitting materials - Plasma light emitting devices - LCD - Laser diodes.

**Optical data storage techniques** - DVD - Blue ray disc - Holographic data storage.

### **UNIT V - NEW ENGINEERING MATERIALS**

**6**

**Metallic glasses** -Preparation, properties and applications.

**Nanoscience and Nanotechnology** - Significance of nanoscale - different types of nanostructures (0-D, 1-D, 2-D and 3-D) - Fabrication of nanomaterials - Ball milling and Chemical vapour deposition technique (CVD).

**Carbon nanotubes** - structure - properties and applications - fabrication - pulsed laser deposition method.

**TOTAL: 30 Hours**

### **TEXT BOOKS**

1. M.N.Avadhanulu, 'Engineering Physics' S.Chand &Company Ltd, New Delhi (2015)
2. B. K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning India Pvt. Ltd., Delhi, 2012.

### **REFERENCES**

1. Shanthi C, 'Physics of materials' Sonaversity , Sona College of Technology, Salem (Revised Edition 2016).
2. Rajendran, V, and Marikani A, 'Materials science' TMH Publications, (2004) New Delhi.

3. Palanisamy P.K, 'Materials science', SciTech Publications (India) Pvt. Ltd., Chennai, Second Edition (2007)
4. M. Arumugam, 'Materials Science' Anuradha Publications, Kumbakonam, (2006).

## U19CHE204A - APPLIED CHEMISTRY – II

L T P C

2 0 0 2

### Course Outcomes: At the end of the course, the students will be able to

1. analyze the characteristics, conducting mechanism, synthesis and applications of conducting polymers.
2. describe the construction, working principle and applications of energy storage devices for electronic appliances.
3. discuss the principles, advantages and applications of organic electronic materials in electronic devices.
4. explain the electrochemical processes carried out in electronic industries.
5. outline the principles and applications of photochemistry and spectroscopy.

### UNIT I - CONDUCTING POLYMERS

6

Introduction – Structural characteristics and doping concept in metals and metal oxide nanoparticles - Charge carriers and conducting mechanism – Classification of conducting polymers: Intrinsic and extrinsic conducting polymers – Synthesis of conducting polymers - bulk and solution polymerization – Applications of conducting polymers in corrosion protection and sensors.

### UNIT II - MODERN ENERGY DEVICES FOR ELECTRONIC APPLIANCES

6

Reversible and Irreversible Cells – Batteries - Types of Batteries – Battery Characteristics-Voltage – Current – Capacity - Electricity Storage Density – Power - Discharge Rate -Cycle Life - Energy Efficiency and Shelf Life – Fabrication and Working of Alkaline Battery - Lead-Acid Battery - Ni-Cd - Lithium Ion Batteries and Solar cells – Hydrogen oxygen Fuel Cells.

### UNIT III - CHEMISTRY OF ORGANIC ELECTRONIC MATERIALS

6

Organic semiconducting materials – working principle and advantages over inorganic semiconducting materials - p-type and n-type organic semiconducting materials - Pentacene Fullerenes-C-60 – Organic dielectric material – Definition - Working principle and examples - Polystyrene – PMMA – Organic Light Emitting Diodes (Oleds) – Construction - Working principle and applications – Organic transistors – Construction - Working principle and applications in electronic Industries.

## UNIT IV - ELECTROCHEMICAL PROCESSES IN ELECTRONIC INDUSTRIES

6

Electroplating – Principle and process - Plating parameters - Current and energy efficiency - Electroplating of nickel - Fundamentals of electroless deposition – Electroless plating of nickel - fabrication of PCB's - Electrochemical etching of copper from PCBs - Anodizing - Definition, principle and working methodology of aluminium anodizing - Chemical sensors - Optical and heat sensors – definitions and applications.

## UNIT V - PHOTOCHEMISTRY AND SPECTROSCOPY

6

**Photochemistry:** Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Quantum efficiency – Determination - Photo processes - Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitization. **Spectroscopy:** Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. UV-Visible and IR spectroscopy – Principles, instrumentation (Block diagram only) and applications.

**TOTAL: 30 Hours**

### TEXT BOOKS

1. P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi , 2010.
2. T. Maruthavanan *et al.*, “Applied Chemistry-II”, Sonaversity, Sona College of Technology, Salem, 2019.

### REFERENCES

1. B. Sivasankar, “Engineering Chemistry”, Tata McGraw-Hill Pub. Co. Ltd., New Delhi (2008).
2. Electroplating, Anodizing and Metal treatment”, Hand book, NIIR board, 2004.
3. Hagen Klauk, “Organic Electronics: Materials, Manufacturing and Applications”, Wiley-VCH, 2006.
4. Douglas A Skoog, Donald M West, James Holler F Stanley, R Crouch, “ Fundamentals Of Analytical Chemistry”, Thomson learning, 2006.



## U19CS201 - PROGRAMMING IN C

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **Course Outcomes: At the end of the course, the students will be able to**

1. write simple C programs using console input and output functions
2. write C programs using arrays, decision making and looping statements
3. design and develop simple application using functions and pointers.
4. design and develop real-time applications using structures and unions
5. design and develop real-time applications using file operation

### **UNIT I - C PROGRAMMING BASICS 9**

Structure of a C program - C Character set, Identifiers and Keywords, Data Types, Declarations, Expressions, Statements and Symbolic constants, Operators – Arithmetic Operators – Unary operators – Relational and Logical Operators – Assignment operators – Conditional operators. Unformatted and formatted Input/Output functions, pre-processor directives and storage classes.

### **UNIT II - CONTROL STATEMENTS, ARRAYS AND STRING 9**

Conditional statements, Unconditional statements, branching and looping statements - Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations

### **UNIT III - FUNCTIONS AND POINTERS 9**

Function – Library functions and user-defined functions – Function prototypes and function definitions – Call by value – Call by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays – Pointers and Functions - Dynamic memory Allocation - Example Programs.

### **UNIT IV - STRUCTURES AND UNIONS 9**

Need for structure data type – structure definition – Structure declaration – Structure within a structure – Passing structures to functions – Array of structures – Pointers to structures – Union - Programs using structures and Unions

## **UNIT V - FILE MANIPULATIONS**

**9**

Files-File operations- Binary files and text files – Types of File processing-Sequential access -Random Access File - Command line arguments.

**TOTAL: 45 Hours**

### **TEXT BOOKS**

1. Deitel and Deitel, “C How to Program”, Pearson Education, New Delhi, 2011.
2. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 14<sup>th</sup> edition, 2016.

### **REFERENCES**

1. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006.
2. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
4. E. Balagurusamy, “Programming in ANSI C”, seventh edition, Tata McGraw Hill, 2016.

## U19EGR206A – ENGINEERING GRAPHICS

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>

### **Course Outcomes: At the end of the course, the students will be able to**

1. predict the construction of various curves in civil elevation, plan and machine components.
2. analyze the principles of projection of various planes by different angle to project points, lines and planes.
3. draw the principles of projection of simple solid by the axis is inclined to one reference plane by change of position method.
4. understand the interior details of complex components, machineries by sectioning the solid body. study the development of surfaces for prisms and pyramids.
5. draw the projection of three dimensional objects representation of machine structure and explain standards of orthographic views by different methods.

### **CONCEPTS AND CONVENTIONS (Not for Examination)**

**03**

Importance of graphics in engineering applications, Use of drafting instrument, BIS conventions and specifications - Size, layout and folding of drawing sheets, Lettering and dimensioning.

### **COMPUTER AIDED DRAFTING (Not for Examination)**

**03**

Importance 2d Drafting, sketching, modifying, transforming and dimensioning.

### **UNIT I – PLANE CURVES (Manual drafting)**

**06**

Curves used in engineering practices Conics – Construction of ellipse – Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

## **UNIT II – PROJECTION OF POINTS, LINES AND PLANE SURFACES**

**(CAD software)**

**12**

Projection of points – Projection of straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to one reference planes.

## **UNIT III – PROJECTION OF SOLIDS (CAD software)**

**12**

Creation of 3D CAD models of pyramids, prisms and solids of revolutions-Sectional views - **(Not for Examination)**

Projection of simple solids like prisms – pyramids – cylinder and cone when the axis is inclined to one reference plane by change of position method.

## **UNIT IV – SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES**

**(CAD software)**

**12**

Sectioning of simple solids like prisms – pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, (Obtaining true shape of section is not required). Development of lateral surfaces of simple and truncated solids – Prisms – pyramids –cylinders and cones.

## **UNIT V – CONVERSION OF ISOMETRIC VIEWS TO ORTHOGRAPHIC**

**VIEWS (Manual drafting)**

**12**

Representation of three dimensional objects – General Principles of Orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout of views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**TOTAL: 60 Hours**

### **TEXT BOOKS**

1. P. Suresh et al., “Engineering Graphics and Drawing”, Sonaversity, Sona College of Technology, Salem, Revised edition, 2012.
2. K.V. Natarajan Engineering Graphics by, Chennai, 17<sup>th</sup> edition 2003.

## REFERENCES

1. Dhananjay A. JoIhe, Engineering Drawing with an introduction to AutoCAD, Tata McGraw Hill Publishing Company Limited, 2008.
2. Basant Agarwal and Agarwal C.M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. K. R. Gopalakrishnana, Engineering Drawing (Vol. I & II), Subhas Publications, 1998.
4. Bertoline & Wiebe fundamentals of graphics communication III edition McGrawhill 2002.

## U19WPL212 – WORKSHOP PRACTICE

**L T P C**

**0 0 2 1**

**Course Outcomes: At the end of the course, the students will be able to**

- CO1** Familiarize with the basic of tools and equipment's used in fitting, carpentry, welding and sheet metal.
- CO2** Fabricate the different simple products in above trades.
- CO3** Produce different joining of metals.

### List of Experiments

**SECTION 1: FITTING**

Tools and Equipment's- Practice in filling.  
Making of Vee joint and square (T-fitting) joint.

**SECTION 2: SHEET METAL**

Tools and Equipment's- Practice  
Making of Dust Pan and Funnel.

**SECTION 3: WELDING**

Tools and Equipment's – Practice  
Arc welding of Butt joint and Lap Joint.

**SECTION 4: CARPENTRY**

Tools and Equipment's- Planning Practice  
Making of Half Lap joint and Dovetail Joint.

**TOTAL: 30 Hours**

## U19CS202 – C PROGRAMMING LABORATORY

L	T	P	C
0	0	2	1

### Course Outcomes: At the end of the course, the students will be able to

1. design and develop simple programs using branching, looping statements
2. develop programs using functions, arrays, structures and string handling
3. write programs using pointers and dynamic memory allocation and file handling

### List of Experiments

1. Programs using Input, Output and assignment statements.
2. Programs using Branching statements
3. Programs using Looping statements
4. Programs using Functions
5. Programs using Arrays
6. Programs using Structures
7. Programs using Strings
8. Programs using Pointers (both data pointers and function pointers)
9. Programs using dynamic memory allocation
10. Programs using Recursion
11. Programs using Files
12. Develop a Mini Project for real time application

**TOTAL: 30 Hours**

## U19GE201 - BASIC APTITUDE – II

L	T	P	C
0	0	2	0

**Course Outcomes: At the end of the course, the students will be able to**

- CO1** Solve more elaborate problems than those in BA-I in specific areas of quantitative aptitude.
- CO2** Solve problems of greater intricacy than those in BA-I in stated areas of logical reasoning.
- CO3** Demonstrate higher than BA-I level verbal aptitude skills in English with regard to specific topics.

### List of Experiments

#### 1. QUANTITATIVE APTITUDE AND LOGICAL REASONING

Solving quantitative aptitude and logical reasoning problems with reference to the following topics:

- a. Ratio and proportion
- b. Partnership
- c. Chain rule
- d. Ages
- e. Profit, loss and discount
- f. Geometry
- g. Area and volume
- h. Data arrangement

#### 2. VERBAL APTITUDE

Demonstrating verbal aptitude skills in English with reference to the following topics:

- a. Jumbled sentences
- b. Reconstructions of sentences (PQRS)
- c. Sentence fillers two words
- d. Idioms and phrases
- e. Spotting errors
- f. Writing captions for given pictures

**TOTAL : 24 Hours**



**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester III under Regulations 2019**  
**Branch: Computer Science and Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
<b>Theory</b>						
1	U19MAT301B	Probability and Statistics	3	1	0	4
2	U19CS301	Data Structures	3	0	0	3
3	U19CS302	Computer Architecture	3	0	0	3
4	U19CS303	Computer and Information Ethics	3	0	0	3
5	U19CS304	Object Oriented Programming	3	0	0	3
6	U19EC306	Communication Systems	3	0	0	3
7	U19GE302	<b>Mandatory Course</b> : Environment and Climate Science	2	0	0	0
<b>Practical</b>						
8	U19CS305	Data Structures Laboratory	0	0	4	2
9	U19CS306	Object Oriented Programming Laboratory	0	0	4	2
10	U19GE301	Soft Skills and Aptitude- I	0	0	2	1
<b>Total Credits</b>						<b>24</b>

**Approved By**

**Chairperson, Computer Science and Engineering BoS**

**Dr.B.Sathiyabhama**

**Member Secretary, Academic Council**

**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**

**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Computer Science and Engineering, Third Semester BE CSE Students and Staff, COE

**COURSE OUTCOMES:**

At the end of the course, the student will be able to

- Apply the concepts of measure of central tendency, dispersion, correlation and regression to the given data and analyze the results.
- Apply the concepts of probability, random variable and their properties to generate the moments.
- Fit the suitable distribution and its properties to the real world problems and interpret the results
- Apply the concepts of joint probability distribution and its properties to find the covariance and transformation of random variables.
- Test the hypothesis of the population using sample information

**UNIT I BASIC STATISTICS****12**

Measures of central tendency (simple arithmetic mean, median, mode) – Quartile's – Measures of dispersion (range, inter-quartile range, quartile deviation, mean deviation, standard deviation, coefficient of variation) – Simple correlation – Curve fitting (straight line and parabola).

**UNIT II RANDOM VARIABLES****12**

Discrete and continuous random variables – Probability mass function, probability density function, moments, moment generating function and their properties.

**UNIT III STANDARD DISTRIBUTIONS****12**

Binomial, Poisson, geometric, uniform, exponential and normal distributions and their properties.

**UNIT IV TWO DIMENSIONAL RANDOM VARIABLES****12**

Joint distributions, marginal and conditional distributions – Covariance – Correlation – Central limit theorem

**UNIT V TESTING OF SIGNIFICANCE****12**

Sampling distributions - Testing of hypothesis for mean, standard deviation, variance, proportion and differences using normal and  $t$  distributions -  $\chi^2$ - tests for independence of attributes and goodness of fit and  $F$  distribution

Theory: **45 Hours**Tutorial: **15 Hours**Total: **60 Hours****TEXT BOOKS:**

1. S. C. Gupta, V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 11<sup>th</sup> Edition, Reprint, 2019.
2. T. Veerarajan, "Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks", McGraw Hill Publishers, 4th Edition (7th reprint), 2018

## REFERENCES:

1. R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.
2. S. Ross, "A first course in probability", Pearson Publishers, 9th Edition, 2019.
3. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall Publishers, (Reprint), 2003
4. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, 3rd Edition, Wiley Publishers, 2008.



**COURSE OUTCOMES:**

**At the end of the course, students will be able to**

- Demonstrate the operational concepts of computers and classify instruction set architectures
- Identify the mechanism of control signals generation in Hardwired control and micro programmed control unit
- Apply the various arithmetic operations and discuss the design of ALU
- Evaluate the performance of a pipelined processors
- Analyze the various performance measures for memory and IoT.

**UNIT I                      BASIC STRUCTURE OF COMPUTERS                      9**

Functional units – Basic operational concepts – Bus structures – Instructions and instruction sequencing – Hardware – Software Interface – Translation from a high level language to the Hardware language- Instruction set architecture – Styles and features-Addressing modes – RISC – CISC- Amdhal’s law- Performance and metrics.

**UNIT II                      BASIC PROCESSING UNIT                      9**

Components of the processor-Data path and control- Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control.

**UNIT III                      ARITHMETIC FOR COMPUTERS                      9**

Signed and Unsigned number representations - Arithmetic operations: Addition and Subtraction – Fast Adders – Binary Multiplication – Booth algorithm-Binary Division – Floating Point Numbers – Representation and operations.

**UNIT IV                      PIPELINING                      9**

Basic concepts – Data hazards – Instruction hazards – Influence on instruction sets – Data path and control considerations – Performance considerations – Exception handling.

**UNIT V                      MEMORY AND I/O                      9**

Need for a hierarchical memory system – Types and characteristics of memories – Cache memories – Improving cache performance – Virtual memory – Memory management techniques - Accessing I/O devices – Programmed Input/Output – Interrupts – Direct Memory Access – Need for Standard I/O Interfaces like PCI, SCSI, USB.

**TOTAL: 45 hours**

**TEXT BOOK:**

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2002.

**REFERENCES**

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Sixth Edition, Pearson Education, 2003.
3. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill, 1998.
4. V.P. Heuring, H.F. Jordan, “Computer Systems Design and Architecture”, Second Edition, Pearson Education

**COURSE OUTCOMES**

**At the end of the course, the students will be able to**

- Analyze a problem and identify classes, objects and the relationships among them.
- Develop applications using various types of Inheritance and Interfaces.
- Develop applications or programs using polymorphism and multithreading.
- Analyze an application and make use of object oriented concepts for its implementation.
- Develop programs using collections, files and streams in java.

**UNIT I INTRODUCTION 7**

Introduction to OOP– Object Oriented Programming Concepts - Java Fundamentals - Characteristics of Java - Data Types, Variables, and Arrays - Operators-Control Statements – Classes – Methods – access specifiers – static members - Constructors- Garbage Collection.

**UNIT II INHERITANCE INTERFACES AND EXCEPTION HANDLING 10**

Inheritance: Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces: Defining an interface, Implementing interface, differences between classes and interfaces and extending interfaces - Exception Handling Fundamentals – Java’s Built-in Exceptions-Creating new Exception subclasses.

**UNIT III POLYMORPHISM AND MULTITHREADING IN JAVA 10**

Polymorphism- Abstract classes and methods-Overloading-Overriding-final methods and classes – Multithreaded programming –The Thread class and the Runnable Interface-Creating multiple threads-Synchronization.

**UNIT IV STRING HANDLING AND COLLECTION FRAMEWORK 11**

String Constructors-String Operations-Generic classes and methods-The Collection Framework Collections-List-ArrayList, Linked List, Set-HashSet, Linked HashSet, Queue-PriorityQueue, Map-HashMap, SortedMap, TreeMap.

**UNIT V FILES AND STREAMS IN JAVA 7**

Files and streams –Byte Stream-I/O Stream, File I/O Stream, ByteArray I/O Stream-Character Stream-File Reader and Writer, CharArrayReader and Writer-Serialization.

**TOTAL: 45 HOURS**

**TEXT BOOKS**

1. Herbert Schildt, “Java the Complete Reference”, Ninth edition Tata Mc Graw Hills, 2014.
2. Cay S. Horstmann, Gary cornell, —Core Java Volume –I Fundamentals, 9th Edition, Prentice Hall, 2013.

**REFERENCES**

1. Paul Deitel and Harvey Deitel, —”Java How to Program (Early Objects)”, Tenth Edition, Pearson Prentice Hall 2014.
2. Timothy Budd, —”An Introduction to Object-Oriented Programming”, Third Edition, Pearson Education, 2008.
3. E.Balaguruswamy, “Programming with Java”, Second Edition, TMH, 2009

**COURSE OUTCOMES:**

At the end of the course, the students will be able to,

- Explain basics of communication systems and its working principles.
- Illustrate the generation and detection methods of various AM systems.
- Describe the transmission and demodulation methods of angle modulation systems
- Examine the fundamentals of analog and digital pulse modulation methods.
- Summarize the principles of spread spectrum methods, satellite and cellular mobile communication systems.

**UNIT I FUNDAMENTALS OF COMMUNICATION SYSTEMS****9**

Basic elements of a communication systems- Modulation and demodulation- Need for modulation-types of modulation - Radio Communication spectrum-Types of signals-analog and digital- Concept of Frequency spectrum and bandwidth-Channel and noise- Types of noise- SNR-Merits and demerits of analog communication systems.

**UNIT II AMPLITUDE MODULATION SYSTEMS****9**

Principles of amplitude modulation-waveforms- Modulation index- Bandwidth and Power relations in AM-Types of AM - Generation and detection methods-Comparison of various AM systems- AM Transmitters, super-heterodyne radio receivers.

**UNIT III ANGLE MODULATION SYSTEMS****9**

Phase and Frequency modulation-waveforms- Frequency analysis of angle modulated waves-Bandwidth requirement of FM-Types of FM- NBFM and WBFM -Direct method and Indirect method of FM generation-FM receivers-Comparison between AM and FM.

**UNIT IV PULSE MODULATION SYSTEMS AND DATA TRANSMISSION****9**

Digital communication systems-Sampling theorem- Analog pulse modulation: PAM, PWM,PPM- Digital Pulse modulation: PCM, DM, ADM- transmitter and receiver- Pass band data transmission- ASK, FSK, PSK- Generation and detection-Performance comparison between different digital modulation methods.

**UNIT V ADVANCED COMMUNICATION SYSTEMS****9**

Spread Spectrum Techniques: Pseudo-noise sequence-Direct sequence spread spectrum - Frequency hopping spread spectrum-Satellite Communication systems: Uplink and downlink frequencies-Multiple Access techniques-FDMA,TDMA and CDMA- Mobile communication systems: Cellular concept and its fundamentals- Comparison between various mobile generation standards.

**Total: 45 Hours**

## **TEXT BOOKS**

1. R.P. Singh and S.D. Sapre, “Communication Systems- Analog and Digital”, Tata McGrawHill, 3rd Edition, 2014..
2. Wayne Tomasi, “Electronic Communication Systems”, 6th edition, Pearson Education, 2015.

## **REFERENCES**

1. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons, 2016.
2. B.P.Lathi, ”Modern Analog and Digital Communication systems”, 3/e, Oxford University Press, 2011
3. Martin S.Roden, “Analog and Digital Communication System”, 3rd Edition, PHI, 2012.
4. Sam Shanmugam “Digital and Analog Communication systems” John Wiley& Sons, 2014.



**COURSE OUTCOMES****At the end of the course the students will be able to**

- Identify the core values that mold the ethical behavior of an IT engineer
- Describe the ethical principles that should be followed by all the stake holders of IT
- Analyze the ethical issues related to freedom of expression
- Describe the intellectual property rights and biometric technologies
- Exercise the ethical principles that should be followed while handling advance computer technologies

**UNIT I INTRODUCTION****9**

Introduction - Ethics in the Business World - Including Ethical Considerations in Decision Making - Ethics in Information Technology - IT Security Incidents - Implementing Trustworthy Computing

**UNIT II ETHICS IN INFORMATION TECHNOLOGY****9**

Ethics for IT Professionals – Ethics for IT Users - Ethics for IT Organizations - The Impact of IT on the Standard of Living and Worker Productivity - The Impact of IT on HealthCare Costs

**UNIT III FREEDOM OF EXPRESSION****9**

Introduction – Anonymity – Security – Privacy - Ethical and Legal Framework for Information - Social Context of Computing

**UNIT IV INTELLECTUAL PROPERTY RIGHTS****9**

Introduction – Copyrights – Patents - Trade Secrets - Key Intellectual Property Issues - Biometric Technologies Ethics: Introduction and Definitions - The Biometric Authentication Process - Biometric System Components - Types of Biometric Technologies - Ethical Implications of Biometric Technologies - The Future of Biometrics

**UNIT V COMPUTER CRIMES AND NEW FRONTIERS FOR COMPUTER ETHICS****9**

Computer Crimes: Introduction - History of Computer Crimes - Types of Computer System Attacks - Motives of Computer Crimes - Costs and Social Consequences - Computer Crime Prevention Strategies - New Frontiers for Computer Ethics: Artificial Intelligence – Cyberspace - Social Network Ecosystems - Mobile Systems

**TOTAL HOURS: 45****TEXT BOOKS:**

1. George W. Reynolds, “Ethics in Information Technology”, Fifth Edition, Cengage Learning, 2014.
2. Joseph Migga Kizza, “Ethical and Social Issues in the Information Age”, Fifth Edition, Springer, 2013.

## **REFERENCE BOOKS:**

1. Gerard Ian Prudhomme, “The Handbook of Information and Computer Ethics”, First edition, Arcler Education Inc, 2016.
2. Luciano Floridi, “The Cambridge Handbook of Information and Computer Ethics” , First edition, Cambridge University Press, 2010.
3. Kenneth E. Himma and Herman T. Tavani, “The Handbook of Information and Computer Ethics”, First Edition, Wiley-Blackwell, 2008.
4. Robert N. Barger, “Computer Ethics: A Case-based Approach”, First edition, Cambridge University Press, 2008.
5. Deborah G. Johnson, “Computer Ethics (Occupational Ethics)”, Second Edition, PHI,1993

**COURSE OUTCOMES:**

**At the end of the course, students will be able to**

- Design and develop simple programs using data structures
- Apply non-linear data structures for various real time applications
- Design shortest path algorithm for various real life applications

**LIST OF EXPERIMENTS**

1. Implementation of Lists ,Stacks and Queues
2. Implementation of Binary Tree and Traversal Techniques
3. Implementation of Binary Search Trees
4. Implementation of AVL Trees
5. Implementation of B-trees
6. Implementation of graphs using BFS and DFS.
7. Implementation of Prim's algorithm.
8. Implementation of Kruskal's algorithm
9. Implementation of Dijkstra's algorithm
10. Implementation of Floyd's algorithm
11. Implementation of Hashing and Collision Resolution Technique.
12. Implementation of Heap
13. Implement the operations on Trie structure

**TOTAL : 30 hours**

**COURSE OUTCOMES:**

**At the end of the course, students will be able to**

- Design and develop simple programs using OOPS concepts
- Apply thread and collection class for various real time applications
- Develop java program using IO streams and File class

**LIST OF EXPERIMENTS**

1. Develop simple programs in java using classes and methods
2. Implement user defined Exception Handling
3. Implement method overloading and method overriding in Java
4. Develop java programs using inheritance and interfaces
5. Create Threads in java using Thread Class and Runnable Interface
6. Create an application using multiple threads
7. Develop programs using inbuilt methods of String class
8. Implement collections like List, Set, Queue, Map in Java
9. Implement Input streams and Output streams in Java
10. Develop java programs to access and perform various operations in file content
11. Implement the given use case/project using various Object oriented concepts in Java

**TOTAL : 30 hours**

Semester-III	U19 GE301- SOFT SKILLS AND APTITUDE – I	L	T	P	C	Marks
		0	0	2	1	100
<b>Course Outcomes</b>						
<b>At the end of the course the student will be able to:</b>						
1. Demonstrate capabilities in specific soft-skill areas using hands-on and/or case-study approaches						
2. Solve problems of greater intricacy in stated areas of quantitative aptitude and logical reasoning						
3. Demonstrate higher levels of verbal aptitude skills in English with regard to specific topics						
<b>1.Soft Skills</b>	<b>Demonstrating soft-skill capabilities with reference to the following topics:</b>					
	<ul style="list-style-type: none"> <li>a. Attitude building</li> <li>b. Dealing with criticism</li> <li>c. Innovation and creativity</li> <li>d. Problem solving and decision making</li> <li>e. Public speaking</li> <li>f. Group discussions</li> </ul>					
<b>2. Quantitative Aptitude and Logical Reasoning</b>	<b>Solving problems with reference to the following topics:</b>					
	<ul style="list-style-type: none"> <li>a. <b>Vedic Maths:</b> Fast arithmetic, multiplications technique, Criss cross, Base technique, Square root, Cube root, Surds, Indices, Simplification.</li> <li>b. <b>Numbers:</b> Types, Power cycle, Divisibility, Prime factors &amp; multiples, HCF &amp; LCM, Remainder theorem, Unit digit, highest power.</li> <li>c. <b>Averages:</b> Basics of averages and weighted average.</li> <li>d. <b>Percentages:</b> Basics of percentage and Successive percentages.</li> <li>e. <b>Ratio and proportion:</b> Basics of R &amp;P, Alligations, Mixture and Partnership.</li> <li>f. <b>Profit ,Loss and Discount:</b> Basic &amp; Advanced PLD</li> <li>g. <b>Data Interpretation:</b> Tables, Bar diagram, Venn diagram, Line graphs, Pie charts, Caselets, Mixed varieties, Network diagram and other forms of data interpretation.</li> <li>h. <b>Syllogism:</b> Six set syllogism using Venn diagram and tick and cross method</li> </ul>					
<b>3. Verbal Aptitude</b>	<b>Demonstrating English language skills with reference to the following topics:</b>					
	<ul style="list-style-type: none"> <li>a. Verbal analogy</li> <li>b. Tenses</li> <li>c. Prepositions</li> <li>d. Reading comprehension</li> <li>e. Choosing correct / incorrect sentences</li> <li>f. Describing pictures</li> <li>g. Error spotting</li> </ul>					

*S. Anand*

Department of Placement Training  
Sona College of Technology.  
Salem-636 005.

MANDATORY COURSE

Sona College of Technology, Salem

Department of Sciences (Chemistry)

SEMESTER – III

MANDATORY COURSE

**U19GE302 - ENVIRONMENT AND CLIMATE SCIENCE**

(Common for CSE, CIVIL, EEE, MECH)

Course Outcomes:

**L T P C**  
**2 0 0 0**

At the end of the course, the student will be able to

1. state the importance of the acute need for environmental awareness and discuss significant aspects of natural resources like forests, water and food resources.
2. explain the concepts of an ecosystem and provide an overview of biodiversity and its conservation.
3. explain environmental based pollution their causes, effects and their remedial measures
4. discuss their causes, effects and the control measures of Global Warming, Acid Rain, Ozone Layer Depletion
5. describe the effect of climate change due to pollution

**UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES** **6**

Definition, Scope and Importance Forest Resources:- Use and over - exploitation, deforestation, Case Studies, Water Resources:- Use and Over-Utilization of Surface and ground water , Floods, Drought, Food Resources- Effects of Modern Agriculture, Fertilizer- Pesticide Problems–Role of an Individual in Conservation of Natural Resources.

**UNIT II ECOSYSTEMS AND BIODIVERSITY** **6**

Structure and Function of an Ecosystem– Energy Flow in the Ecosystem -Food Chains, Food Webs and Ecological Pyramids.

Introduction to Biodiversity –Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values –India as a Mega-Diversity Nation — Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.

**UNIT III ENVIRONMENTAL POLLUTION** **6**

Definition – Causes, Effects and Control Measures of:- (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution, Solid Waste Management- Effects and Control Measures of Acid Rain,– Role of an Individual in Prevention of Pollution..

20.05.2020

B.E. / B.Tech. Regulations 2019

**UNIT IV CLIMATE CHANGE ON THE ENVIRONMENT**

6

Sustainable Development- - Climate Change- Causes and effects of Global Warming - Effect of global warming in food supply, plants, sea, coral reef, forest, agriculture, economy - Kyoto Protocol in reduction of greenhouse gases - Ozone Layer Depletion - mechanism, effects and control measures- Montreal Protocol to protect ozone layer depletion - Rain Water Harvesting - .Effect of climate change due to air pollution Case study - CNG vehicles in Delhi

**UNIT V EFFECT OF CLIMATE CHANGE ON POLLUTION**

6

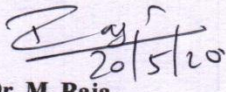
Fungal diseases in forests and agricultural crops due to climatic fluctuations - Growing energy needs - effect of climate change due to non-renewable energy resources. Renewable energy resources in the prevention of climatic changes- Effect of climatic changes in ground water table, garments, monuments, buildings, consumption of energy, agriculture and in electric power sector - Carbon credit - carbon footprint - disaster management -Role of an individual to reduce climate change.

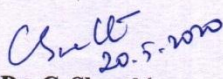
**TOTAL: 30 HOURS****Text Books:**

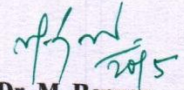
1. Miller, T.G. Jr., "Environmental Science", Wadsworth Pub. Co. 2018
2. Anubha Kaushik and Kaushik, "Environmental Science and Engineering" New Age International Publication, 4<sup>th</sup> Multicolour Edition, New Delhi, 2014.

**References:**

1. S. Radjarejesri et al., "Environmental Science" Sonaversity, Sona College of Technology, Salem, 2018.
2. Masters, G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2<sup>nd</sup> Edition, 2004.
3. Erach, B., "The Biodiversity of India", Mapin Publishing P.Ltd., Ahmedabad, India.
4. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", 2005, University Grands Commission, Universities Press India Private Limited, Hyderguda, Hyderabad – 500029.

  
**Dr. M. Raja**  
Course Coordinator / Sciences

  
**Dr. C. Shanthi**  
HOD / Sciences

  
**Dr. M. Renuga**  
Chairperson BOS,  
Science and Humanities

20.05.2020

**B.E. / B.Tech. Regulations 2019**

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester IV under Regulations 2019**  
**Branch: Computer Science and Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
<b>Theory</b>						
1	U19MAT401A	Numerical and Regression Analysis	3	1	0	4
2	U19CS401	Operating Systems	3	0	0	3
3	U19CS402	Database Management Systems	3	0	0	3
4	U19CS403	Design and Analysis of Algorithms	3	0	0	3
5	U19GE405	Principles of Management	3	0	0	3
6	U19GE403	<b>Mandatory Course:</b> Essence of Indian Traditional Knowledge	2	0	0	0
<b>Practical</b>						
7	U19CS404	Operating Systems Laboratory	0	0	4	2
8	U19CS405	Database Management Systems Laboratory	0	0	4	2
9	U19GE401	Soft Skills and Aptitude -II	0	0	2	1
<b>Total Credits</b>						<b>21</b>

**Approved By**

**Chairperson, Computer Science and Engineering BoS**  
**Dr.B.Sathiyabhama**

**Member Secretary, Academic Council**  
**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**  
**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Computer Science and Engineering, Fourth Semester BE CSE Students and Staff, COE



**COURSE OUTCOMES**

**At the end of the course, the student will be able to**

- Solve algebraic, transcendental and linear system of equations using appropriate numerical techniques
- Apply the Newton's forward, backward, divided difference formulae and Lagrange's formula to obtain the polynomial interpolation and their derivatives at desired point
- Apply the Trapezoidal rule, Simpson's rule, Romberg's method and Gaussian quadrature formula to evaluate definite integrals.
- Solve the linear and nonlinear ordinary differential equations of first order by single and multi-step methods.
- Compute simple and partial correlation coefficients and analyse regression equation for estimation and prediction purpose.

**UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 12**

**Solution of algebraic and transcendental equations:** Regula-Falsi method – Fixed point theorem (statement only) – Fixed point iteration method – Newton Raphson method – **Solution of linear system of equations:** Cholesky decomposition method – **Eigen values of a matrix:** Power method

**UNIT II INTERPOLATION AND NUMERICAL DIFFERENTIATION 12**

Newton's forward and backward difference formulae – Newton's divided difference interpolation – Lagrange's interpolation – Inverse Lagrange's interpolation – Approximation of derivatives using interpolation polynomials.

**UNIT III NUMERICAL INTEGRATION 12**

Trapezoidal rule – Simpson's  $1/3^{rd}$  and  $3/8^{th}$  rules – Romberg's method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

**UNIT IV INITIAL VALUE PROBLEMS – ORDINARY DIFFERENTIAL EQUATIONS 12**

**Single step methods:** Taylor series method – Fourth order Runge – Kutta method for solving first order ordinary differential equations. **Multi step methods:** Milne's and Adams – Bash forth predictor and corrector methods for solving first order ordinary differential equations.

**UNIT V REGRESSION ANALYSIS 12**

Multiple and partial correlation – Liner regression – relationship between correlation and regression – multiple and partial regression.

Theory: **45 Hours**

Tutorial: **15 Hours**

Total: **60 Hours**

**TEXT BOOKS:**

1. R.L.Burden and J.D.Faires, “Numerical Analysis” Cengage Publishers, 9<sup>th</sup> Edition, 2016.
2. S.P.Gupta, “Statistical Methods”, Sultan Chand and Sons Publishers, 15<sup>th</sup> Edition, 2012.

**REFERENCE BOOKS:**

1. T. Veerarajan and T. Ramachandran, “Numerical Methods with programs in C”, McGraw Hill Publishers, 2<sup>nd</sup> Edition, Reprint, 2019.
2. C. F. Gerald and P. O. Wheatly, “Applied Numerical Analysis”, Pearson Publishers, 7<sup>th</sup> Edition, 2004
3. B. S. Grewal, “Numerical Methods in Engineering & Science with Programs in C, C++ & MATLAB”, Khanna Publishers, 11<sup>th</sup> Edition, 2013.
4. K. Sankar Rao, “Numerical Methods for Scientists and Engineers”, Prentice Hall Publishers, 4<sup>th</sup> Edition, 2018.
5. P. Kandasamy, K. Thilagavathy and K. Gunavathy, “Numerical Methods”, S. Chand Publishers, 5<sup>th</sup> Edition, 2013

**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Compare the different operating system structures
- Evaluate the various process scheduling algorithms
- Design algorithms for achieving process synchronization
- Evaluate the various memory management techniques
- Analyze the effectiveness of a file system

**UNIT I INTRODUCTION AND OPERATING SYSTEM STRUCTURES 9**

Introduction - Mainframe Systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time Systems – Handheld Systems - Hardware Protection - System Components – Operating System Services – System Calls – System Programs – System Structure – Virtual Machines – System Design and Implementation.

**UNIT II PROCESS MANAGEMENT 9**

Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter-process Communication- Threads – Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - Case study – Linux Scheduling.

**UNIT III PROCESS SYNCHRONIZATION AND DEADLOCKS 9**

Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors. System Model – Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks.

**UNIT IV STORAGE MANAGEMENT AND FILE SYSTEM INTERFACE 9**

Storage Management – Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging - Virtual Memory – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing - File Concept – Access Methods – Directory Structure – File System Mounting – Protection. Case study – Linux memory management

**UNIT V FILE SYSTEM IMPLEMENTATION AND MASS STORAGE STRUCTURE 9**

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management - Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management - Case study – Linux file system.

**Total: 45 hours**

## **TEXT BOOKS**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9<sup>th</sup> Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2012.

## **REFERENCES**

1. Harvey M. Deitel, P.J.Deitel and D.R.Choffnes, “Operating Systems”, 3rd Edition, Pearson Education Pvt. Ltd, 2004.

2. Andrew S. Tanenbaum and Herbert Bos, “Modern Operating Systems”, Pearson Education Pvt. Ltd, 4<sup>th</sup> Edition, 2016

3. William Stallings, “Operating System Internals and Design Principles”, Pearson Education Pvt. Ltd, 9<sup>th</sup> Edition, 2018

**COURSE OUTCOMES**

At the end of the course, students will be able to

- Demonstrate the need, background, architecture and evolution of database management system and to introduce the concepts of ER model
- Design and develop relational models with an emphasis on how to organize, maintain, retrieve and secure information efficiently and effectively from a RDBMS
- Design and evaluate the normality of a logical data model, and correct any anomalies and identify the requirements of data storage and indexing techniques
- Implement query processing methodologies using various operators
- Design and develop methods for multiple transactions are managed concurrently and recovered efficiently during failures

**UNIT I INTRODUCTION****9**

**Database and Database Users:** Characteristics of database approach- Advantages of using the DBMS Approach-Database Applications.

**Database system concepts and architecture:** Data models-Schemas- Instance-Three schema architecture and data independence- DBMS languages and interfaces- database system Environment-ER model.

**UNIT II RELATIONAL MODEL****9**

Relational data model-relational constraints: Relational model concepts- Relational constraints and Relational data base schema- update operations- basic Relational algebra operations- additional relational operations.

**SQL:** Data definition and Data type- specifying SQL constraints- Basic queries-insert-delete- update-complex queries- views- assertions and triggers- dynamic SQL.

**Database security and Authorization:** Security issues- grant/revoke privileges- SQL injections.

**UNIT III RELATIONAL DATABASE DESIGN****9**

**Functional dependencies and normalization:** Functional dependencies-Normal forms: 1NF- 2NF- 3NF-Boyce Codd NF- decomposition-Multivalued dependencies and 4NF- join dependencies and 5NF.

**UNIT IV DATA STORAGE AND QUERY PROCESSING****9**

**Disk Storage, Basic File Structures, and Hashing:** Secondary Storage Device-RAID-Operations on Files-Heap Files-Sorted Files-Hashing Techniques.

**Indexing Structures for Files:** Types of Single-Level Ordered Indexes- Multilevel Indexes-- Dynamic Multilevel Indexes Using B-Trees and B+-Trees.

**Query Processing:** Translating SQL Queries into Relational Algebra- Algorithms for External Sorting-Algorithms for SELECT and JOIN Operations- Algorithms for PROJECT and Set Operations.

## **UNIT V TRANSACTION MANAGEMENT**

**9**

**Transaction Processing:** Introduction-Transaction and System Concepts- desirable Properties of Transactions-Schedules based on Recoverability- Schedules based on Serializability.

**Concurrency Control Techniques:** Two-Phase Locking Techniques for Concurrency Control-Timestamp Ordering.

**Database Recovery Techniques:** Recovery Concepts, Deferred Update, Immediate Update-Shadow Paging- ARIES recovery algorithm.

**Total: 45 hours**

### **TEXT BOOKS**

1. Abraham Silberschatz, Henry F. Korth and Sudarshan. S, “Database System Concepts”, Sixth Edition, McGrawHill, 2010

### **REFERENCES**

1. Ramez Elmasri and Shamkant Navathe, “Fundamentals of Database Systems ”, 6th Edition, Addison-Wesley, 2011

2. Raghu Ramakrishnan, “Database Management System”, Tata McGraw-Hill Publishing Company, 2003

3. Date. C. J, Kannan. A, Swamynathan. S, “An Introduction to Database Systems”, 8th Edition, Pearson Education, 2006

4. Rajesh Narang, “Database Management systems”, PHI Learning pvt. Ltd, New Delhi,2006

**COURSE OUTCOMES**

**At the end of the course, the student will be able to**

- Analyze the algorithms that are used to solve various problems.
- Generate and solve the recurrences for divide and conquer techniques.
- Solve the problems using greedy and dynamic programming paradigms.
- Design the algorithms for solving the backtracking and transform and conquer methodologies.
- Apply the branch and bound technique to solve various problems.

**UNIT I FUNDAMENTALS OF ALGORITHM ANALYSIS 9**

Introduction - Problem solving techniques-Analysis framework – Time space tradeoff – Asymptotic notations – Conditional asymptotic notation – Properties of Big-Oh notation – Recurrence equations – Mathematical Analysis of Non-recursive algorithms - Mathematical analysis of recursive Algorithms – Analysis of linear search - Empirical analysis - Algorithm visualization

**UNIT II BRUTE FORCE AND DIVIDE AND CONQUER STRATEGIES 9**

Brute Force: Selection Sort - Bubble Sort – String matching - Exhaustive Search: Travelling Salesman problem - Divide and Conquer: General Method – Binary Search – Closest-pair problem – Merge Sort-Quick Sort.

**UNIT III GREEDY AND DYNAMIC PROGRAMMING PARADIGMS 9**

Greedy Algorithms: General Method – Container Loading – Huffman code – Knapsack problem - Dynamic Programming: General Method – Multistage Graphs – Optimal binary search trees.

**UNIT IV BACKTRACKING AND TRANSFORM AND CONQUER METHODOLOGIES 9**

Backtracking: General Method – N-Queen's problem – Sum of subsets – Graph coloring – Hamiltonian problem. Transform and conquer : Presorting – Gaussian elimination.

**UNIT V GRAPH AND BRANCH AND BOUND STRATEGIES 9**

Graph : Connected Components – Bi-connected components – Branch and Bound: General Method (FIFO and LC) – Job assignment problem - 0/1 Knapsack problem – Introduction to NP-Hard and NP-Completeness.

**Total: 45 hours**

## **TEXT BOOKS**

1. Anany Levitin “Introduction to the design and Analysis of Algorithms”, Pearson Education, Second Edition, 2014.

## **REFERENCES**

1. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "Introduction to Algorithms", Third Edition, Prentice Hall of India Pvt. Ltd, 2009.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education, 1999.
3. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2008.
4. K.S. Easwarakumar, “ Object Oriented Data Structures Using C++”, Vikas Publication House Pvt Ltd, First Edition, 2000.



**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Identify the organizational factors and roles of Management
- Apply planning, forecasting and decision making in real time applications
- Apply the concepts of organizing in an organization
- Analyze the concepts of delegation of authority and Organization culture.
- Apply the concepts of controlling in an organization

**UNIT I INTRODUCTION****9**

Definitions of Management-Scope of Management-Levels of Management-Functions and Roles of a manager-Evolution of Management thought-Organisation and Environmental Factors-Forms of Business Organizations-Corporate Social Responsibility-recent trends and challenges in global management scenario.

**UNIT II PLANNING****9**

Definition of Planning-Nature and purpose of planning-Planning process-Types of plans-Objectives-Management of objective(MBO)-Management by exception-Types of strategies-Decision Making: definition and process-Types of managerial decision-group decision making techniques-Decision making under different conditions-forecasting and its techniques.

**UNIT III ORGANISING****9**

Definition of organizing-Nature and purpose of organizing-Formal and informal organizations-organization charts-Organization structures-Span of control-factors determining effective span-line and staff authority-Departmentation-Centralization and Decentralization-Delegation of authority-staffing-selection and recruitment-Orientation-Training and development-Performance Appraisal-organization change-Staffing

**UNIT IV DIRECTING****9**

Directing: nature and purpose-Motivation and Satisfaction-Motivation theories-job enrichment-definition of leadership-elements of leadership-Leadership styles-leadership theories-Communication-process and barriers to effective communication-Organization culture-Elements and types of culture-Managing cultural diversity.

**UNIT V CONTROLLING****9**

Process of controlling-Types of control-Budgetary and non-budgetary control techniques- MIS-Managing productivity-Constant control-purchase control- Maintenance control-quality control-planning operations-performance standards-Measurement of performance-Remedial actions-Recent Trends in Management

**Total :45 hours**

## **TEXT BOOKS**

1. Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India) Pvt. Ltd., 14th Edition, 2017.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2004.

## **REFERENCES**

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" Pearson Education, 9th Edition, 2016.
2. Robert Kreitner & Mamata Mohapatra, " Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill,2006.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 2012

**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Simulate various Unix commands using shell scripts
- Design, develop and demonstrate various page replacement policies and memory management techniques
- Design and develop an deadlock avoidance algorithm

**(Implement the following on LINUX platform. Use C for high level language implementation)**

**LIST OF EXPERIMENTS**

1. UNIX - Basic Commands.
2. Shell programming (Using looping, control constructs etc.,)
3. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
5. Write C programs to simulate UNIX commands like ls, grep, etc.
6. Implementation of CPU scheduling algorithms: FCFS, SJF, Round Robin & Priority Scheduling.
7. Implementation of the Producer – Consumer problem using Semaphores.
8. Implementation of Banker's algorithm.
9. Implementation of memory management schemes (First fit, Best fit & Worst fit)
10. Implement page replacement algorithms (FIFO & LRU)

**Total: 60 hours**

**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Design schema for the given database by creating appropriate tables and write SQL queries using DDL and DML statements to retrieve information out of it.
- Create views and triggers that automatically indicate the updating of data in the tables
- Apply the concept of databases to the real time application development

**LIST OF EXPERIMENTS**

1. Create a relational database system using DDL commands with constraints
2. Update the database system using DML commands
3. Query the database using simple and complex queries
4. Create and update views
5. High level programming language extensions (Control structures, Procedures and Functions)
6. Working with triggers
7. Use of front end tools to manipulate the database
8. Menu Design
9. Generate reports using a reporting tool
10. Database Design and implementation of an application system. (Suggested Mini Project)

**Total: 60 hours**

Semester – IV	UI9GE401 SOFT SKILLS AND APTITUDE – II	L	T	P	C	Marks
		0	0	2	1	100
<b>Course Outcomes</b>						
<b>At the end of the course the student will be able to:</b>						
1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches						
2. Solve problems of increasing difficulty than those in SSA-I in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests						
3. Demonstrate greater than SSA-I level of verbal aptitude skills in English with regard to given topics and score 65-70% marks in company-specific internal tests						
<b>1.Soft Skills</b>	<b>Demonstrating soft-skill capabilities with reference to the following topics:</b>					
	<ul style="list-style-type: none"> <li>a. SWOT</li> <li>b. Goal setting</li> <li>c. Time management</li> <li>d. Stress management</li> <li>e. Interpersonal skills and Intrapersonal skills</li> <li>f. Presentation skills</li> <li>g. Group discussions</li> </ul>					
<b>2. Quantitative Aptitude and Logical Reasoning</b>	<b>Solving problems with reference to the following topics:</b>					
	<ul style="list-style-type: none"> <li>a. Equations: Basics of equations , Linear, Quadratic Equations of Higher Degree and Problem on ages.</li> <li>b. Logarithms, Inequalities and Modulus</li> <li>c. Sequence and Series: Arithmetic Progression, Geometric Progression, Harmonic Progression, and Special Series.</li> <li>d. Time and Work: Pipes &amp; Cistern and Work Equivalence.</li> <li>e. Time, Speed and Distance: Average Speed, Relative Speed, Boats &amp; Streams, Races and Circular tracks and Escalators.</li> <li>f. Arithmetic and Critical Reasoning: Arrangement, Sequencing, Scheduling, Network Diagram, Binary Logic, and Logical Connection.</li> <li>h. Binary number System.- Binary to decimal, Octal, Hexadecimal</li> </ul>					
<b>3. Verbal Aptitude</b>	<b>Demonstrating English language skills with reference to the following topics:</b>					
	<ul style="list-style-type: none"> <li>a. Critical reasoning</li> <li>b. Theme detection</li> <li>c. Verbal analogy</li> <li>d. Prepositions</li> <li>e. Articles</li> <li>f. Cloze test</li> <li>g. Company specific aptitude questions</li> </ul>					

## SEMESTER – IV

## MANDATORY COURSE

## U19GE403 - ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

(Common for EEE, CIVIL, MECH and CSE)

L	T	P	C
2	0	0	0

**Course Outcomes**

At the end of the course, the students will be able to,

1. understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.
2. show an ability to comment critically on curriculum proposals that aim to promote science citizenship/scientific literacy
3. communicate using common medical and psychological terminology, including the skill to discuss commonly used medications, supplements, and surgical procedures
4. use effective oral and written language skills to communicate scientific data and ideas
5. describe the fundamentals of yoga and its importance

**Unit I**

- Introduction to Vedas
- Traditional methodology of Veda – Sat Angas
- Types of Vedas and their application
- Sub Veda – Ayurveda - their modern day application

**Unit II**

- Basics of Applied Vedic Science
- Modern day application of Vedas and procedure
- Ancient Indian Scientific thoughts
- Introduction to the Vedic language “Sanskrit”

**UNIT – III- Modern science**

- Introduction – modern science
- Objectives – modern science
- Architecture in ancient India

**UNIT – IV Technology**

- India's contribution to science and technology (from ancient to modern)
- Nobel laureates of Indian origin and their contribution
- India in space
- Latest achievement from Jan – 2017

23.01.2021

B.E. / B.Tech. Regulations 2019

**UNIT – V- Yoga and Holistic Health Care**

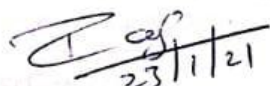
6


- Fundamentals of yoga and holistic health
- Human biology
- Diet and nutrition
- Life management
- Contemporary yogic models – case study

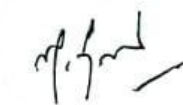
**References**

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016.
4. Roshan Dalal The Vedas: An Introduction to Hinduism's Sacred Texts, Penguin Books 2014. ISBN 13: 9780143066385
5. Raja Ram Mohan Roy, Vedic Physics, Mount Meru Publication ISBN : 9781988207049

**Total: 30 HOURS**

  
**Dr. M. Raja**  
Course Coordinator / Sciences

  
**Dr. C. Shanthy**  
HOD / Sciences

  
**Dr. M. Renuga**  
Chairperson BOS,  
Science and Humanities

23.01.2021

**B.E. / B.Tech. Regulations 2019**

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester V Regulations 2019**  
**Branch: Computer Science and Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
<b>Theory</b>							
1	U19CS501	Computer Networks	3	0	0	3	45
2	U19CS502	Software Engineering	3	0	0	3	45
3	U19CS503	Theory of Computation	3	0	0	3	45
4	U19CS509	Embedded System Design	3	0	0	3	45
5	noc21-cs73	<b>Elective</b> NPTEL - Software Testing	3	0	0	3	45
6	U19CS901	<b>Elective-</b> Software Project Management	3	0	0	3	45
	U19CS902	<b>Elective-</b> Agile Methodologies					
<b>Practical</b>							
7	U19CS504	Computer Networks Laboratory	0	0	4	2	60
8	U19CS505	Software Development Laboratory	0	0	2	1	30
9	U19GE501	Soft Skills and Aptitude -III	0	0	2	1	30
<b>Total Credits</b>						<b>22</b>	

**Approved By**

**Chairperson, Computer Science and Engineering BoS**

Dr.B.Sathiyabhama

**Member Secretary, Academic Council**

Dr.R.Shivakumar

**Chairperson, Academic Council & Principal**

Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Computer Science and Engineering, Fifth Semester BE CSE Students and Staff, COE



**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Compare and analyze the various life cycle models of software process
- Design an appropriate analysis model that suits the requirement
- Create models using UML for various applications
- Apply different design strategies in software application development the strategies
- Apply appropriate testing strategies to uncover errors in the software

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	SOFTWARE ENGINEERING														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	2	2	1	2	2	3	3	3	3	3	3
CO2	2	2	2	3	3	1	2	2	3	3	3	3	2	2	1
CO3	1	1	2	2	3	1	3	2	2	3	3	2	3	3	3
CO4	2	1	2	2	2	2	2	2	2	3	3	2	2	2	2
CO5	2	3	2	2	3	2	2	2	2	2	3	2	2	2	2

**UNIT I SOFTWARE PROCESS****9**

Software process structure – Process models: Waterfall model, Incremental process models, Evolutionary process models, Specialized process models – Unified Process-Agile development: Agile process – Extreme programming – Scrum

**UNIT II SOFTWARE REQUIREMENTS****9**

Requirements engineering – Eliciting requirements - Developing use cases – Building the analysis model – Negotiating requirements – Requirements monitoring – Validating requirements – Requirements analysis

Introduction – Unified Modeling Language – Static model – Dynamic model – Unified Modeling Language - UML diagrams – UML class diagram – Use case diagram – UML dynamic modeling : UML interaction diagrams – UML state chart diagram – UML activity diagram – Implementation Diagrams – Component diagram – Deployment diagram

**UNIT IV SOFTWARE DESIGN****9**

Design concepts and model – Architectural design: Software architecture, Architectural styles – Architectural design – Component level design: Designing class-based components, Conducting component level design – User interface design: User interface analysis and design – Interface analysis – Interface design steps - Design patterns.

**UNIT V SOFTWARE TESTING FUNDAMENTALS****9**

Software testing strategies: Strategic approach – Issues – Test strategies for conventional and Object Oriented software – Validation and System testing – Debugging – Testing conventional applications: White box testing – Basis path testing – Control structure testing – Black box testing – Software configuration management – SCM repository – SCM process.

**Total: 45 hours****TEXTBOOK**

1. Roger S .Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Edition, 8th edition, 2015.

**REFERENCES**

1. Ali Bahrami, "Object Oriented Systems Development", 1st Edition, Tata McGraw-Hill, New Delhi, 2008.
2. Ian Sommerville, Software engineering, Pearson education Asia, 9th edition, 2011.
3. Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
4. James F Peters and Witold Pedrycz, "Software Engineering – An Engineering Approach", John Wiley and Sons, New Delhi, 2000.

**COURSE OUTCOMES**

**At the end of the course, the student will be able to**

- Identify the suitable network services for the given network applications
- Comprehend transport layer and its protocols
- Select and apply appropriate routing algorithm
- Analyze the various functionalities of data link layer
- Describe the key concepts and functions of physical layer

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	COMPUTER NETWORKS														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	2	1	1	3	1	2	3	2	3	1
CO2	3	2	2	2	3	2	2	1	3	3	2	3	1	3	3
CO3	3	2	3	2	3	2	1	1	3	3	3	3	1	3	3
CO4	3	3	3	3	3	1	2	1	3	3	3	3	2	3	3
CO5	3	3	2	2	2	1	1	1	3	3	3	3	2	3	3

**UNIT I INTRODUCTION AND APPLICATION LAYER****9**

The Internet – Protocol – The network edge – ISPs and Internet backbones ; Introduction to Software Defined Networks ; Introduction to cloud ; Protocol layers and their service models; Network applications – The Web and HTTP – FTP – SMTP – DNS – SNMP.

**UNIT II TRANSPORT LAYER****9**

Connectionless transport – User Datagram Protocol; Connection Oriented transport – Transmission Control Protocol; Congestion control – TCP congestion control; Introduction to Quality of Service.

**UNIT III NETWORK LAYER****9**

Circuit Switching – Packet Switching – Virtual Circuit and Datagram Networks – The Internet protocol (IP) – Datagram format – IPv4 addressing– Sub netting – ICMP – Ipv6 – Routing algorithms – Link State Routing – Distance Vector Routing – RIP – OSPF – BGP – Multicast – IGMP.

**UNIT IV DATA LINK LAYER****9**

Error-Detection and -Correction Techniques - Framing - Flow Control and Error control protocols (Simple - STOP and WAIT - Go Back-N ARQ - Selective Repeat ARQ - Piggybacking) – Media access protocols – Channel partitioning protocols – Random access protocols – Link layer addressing – ARP– Ethernet – Token Ring – Switches – Wireless LAN.

**UNIT V PHYSICAL LAYER****9**

Data and signals – Performance – Digital Transmission– Analog Transmission ; Bandwidth Utilization- – Multiplexing – Spread Spectrum ; Transmission media – Guided media –Unguided media.

**Total: 45 hours****TEXT BOOK**

1. James F. Kurose, K. W. Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, 7th Ed, Addison-Wesley, 2017.
2. Behrouz A. Ferouzan, “Data Communications and Networking”, Fifth Edition, Tata McGraw-Hill Publication, 2013.

**REFERENCES**

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers Inc., 2011.
2. William Stallings, “Data and Computer Communications”, Tenth Edition, Pearson Education, 2014.
3. Andrew Tanenbaum, Computer Networks, Prentice Hall of India, fifth edition, 2010.
4. Douglas E. Comer, “Computer Networks and Internets with Internet Applications”, Fifth Edition, Pearson Education, 2009.

**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Compare various and analyze various Finite Automata
- Construct finite automata from regular expressions and identify the properties of regular language
- Design recognizers for different formal languages and Push Down Automata
- Convert CFG to normal forms and design Turing machines for various problems
- Determine the decidability and intractability of computational problems

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	THEORY OF COMPUTATION														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	2	1	1	3	1	2	3	2	3	1
CO2	3	2	2	2	3	2	2	1	3	3	2	3	1	3	3
CO3	3	2	3	2	3	2	1	1	3	3	3	3	1	3	3
CO4	3	3	3	3	3	1	2	2	3	3	3	3	2	3	3
CO5	3	3	2	2	2	1	1	2	3	3	3	3	2	3	3

**UNIT I AUTOMATA****9**

Introduction to formal proof – Additional forms of proof – Inductive proofs –Chomsky Hierarchy- Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non- deterministic Finite Automata (NFA) – Finite automata with epsilon transitions. Case Study: Cruise Control.

**UNIT II REGULAR EXPRESSIONS AND LANGUAGES****9**

Regular expression – FA and Regular expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of automata.

**UNIT III CONTEXT-FREE GRAMMAR AND LANGUAGES****9**

Context Free Grammar (CFG) – Parse trees – Ambiguity in grammars and languages – Definition of the pushdown automata – Languages of a pushdown automata – Equivalence of pushdown automata and CFG – Deterministic pushdown automata- Pumping lemma for CFL – Closure properties of CFL

**UNIT IV TURING MACHINE****9**

Normal forms for CFG – Turing machines -Language of TM -Programming Techniques for TM- Variants in TM. Case study: Church's Thesis-Godelization.

**UNIT V UNDECIDABILITY****9**

Recursively Enumerable (RE) - An Undecidable problem that is RE – Halting Problem– Post's correspondence problem –Rice Theorem-Classes P and NP –NP Completeness-Relationship between Time Complexity and Space Complexity.

**Total: 45 hours****TEXT BOOK**

1. Hopcroft, J.E. Motwani, R. and Ullman, J.D "Introduction to Automata Theory, Languages and Computations", 2nd Edition, Pearson Education, 2013.

**REFERENCES**

1. Michael Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.
2. Martin, J., "Introduction to Languages and the Theory of Computation", 3rd Edition, TMH, 2003.
3. Lewis, H. and Papadimitriou, C.H "Elements of the Theory of Computation", 2nd Edition, Pearson Education/PHI, 2003.
4. Greenlaw, "Fundamentals of Theory of Computation, Principles and Practice", Elsevier, 2008.

**COURSE OUTCOMES**

At the end of the course, students will be able to

- Comprehend the roles of the project manager and opportunities in project management
- Assess and evaluate the projects based on various approaches
- Apply the best practices to develop competencies and skills in planning and controlling Projects
- Analyze the scheduling resources using various models
- Discuss managing people and organizing teams

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	SOFTWARE PROJECT MANAGEMENT														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	3	2	3	3	2	2	3	2	2
CO2	3	3	3	3	3	2	2	1	3	2	3	2	3	3	3
CO3	3	3	3	3	3	2	2	2	3	2	2	2	3	3	3
CO4	3	3	3	3	3	2	2	1	3	2	2	2	3	3	2
CO5	3	3	3	3	3	3	2	2	2	3	2	2	3	2	2

**UNIT I INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT****9**

Project Definition – Contract Management – Activities Covered by Software Project Management – Overview of Project Planning – Stepwise Project Planning.

**UNIT II PROJECT EVALUATION****9**

Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation – Software effort Estimation

**UNIT III ACTIVITY PLANNING****9**

Objectives – Project Schedule – Sequencing and Scheduling Activities – Network Planning Models –Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management – Nature Of Risk – Types of Risk – Managing Risk – Hazard Identification –Hazard Analysis – Risk Planning and Control.

## **UNIT IV MONITORING AND CONTROL**

**9**

Resource allocation - identifying and scheduling resources – publishing resource and cost schedule – scheduling sequence - Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring– Earned Value – Priortizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

## **UNIT V MANAGING PEOPLE AND ORGANIZING TEAMS**

**9**

Introduction – Understanding Behavior – Organizational Behavior - Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team – Decision Making – Leadership – Organizational Structures –Stress – Health And Safety – Case Studies.

**Total: 45 hours**

### **TEXT BOOK**

1. Bob Hughes, Mikecotterell, “Software Project Management”, Tata McGraw Hill, Fifth Edition,,2010.

### **REFERENCES**

1. Ramesh, Gopaldaswamy, "Managing Global Projects", Tata McGraw Hill, 2006.
2. Royce, “Software Project Management”, Pearson Education, 2005.
3. Jalote, “Software Project Management in Practice”, Pearson Education, 2002.
4. Robert T. Futrell, Donald F. Shefer and Linda I. Shefer, “Quality Software Project Management”, Pearson Education, 2006.



**COURSE OUTCOMES**

At the end of the course, students will be able to

- Apply Agile principles to deliver software projects
- Utilize the scrum's emphasis on project management and self-organization
- Experiment user stories, story points, project velocity and visualization tools
- Design XP practices and pair programming practices for solving a given problem
- Use appropriate methods to ensure fast delivery of software

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	AGILE METHODOLOGIES														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	1	1	2	2	1	2	3	1	3
CO2	3	2	1	2	3	1	1	1	3	2	3	2	3	1	3
CO3	3	2	2	2	3	1	1	1	1	2	2	3	3	1	3
CO4	3	2	3	2	2	1	1	1	2	2	2	3	3	1	3
CO5	3	2	1	2	1	1	1	1	3	3	1	3	3	1	3

**UNIT I AGILE PRINCIPLES****9**

What is Agile? – Understanding the Agile Values – Silver Bullet Methodology – Agile to the Rescue – A fractured perspective - Agile Manifesto and Purpose behind each practice – Agile Elephant – Where to start with a new Methodology – 12 principles of Agile Software – The Customer is always Right – Delivering the project – Communicating and Working Together – Project Execution – Constantly improving the project and the team – Agile Project.

**UNIT II SCRUM AND SELF-ORGANIZING TEAMS****9**

Basic pattern for a Scrum Project – Rules of Scrum – Command-and-Control Team – Self-Organizing Teams – Scrum Values – Daily Scrum – Sprints, Planning and Retrospectives.

**UNIT III SCRUM PLANNING AND COLLECTIVE COMMITMENT****9**

User stories – Conditions of Satisfaction – Story Points and Velocity – Burndown Charts – Planning and Running a Sprint – GASP – Scrum Values Revisited – Practices Do Work Without the Values – Company Culture Compatible with Scrum Values.

## **UNIT IV XP AND INCREMENTAL DESIGN**

**9**

Primary Practices of XP – The XP values help the team change their mindset – An effective mindset starts with the XP values – Understanding the XP principles – Feedback Loops – Code and Design – Make Code and Design Decisions at the Last Responsible Moments – Incremental Design and the Holistic XP.

## **UNIT V LEAN, KANBAN AND AGILE COACH**

**9**

Lean Thinking – Commitment, Options Thinking and Set Based Development – Create Heroes and Magical Thinking – Eliminate Waste – Value Stream Map – Deliver As Fast As Possible – Visualize work in progress – Pull Systems – The Principles of Kanban – Improving Your Process with Kanban – Measure and Manage Flow – Little's Law – Emergent Behavior with Kanban – The Agile Coach – Shuhari – The Principles of Coaching.

**TOTAL: 45**

### **TEXT BOOK:**

1. Andrew Stellman & Jennifer Greene, "Learning Agile: Understanding Scrum, XP, Lean and Kanban", 1st Edition, O'Reilly Media Inc, 2015.

### **REFERENCES:**

1. Robert C. Martin, "Agile Software Development: Principles, Patterns, and Practices", Pearson Prentice Hall, 2011.
2. Eric Brechner, "Agile Project Management with Kanban", 1st Edition, Microsoft Press, 2015.

**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Develop the network applications using any high level programming language
- Configure and analyze network traffic using netstat, TCPDump, Wireshark and CISCO packet tracer tools
- Simulate the different network topologies using ns-2

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	COMPUTER NETWORKS LABORATORY														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	3
CO2	3	3	3	3	3	2	3	1	3	3	1	3	3	3	3
CO3	3	3	3	3	1	1	3	3	1	3	1	3	3	3	3

**LIST OF EXPERIMENTS:**

1. Simulation of HTTP protocol using TCP Socket.
2. Programs using TCP and UDP Sockets (like getting date and time from server, Chat application, etc...).
3. Programs using RMI.
4. Network analysis using TCP Dump, Netstat, Trace Route tools.
5. Simulating a simple LAN using CISCO Packet tracer.
6. Simulating an organization LAN with multiple subnets using CISCO Packet tracer.
7. Simulation of a web server based network using CISCO Packet tracer.
8. Simulation of smart home network with IoT devices using CISCO Packet tracer.
9. Network topology configuration using ns2.
10. Packet sniffing and traffic analysis using WIRESHARK.

**Total: 60 hours**

**COURSE OUTCOMES:**

**At the end of the course, students will be able to**

- Design and implement projects using OO concepts
- Use UML analysis and design diagrams in various applications
- Apply appropriate design patterns for the given scenarios

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	SOFTWARE DEVELOPMENT LABORATORY														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	3	3	2	2	2	2	2	3	3	3	3	3
CO2	1	2	3	3	3	2	1	2	3	2	2	3	3	3	1
CO3	1	2	1	2	2	2	1	2	2	2	3	2	2	2	2

**List of Exercises / Experiments:**

1. Define the problem statement
2. Identify use cases and develop business use case model (System use case diagram).
3. Identify the conceptual classes (boundary, controller and entity classes) and develop a domain model with UML Class diagram.
4. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
5. Draw the State Chart diagram and UML Activity diagram.
6. Develop Interface pattern.
7. Identify the User Interface and domain objects. Draw the UML package diagram.
8. Implement the User Interface (presentation) layer using thin client with HTML/Java/JSP/Servlet/PHP
9. Implement the Business layer (domain object) using JDBC adapter
10. Implement the Data layer using JDBC mapper

**TOTAL: 30**

**REFERENCES/MANUAL/SOFTWARE:**

1. IBM RAD
2. Java / Eclipse IDE/.Net Framework/Visual Studio Package

**COURSE OUTCOMES**

At the end of each unit, the students will be able to –

- Discuss the hardware and software architectures of embedded system.
- Develop embedded design using suitable RTOS objects.
- Discuss the architecture, memory and peripherals of 8051 microcontroller
- Develop the application based on 8051 using embedded C programs.
- Investigate the architecture of ARM processor and peripherals

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	EMBEDDED SYSTEM DESIGN														
	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	2	2	1	2	2	3	2	2	2
CO2	3	3	3	3	2	3	3	2	3	2	3	2	3	3	3
CO3	3	2	2	2	2	2	2	2	1	3	2	3	3	3	3
CO4	2	3	3	3	3	3	3	3	3	2	3	2	3	3	3
CO5	2	2	2	2	2	1	2	2	1	1	1	3	2	2	2

**UNIT I Architecture of Embedded Systems****9**

Introduction – Application Areas – Categories of Embedded System – Specialties of Embedded System – Recent Trends in Embedded System – Overview of Embedded System Architecture – Hardware Architecture – Software Architecture – Communication Software – Process of Generation of Executable Image – Development-Testing Tools.

**UNIT II Design of Embedded Systems****9**

Hardware design-Selection of processor-Software design- Implementation-Integration and testing-Types of testing-Types of Hardware Platforms-Hardware description of AVR microcontroller development and its features-Introduction to RTOS –Architecture of the kernel-Static and Dynamic Scheduling Algorithms

**UNIT III 8051 Microcontroller****9**

Introduction to Microprocessor – Microcontroller - Architecture of 8051 Microcontroller – signals – I/O ports – memory – counters and timers – serial data I/O – interrupts.

**UNIT IV Embedded 'C' programming in 8051****9**

Data types and time delay – I/O Programming - Logic Operations – Data conversion-Data serialization-Timer -Counter.

**UNIT V ARM Processor and Peripherals****9**

ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3 MCU.

**Total Hour 45****Text Book**

1. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 4<sup>th</sup> Edition —Morgan Kaufmann Publisher (An imprint from Elsevier), 2016
2. Mazidi,Mazidi & McKinlay, "8051 Microcontroller and Embedded System", Pearson New International Edition, 2<sup>nd</sup> Edition, 2014.
3. Steve Furber, "ARM System on Chip Architecture", Pearson Publications, 2<sup>nd</sup> Edition, 2015.

**REFERENCE BOOKS**

1. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dreamtech press, 2016
2. Raj Kamal "Embedded Systems Architecture Programming and Design" 2nd Edition TMH, 2010
3. Shibu K V, "Introduction to Embedded Systems", McGraw Hill, 2009.

Semester –V	U19GE501 : SOFT SKILLS AND APTITUDE - III	L	T	P	C	Marks
		0	0	2	1	100
<b>Course Outcomes</b>						
<b>At the end of the course the student will be able to:</b>						
1. Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches						
2. Solve problems of advanced levels than those in SSA-II in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests						
3. Demonstrate greater than SSA-II level of verbal aptitude skills in English with regard to given topics and score 70-75% marks in company-specific internal tests						
1.SOFT SKILLS	<b>Demonstrating soft-skill capabilities with reference to the following topics:</b>					
	<ul style="list-style-type: none"> <li>a. <b>Career planning:</b> Importance; Exploring various career options, Field research, Social media management; Process, benefits and limitations of career planning; Mapping SWOT and GOALS to career planning; Self-evaluation</li> <li>b. <b>Resume writing :</b> Build credentials and resume, Positioning yourself and your career, JD mapping, Video resume, Relevant resume phrases and components; Cover letter; Portfolio management and Social media cover</li> <li>c. <b>Group discussion :</b> Skills needed for GD; Frequently Asked topics and Practice; Types of topics; Various framework and tools to handle GD; Practice and assessment</li> <li>d. <b>Teamwork :</b> Definition and importance of team-building; Stages of team-building; Communication within a team; Various styles of teams and their analysis; Activities demonstrating a team</li> <li>e. <b>Leadership skills :</b> Role of a leader; Difference between a manager and a leader; Various Leadership styles; Compelling qualities of a leader; Famous leaders and their impact to the world; Self-assessment</li> <li>f. <b>Interview skills :</b> Process and types of interview; Appearance and grooming etiquette; Do's and Don'ts (Before – During interview); Brainstorming interview possible questions; Hot seat; Transactional Analysis for effective communication and handling interviewers; mock interviews and assessment parameters discussion</li> <li>g. <b>Mock interviews :</b> Frequently Asked Questions practice and assessment; Discussion and demonstrations on Stress and Technical interviews; Group interview</li> <li>h. <b>Mock GDs :</b> Frequently Asked Topics Practice; Assessment and feedback</li> </ul>					

<p><b>2. QUANTITATIVE APTITUDE AND LOGICAL REASONING</b></p>	<p><b>Solving problems with reference to the following topics :</b></p> <ul style="list-style-type: none"> <li>a. <b>Geometry:</b> 2D, 3D, Coordinate Geometry, and Height &amp; Distance.</li> <li>b. <b>Permutation &amp; Combinations :</b> Principles of counting, Circular Arrangements and Derangements.</li> <li>c. <b>Probability:</b> Addition &amp; Multiplication Theorems, Conditional Probability and Bayes Theorem.</li> <li>d. <b>Statistics :</b> Mean Median, Mode, Range and Standard Deviation.</li> <li>e. <b>Interest Calculation :</b> Simple Interest and Compound Interest</li> <li>f. <b>Crypto arithmetic:</b> Addition and Multiplication based problem.</li> <li>g. <b>Logical Reasoning :</b> Blood Relations, Directions Test, Series, Odd man out, Analogy, Coding &amp; Decoding, Problems and Input – Output Reasoning.</li> <li>h. Statement &amp; Assumptions, Statements &amp; Arguments, Inference.</li> <li>i. <b>Company Specific Pattern :</b> Infosys and TCS company specific problems</li> </ul>
<p><b>3. VERBAL APTITUDE</b></p>	<p><b>Demonstrating English language skills with reference to the following topics:</b></p> <ul style="list-style-type: none"> <li>a. Subject verb agreement</li> <li>b. Selecting the best alternative for the stated parts of given sentences</li> <li>c. Reading comprehension</li> <li>d. Contextual synonyms</li> <li>e. Sentence fillers</li> <li>f. Writing a story for a given picture</li> <li>g. Company specific aptitude questions</li> </ul>

*S. Anita*

**Dr.S.Anita**

**Head/Training**

**Department of Placement Training  
Sona College of Technology,  
Salem-636 005.**



**PREAMBLE**

The “Internet of Things” (IoT) is the network of physical objects or "things" embedded with sensors, actuators, software, electronics and network connectivity to enable it to achieve greater value and service by exchanging data between the physical world and computer systems over existing network infrastructure. By connecting everyday real world objects such as transports, buildings and industrial equipments, IoT guarantees to revolutionize how we live and work. In the year 2020, it is estimated that approximately 30 billion devices will be connected in IoT. IoT will drive new consumer and business behavior that will demand increasingly intelligent industry solutions. It can also help various industries like agriculture, health services, energy, security, disaster management etc., which need to automate solutions to problems faced through remotely connected devices.

The Internet of Things involves three distinct stages:

1. The sensors which collect data (including identification and addressing the sensor/device)
2. An application which collects and analyzes this data for further consolidation
3. Decision making and the transmission of data to the decision-making server. Analytical engines, actuators and Big data may be used for the decision making process.

After completing the course the students will attain the following,

- Ability to build real time IoT applications by interfacing the sensors with minimal programming.
- Ability to associate sensor networks and communication modules for building IoT systems.

**COURSE OUTCOMES:****At the end of the course the students will be able to**

- Recall characteristics, physical and logical designs, domains.
- Differentiate IoT and M2M and explain IoT design methodology.
- Describe the various IoT components.
- Design a portable IoT system using Arduino/Raspberry Pi.
- Discuss the various applications of IoT.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	3	1	2	2	2	1	2	2	2	3
CO2	3	2	3	3	3	2	2	3	3	3	2	3	3	3	3
CO3	3	2	2	3	2	2	3	2	3	3	3	3	3	3	3
CO4	3	3	2	2	1	2	2	2	3	3	3	3	3	3	3
CO5	3	2	3	3	2	3	2	1	3	3	3	3	3	3	3

**UNIT I FUNDAMENTALS OF IOT****9**

Introduction-Definition and Characteristics of IoT- Physical design- IoT Protocols-Logical design - IoT communication models, Iot Communication APIs- Enabling technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates - Domain specific IoTs.

**UNIT II M2M AND IOT DESIGN METHODOLOGY****9**

IoT and M2M- difference between IoT and M2M - Software defined networks, network function virtualization- Needs- IoT design methodology

**UNIT III IOT COMPONENTS****9**

Sensors and actuators - Communication modules - Zigbee- RFID-Wi-Fi-Power sources.

**UNIT IV BUILDING IOT WITH HARDWARE PLATFORMS****9**

Platform - Arduino/Raspberry Pi- Physical devices - Interfaces - Programming - APIs/Packages

**UNIT V CASE STUDY****9**

Various Real time applications of IoT- Home automation-Automatic lighting-Home intrusion detection-Cities-Smart parking-Environment-Weather monitoring system- Agriculture- Smart irrigation.

**TOTAL: 45 PERIODS**

**TEXT BOOK:**

1. Arshdeep Bahga, Vijay Madiseti, "Internet of Things-A hands-on approach", Universities Press, 2015.

**REFERENCES:**

1. Manoel Carlos Ramon, —Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers, Apress, 2014.

2. Marco Schwartz, —Internet of Things with the Arduino Yun, Packt Publishing, 2014.

3. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, Wiley Publications, 2012.

4. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things: Key applications and Protocols”, Wiley Publications 2nd edition , 2013.

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester VI Regulations 2019**  
**Branch: Computer Science and Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact hours
<b>Theory</b>							
1	U19CS914	<b>Elective-</b> Data Warehousing and Data Mining	3	0	0	3	45
	U19CS909	Machine Learning					
	U19CS908	Bigdata Analytics					
2	U19CS918	<b>Elective-</b> Cloud Computing	3	0	0	3	45
3	U19CS601	Principles of Compiler Design	3	0	0	3	45
4	U19CS602	Full Stack Development	2	0	1	3	45
5	U19CS603	Artificial Intelligence	3	0	0	3	45
<b>Open Elective</b>							
6	U19BM1001	Hospital Management	3	0	0	3	45
7	U19CE1001	Building Services And Safety Regulations					
8	U19CE1003	Energy Efficiency And Green Building					
9	U19EC1003	Sensors And Smart Structures Technologies					
10	U19EC1006	Mobile Technology And Its Applications					
11	U19EE1002	Energy Conservation And Management					
12	U19EE1003	Innovation, IPR and Entrepreneurship Development					
13	U19EE1004	Renewable Energy Systems					
14	U19FT1001	Fundamentals Of Fashion Design					
15	U19FT1002	Garment Manufacturing Technology					
16	U19MC1003	Smart Automation					
<b>Practical</b>							
17	U19CS604	Compiler Design Laboratory	0	0	4	2	60
18	U19CS605	Artificial Intelligence Laboratory	0	0	4	2	60
19	U19GE601	Soft Skills and Aptitude – IV	0	0	2	1	30
<b>Total Credits</b>						<b>23</b>	

**Approved By**

**Chairperson, Computer Science and Engineering BoS**

Dr.B.Sathiyabhama

**Member Secretary, Academic Council**

Dr.R.Shivakumar

**Chairperson, Academic Council & Principal**

Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Computer Science and Engineering, Sixth Semester BE CSE Students and Staff, COE

**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Comprehend the fundamental concepts of compilers
- Design and implement a lexical analyzer
- Design and analyze various top down and bottom up parsers
- Generate the Intermediate code using various syntax directed translation techniques
- Design and analyze code generation schemes and optimized compilers

<b>CO / PO, PSO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PS O2	PSO 3
CO1	2	2	2	3	3	1	1	3	2	2	1	3	3	3	3
CO2	2	2	3	3	3	2	1	3	2	2	1	3	3	3	3
CO3	3	3	3	3	3	1	1	3	2	2	2	3	3	3	3
CO4	2	3	3	3	3	1	1	3	2	2	1	3	3	3	3
CO5	3	3	3	3	3	1	2	3	2	2	1	3	3	3	3

**UNIT I INTRODUCTION TO COMPILERS 7**

Translators-Compilation and Interpretation - Language processors - The Phases of Compiler Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools.

**UNIT II LEXICAL ANALYSIS 9**

Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to a DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of a Lexical Analyzer for a sample Language.

### **UNIT III SYNTAX ANALYSIS**

**10**

Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies- Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser -LR (0)item Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for Sample Language

### **UNIT IV SYNTAX DIRECTED TRANSLATION & INTERMEDIATE CODE GENERATION**

**9**

Syntax Directed Definitions- Run-Time Environments- Storage Organization-Storage Allocation Strategies-Symbol Tables-Intermediate Code Generation – Intermediate languages – Declarations – Assignment Statements-Boolean expressions – Case statements- Backpatching - Procedure calls.

### **UNIT V CODE OPTIMIZATION AND CODE GENERATION**

**10**

Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis-Efficient Data Flow Algorithms-Issues in Design of a Code Generator - A Simple Code Generator Algorithm- Optimizing compilers for modern architecture

**Case Study:** Single pass and two pass compilers.

**Total: 45 hours**

### **TEXT BOOK**

1. Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, “Compilers – Principles, Techniques and Tools”, 2nd Edition, Pearson Education, 2014.

### **REFERENCES**

1. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: Dependence-based Approach”, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, “Advanced Compiler Design and Implementation”, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
3. Keith D Cooper and Linda Torczon, “Engineering a Compiler”, Morgan Kaufmann Publishers Elsevier Science, 2004.
4. Charles N. Fischer, Richard. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education, 2008.
4. Kenneth C. Loude , "Compiler Construction Principles and Practice", Cengage Learning, 1997

## COURSE OUTCOMES

At the end of the course, students will be able to

- Comprehend the basics of JavaScript and importance of MERN stack
- Apply the role of React in designing front-end components
- Analyze the design issues in the development of backend components using Node.js and Express
- Develop program using MongoDB as a database system
- Understand the advanced features of full stack development

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PS O2	PSO 3
CO1	3	3	3	1	3	3	3	3	1	3	2	3	3	3	3
CO2	3	2	3	1	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	1	3	3	3	2	2	3	2	3	3	3	3
CO4	3	3	3	2	3	3	3	2	2	3	2	3	3	3	3
CO5	3	3	3	2	3	3	3	2	2	3	2	3	3	3	3

### UNIT I

### JAVASCRIPT AND BASICS OF MERN STACK

9

JavaScript Fundamentals - Objects - Generators, advanced iteration – Modules- DOM tree-Node properties - browser events - Event delegation - UI Events -Forms, controls - Document and resource loading - Mutation observer - Event loop: micro-tasks and macro- tasks - MERN Components- React - Node.js - Express - MongoDB - Need for MERN - Server- Less Hello World - Server Setup- npm - Node.js - npm.

### UNIT II

### REACT

9

React Introduction - React ES6 - React Render HTML - React JSX - Components -React Classes -Composing Components - Passing Data - Dynamic Composition - React state - setting State –AsyncState Initialization - Event Handling Communicating from Child to Parent - Stateless Components -Designing components- React Forms - React CSS - React SaaS





**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Design an intelligent agent by considering the nature of environment and applications
- Apply suitable search technique to solve the real world problems
- Create knowledge base for any application using propositional/first order logic
- Design multi agent system for any real time application
- Develop a communicative agent for NLP application

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
<b>COs</b>	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO9</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>PSO 1</b>	<b>PS O2</b>	<b>PSO 3</b>
CO1	3	3	3	2	1	2	2	2	2	2	2	2	2	3	3
CO2	3	3	3	2	2	2	1	1	2	2	1	3	2	3	3
CO3	3	3	3	2	2	1	2	2	2	1	2	2	2	3	3
CO4	3	3	3	2	2	2	2	2	2	3	3	3	2	3	3
CO5	3	3	3	2	2	1	2	3	2	1	3	1	2	3	3

**UNIT I INTRODUCTION 9**

Introduction to Artificial Intelligence-The Foundations of Artificial Intelligence - The History of Artificial Intelligence-Intelligent Agents: Agents and Environments-The Concept of Rationality-The Nature of Environments-The Structure of Agents- Problem-Solving Agents- Example problems.

**UNIT II PROBLEM SOLVING USING SEARCH TECHNIQUES 9**

Uninformed Search Strategies- Avoiding Repeated States- Searching with Partial Information- Informed Search and Exploration: Informed (Heuristic) Search Strategies- Heuristic Functions- Local Search Algorithms and Optimization Problems- Constraint Satisfaction problems-Adversarial search- minimax algorithm- Alpha-Beta pruning.

**UNIT III KNOWLEDGE AND REASONING 9**

Knowledge-Based agents – Logic –Propositional logic – First order logic-Representation – Syntax and semantics – Knowledge engineering – Inference in First order logic- Unification and lifting- Forward and backward chaining- Resolution- learning Agents-Different forms of Learning.

## **UNIT IV SOFTWARE AGENTS**

**9**

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems, Tools to implement MAS.

## **UNIT V COMMUNICATION AND APPLICATIONS OF AI**

**9**

Communication: Phrase Structure Grammars - A Formal Grammar for a Fragment of English- Syntactic Analysis (Parsing) – Augmented Grammar and Semantic Interpretation - Machine translation –Speech recognition.- Robot – Hardware – Perception – Planning – Moving - Tool for Artificial Intelligence -Tensor flow and IBM Watson.

**Total: 45 hours**

### **TEXT BOOK**

1. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Prentice Hall, 2015.

### **REFERENCES**

1. Elaine Rich, Kevin Knight, Shiva Shankar B. Nair , "Artificial Intelligence", McGraw Hill, 2017
2. Nils J. Nilsson, “Artificial Intelligence: A New Synthesis”, Harcourt Asia Pvt. Ltd., 2009.
3. George F. Luger, “Artificial Intelligence-Structures and Strategies for Complex Problem Solving”, Pearson Education, 2009.
4. Gerhard Weiss, —Multi Agent Systems, Second Edition, MIT Press, 2013.
5. Michael Wooldridge, "An Introduction to Multi Agent Systems", John & Wiley , 2009

**COURSE OUTCOMES**

At the end of the course, students will be able to

- Construct NFA and minimized DFA from a given regular expression using C program
- Use LEX and YACC tool to implement a lexical analyzer and parser for the grammar
- Generate a code for a given intermediate code

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
<b>COs</b>	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO9</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>PSO 1</b>	<b>PS O2</b>	<b>PSO 3</b>
CO1	2	3	3	3	3	2	1	3	2	3	3	3	3	3	3
CO2	2	3	3	3	3	2	1	3	2	3	3	3	3	3	3
CO3	2	3	3	3	3	2	1	3	2	3	3	3	3	3	3

**LIST OF EXPERIMENTS:**

1. Construction of NFA.
2. Construction of minimized DFA from a given regular expression.
3. Use LEX tool to implement a lexical analyzer.
4. Use YACC and LEX to implement a parser for the grammar.
5. Implement a recursive descent parsing.
6. Construction of operator precedence parse table.
7. Implementation of symbol tables.
8. Implementation of shift reduced parsing algorithms.
9. Construction of LR parsing table.
10. Generation of code for a given intermediate code.
11. Implementation of code optimization techniques.

**Total: 60 hours**

**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Design heuristics and apply different search techniques in game playing and problem solving
- Create knowledge base using Predicate logic
- Apply knowledge representation and natural Language processing concepts in implementing chat bot applications and semantic search

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
<b>COs</b>	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO9</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>PSO 1</b>	<b>PS O2</b>	<b>PSO 3</b>
CO1	3	3	3	2	3	2	2	1	2	2	3	3	2	3	3
CO2	3	3	3	3	3	2	2	2	2	3	2	2	2	3	3
CO3	3	3	3	2	3	3	3	3	2	2	1	2	2	3	3

**LIST OF EXPERIMENTS:**

**(Java/Python for Ex.1-7 and any chat bot creator platform such as wit.ai, IBM Watson, Botsify, etc... for Ex.8)**

1. Implement state space search using the following algorithms:
  - i. Hill climbing algorithm
  - ii. A\* Algorithm
2. Adversarial search and Game Playing.
3. Creating rule base and infer the proof using First order Predicate logic.
4. Solving n-Queen’s problem.
5. Solving travelling salesman problem
6. Develop Multi agent system for a real time problem.
7. Information retrieval using semantic search.
8. Designing a Chat bot application.

**Total: 60 hours**

**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Compare different types of Big Data
- Comprehend Data Science fundamentals
- Design and develop simple applications using Hadoop and MapReduce
- Write queries using NoSQL Databases
- Design applications using Hive and Pig Databases

<b>CO / PO, PSO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	2	1	1	2	2	1	1	3	2	1
CO2	3	2	1	2	3	1	1	1	2	2	1	2	2	2	1
CO3	2	2	2	1	2	3	1	2	2	1	2	1	3	2	2
CO4	3	2	1	2	2	2	1	3	2	1	2	1	3	2	2
CO5	3	2	1	2	2	2	1	3	3	1	2	1	3	2	2

**UNIT I INTRODUCTION TO BIG DATA****9**

Classification of Digital Data - Characteristics of Data - Evolution of Big Data, Definition of Big Data - Challenges with Big Data - Characteristics of Big Data - Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment - A Typical Hadoop Environment.

**UNIT II DATA SCIENCE FUNDAMENTALS****9**

Big Data Analytics - Classification of Analytics - Challenges in Big Data - Technologies to handle Challenges Posed by Big Data - Data Science - Data Scientist, Terminologies Used in Big Data Environments - Basically Available Soft State Eventual Consistency (BASE) - Few Top Analytics Tools.

**UNIT III HADOOP****9**

Introduction to Hadoop - RDBMS versus Hadoop, Distributed Computing Challenges - History of Hadoop - Hadoop Overview - Use Case of Hadoop ,Hadoop Distributors - HDFS (Hadoop Distributed File System) - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator) - Interacting with Hadoop Ecosystem - MapReduce Programming.

Cassandra: Apache Cassandra Introduction - Features of Cassandra - CQL Data types, CQLSH - Keyspaces - CRUD (Create, Read, Update and Delete) Operations – Collections - Alter Commands - Import and Export - Querying System Tables - Practice Examples.

MongoDB: Introduction - Terms Used in RDBMS and MongoDB - Data Types in MongoDB - MongoDB Query Language.

**UNIT V HIVE AND PIG**

Hive: Introduction to Hive - Hive Architecture - Hive Data Types - Hive File Format - Hive Query Language (HQL) - RCFile Implementation – SerDe - User-defined Function (UDF).

Pig: Introduction to Pig - The Anatomy of Pig - Pig on Hadoop - Pig Philosophy - Use Case for Pig: ETL Processing - Pig Latin Overview - Data Types in Pig - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions (UDF) - Parameter Substitution - Diagnostic Operator - Word Count Example using Pig, Pig versus Hive.

**TEXT BOOK**

1. Seema Acharya, Subhashini Chellapan, “Big Data and Analytics”, 2<sup>nd</sup> edition, Wiley, 2020.

**REFERENCES**

1. Hadoop in Practice, Alex Holmes, Manning Publications Co., September 2014, Second Edition, 2014
2. Programming Pig, Alan Gates, O’Reilly, Kindle Publication
3. Programming Hive, Dean Wampler, O’Reilly, Kindle Publication

**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Comprehend the machine learning concepts
- Construct probabilistic, discriminative and generative models for real-time applications
- Apply typical clustering algorithms for different types of applications
- Build graphical models for real-time applications
- Design advanced machine learning models

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
COs	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	2	2	1	2	2	1	1	1	2	3
CO2	2	2	2	3	2	3	1	1	2	2	-	2	2	3	2
CO3	3	3	3	3	3	3	1	1	2	1	2	2	3	3	3
CO4	3	3	3	3	3	2	1	1	2	1	2	2	2	3	3
CO5	3	3	3	2	3	2	2	1	-	2	1	2	1	1	1

**UNIT I INTRODUCTION****9**

Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Weight Space – Testing Machine Learning Algorithms – A Brief Review of Probability Theory – Turning Data into Probabilities – The Bias-Variance Trade off.

**UNIT II SUPERVISED LEARNING****9**

Linear Models for Regression – Linear Basis Function Models – The Bias-Variance Decomposition – Bayesian Linear Regression – Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression – Linear Models for Classification – Discriminant Functions – Probabilistic Generative Models – Probabilistic Discriminative Models – Laplace Approximation – Bayesian Logistic Regression – Common Classification Algorithms – k-Nearest Neighbors – Decision Trees – Random Forest model – Support Vector Machines.

**UNIT III UNSUPERVISED LEARNING****9**

Mixture Models and EM – K-Means Clustering – Dirichlet Process Mixture Models – Spectral Clustering – Hierarchical Clustering – The Curse of Dimensionality – Dimensionality Reduction – Principal Component Analysis – Latent Variable Models(LVM) – Latent Dirichlet Allocation (LDA).

**UNIT IV GRAPHICAL MODELS****9**

Bayesian Networks – Conditional Independence – Markov Random Fields – Learning – Naive Bayes Classifiers – Markov Model – Hidden Markov Model.

**UNIT V ADVANCED LEARNING****9**

Reinforcement Learning – Representation Learning – Neural Networks – Active Learning – Ensemble Learning – Bootstrap Aggregation – Boosting – Gradient Boosting Machines – Deep Learning.

**Total: 45 hours****TEXT BOOK**

1. Ethem Alpaydin, “Introduction to Machine Learning”, Third Edition, Prentice Hall of India, 2015.

**REFERENCES**

1. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006.
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition, CRC Press, 2014.
4. Tom Mitchell, “Machine Learning”, McGraw-Hill, 2017.
5. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning”, Second Edition, Springer, 2008.
6. Fabio Nelli, “Python Data Analytics with Pandas, Numpy, and Matplotlib”, Second Edition, Apress, 2018.



**COURSE OUTCOMES**

**At the end of the course, students will be able to**

- Describe OLAP operations to query processing in data mining and evolve multidimensional models from a typical system
- Apply preprocessing techniques to improve the data quality
- Extract the knowledge from the high dimensional system using different classification methods
- Apply clustering to discover the hidden interesting patterns from massive data using various data mining tasks
- Apply various mining techniques to the web and text

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
COs	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	2	1	3	1	1	3	1	1	1
CO2	3	3	3	3	2	3	3	1	3	2	3	3	3	3	3
CO3	3	3	3	3	1	1	2	1	3	1	3	3	3	3	3
CO4	3	3	3	3	3	2	2	1	3	1	3	3	3	3	3
CO5	3	3	3	3	3	3	3	1	3	2	3	3	3	3	3

**UNIT I DATA WAREHOUSE PROCESS AND ARCHITECTURE****9**

Evolution of Decision Support Systems—Building a Data warehouse- Data Warehouse and DBMS, Data marts, Metadata, Multidimensional data model, OLAP operations, Data cubes, Schemas for Multidimensional Database: Stars, Snowflakes and Fact constellations. Types of OLAP servers, 3-Tier data warehouse architecture, distributed and virtual data warehouses. Data warehouse implementation – Introduction to business intelligence- BI tools.

**UNIT II INTRODUCTION TO DATA MINING CONCEPTS****9**

Data mining - KDD versus data mining, Stages of the Data Mining Process-task primitives, Data Mining Techniques - Data mining knowledge representation – Data mining query languages, Issues, Data preprocessing – Data cleaning, Integration ,transformation and reduction, Discretization and generating concept hierarchies, Data Generalization And Summarization Based Characterization - Mining frequent patterns- association-correlation - Installation of WEKA tool, Experiments with Weka - filters, discretization.

### **UNIT III CLASSIFICATION AND PREDICTION**

**9**

Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation - Lazy Learners – Other Classification Methods- Prediction - Evaluating classifier accuracy- Ensemble methods. Experiments with Weka generating rule and decision tree.

### **UNIT IV CLUSTERING**

**9**

Clustering techniques – Partitioning methods- k-means- Hierarchical Methods – distance based agglomerative and divisible clustering – expectation maximization -Grid Based Methods – Model-Based Clustering Methods – Constraint based Cluster Analysis – Outlier Analysis - Experiments with Weka – k-means and EM.

### **UNIT V DATA WAREHOUSING AND DATA MINING APPLICATIONS**

**9**

Mining complex data objects, Spatial databases, temporal databases, Multimedia databases, Time series and Sequence data; Text Mining – Graph mining - web mining - Application and trends in data mining.

**Total: 45 hours**

### **TEXT BOOK**

1. Jiawei Han and Micheline Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers, third edition 2011, ISBN: 1558604898.

### **REFERENCES**

1. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman,” Mining of Massive Datasets”, Cambridge University Press; 3rd edition, February 13, 2020.
2. Mehmed kantardzic,“Datamining concepts, models, methods, and algorithms”, Wiley Interscience, 2003.
3. Ian Witten, Eibe Frank, “Data Mining; Practical Machine Learning Tools and Techniques”, Third edition, Morgan Kaufmann, 2011.
4. George M Marakas, “Modern Data Warehousing, Mining and Visualization”, Prentice Hall,2003.
5. Alex Berson and Stephen J. Smith, “ Data Warehousing, Data Mining & OLAP”, TataMc Graw Hill Edition, Tenth Reprint 2007.
6. G. K. Gupta, “Introduction to Data Min Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
7. [www.cs.waikato.ac.nz/ml/weka/](http://www.cs.waikato.ac.nz/ml/weka/)

**COURSE OUTCOMES**

At the end of the course, students will be able to

- Identify the suitable cloud computing model and services for the given application
- Understand the role of virtualization in cloud computing
- Deploy private and public cloud in real-time environment
- Analyze various threats and risks associated with cloud security
- Evaluate the challenges involved in migrating to cloud

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
COs	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	3	3	3	3	3	3	2	3	3	3
CO2	2	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CO3	3	2	3	3	3	2	2	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	2	2	3	3	2	2	3	3	2	2
CO5	3	3	2	3	3	3	3	3	2	3	3	3	3	2	2

**UNIT I OVERVIEW OF CLOUD COMPUTING****8**

Brief history and evolution - History of Cloud Computing, Evolution of Cloud Computing, Traditional vs. Cloud Computing - Why Cloud Computing, Cloud service models (IaaS, PaaS & SaaS). Cloud deployment models (Public, Private, Hybrid and Community Cloud), Benefits and Challenges of Cloud Computing - Introduction to AWS Public Cloud Vendor.

**UNIT II VIRTUALIZATION****8**

Basics of virtualization, Server virtualization, VM migration techniques, Role of virtualization in Cloud Computing - Container and Container Orchestration in Virtualization – Overview on Dockers – Kubernetes.

**UNIT III WORKING WITH PRIVATE AND PUBLIC CLOUDS****10**

Private Cloud Definition - Characteristics of Private Cloud - Private Cloud deployment models, Private Cloud Vendors – CloudStack - Eucalyptus and Microsoft Private Cloud – Benefits and Challenges - Private Cloud implementation in Amazon EC2 service

What is Public Cloud - Why Public Cloud - When to opt for Public Cloud - Public Cloud Service Models and Public Cloud Vendors and offerings ( IaaS, PaaS, SaaS) - Demonstrating public cloud with AWS - Introduction to EC2 and Storage services of AWS - Private vs. Public Cloud – When to choose.

#### **UNIT IV OVERVIEW OF CLOUD SECURITY**

**10**

Explain the security concerns in Traditional IT - Introduce challenges in Cloud Computing in terms of Application Security - Server Security and Network Security - Security reference model - Abuse and Nefarious Use of Cloud Computing - Insecure Interfaces and APIs - Malicious Insiders - Shared Technology Issues - Data Loss or Leakage - Account or Service Hijacking - Unknown Risk Profile - Shared security model between vendor and customer in IAAS/PAAS/SAAS - Implementing security in AWS.

#### **UNIT V FUTURE DIRECTIONS IN CLOUD COMPUTING**

**9**

When and not to migrate to Cloud - Migration paths for cloud - Selection criteria for cloud deployment - Issues/risks in cloud computing - Future technology trends in Cloud Computing – Overview on osmotic computing.

**Total: 45 hours**

#### **TEXT BOOKS**

1. Cloud Computing: Principles and paradigms By Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, 2011

#### **REFERENCES**

1. Cloud computing: Implementation, management and security By Rittinghouse, John, W., CRC Press,2009
2. Cloud Computing Bible, By Barrie Sosinsky, Wiley, 2011
3. Cloud Computing and Virtualization, Dac-Nhuong Le, Raghvendra Kumar, John Wiley & Sons, 2018
4. Cloud Computing Architected: Solution Design Handbook by Rhoton, John,2013
5. Cloud Security, A comprehensive Guide to Secure Cloud Computing by Krutz, Ronald L.; Vines, Russell Dean, Wiley,2010

Semester –VI	U19GE601-SOFT SKILLS AND APTITUDE – IV (Common to All except Civil)	L	T	P	C	Marks
		0	0	2	1	100
<b>Course Outcomes</b>						
<b>At the end of the course the student will be able to:</b>						
1. Demonstrate capabilities in job-oriented company selection processes using the hands-on approach						
2. Solve problems of any given level of complexity in all areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests						
3. Demonstrate advanced-level verbal aptitude skills in English and score 70-75% marks in company-specific internal tests						
<b>1. Soft Skills</b>	<b>Demonstrating Soft -Skills capabilities with reference to the following topics:</b>					
	a. Mock group discussions					
	b. Mock interviews					
	c. Mock stress interviews					
<b>2. Quantitative Aptitude and Logical Reasoning</b>	<b>Solving problems with reference to the following topics:</b>					
	a. Functions and Polynomials					
	b. Clocks and Calendars					
	c. Data Sufficiency: Introductions, 3 Options Data Sufficiency, 4 Options Data Sufficiency and 5 Options Data Sufficiency.					
	d. Logical reasoning: Cubes, Non Verbal reasoning and Symbol based Reasoning.					
	e. Decision making table and Flowchart					
	Campus recruitment papers: Solving of previous year questions paper of all major recruiters					
	f. Miscellaneous: Cognitive gaming Puzzles-(Picture, Word and Number based), IQ Puzzles, Calculation Techniques and Time Management Strategies.					
	g. Trigonometry.- Concepts					
<b>3. Verbal Aptitude</b>	<b>Demonstrating English language skills with reference to the following topics:</b>					
	a. Writing captions for given pictures					
	b. Reading comprehension					
	c. Critical reasoning					
	d. Theme detection					
	e. Jumbled sentences					
	f. Writing a story on given pictures					
	g. Company specific verbal questions					

  
Dr.S.Anita

Head/Training

Department of Placement Training  
Sree College of Technology

**COURSE OUTCOMES:**

**At the end of the course the students will be able to**

- Compare and analyze different types of digital data characteristics of Big Data
- Implement programs using Hadoop open source software framework
- Design and develop programs using NoSQL Databases like Mongo DB and Cassandra
- Apply MapReduce programming for various big data based problems.
- Implement programs using Hive and Pig Databases

<b>CO / PO, PSO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	2	0	1	0	2	1	2	2	2
CO2	2	1	2	2	3	2	0	1	1	2	2	2	2	2
CO3	2	1	2	3	3	2	1	1	1	2	3	2	2	3
CO4	3	1	2	3	3	2	0	1	0	2	3	2	2	3
CO5	2	2	3	3	3	1	0	1	0	2	3	2	3	3

**UNIT I INTRODUCTION TO BIG DATA**

**9**

Types of Digital Data: Classification of Digital Data Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, Characteristics of Big Data ,Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment , A Typical Hadoop Environment.

**UNIT II BIG DATA ANALYTICS**

**9**

Introduction -Big Data Analytics, Classification of Analytics, Challenges in Big Data, Technologies to handle Challenges Posed by Big Data- Data Science- Data Scientist, Terminologies Used in Big Data Environments, Basically Available Soft State Eventual Consistency (BASE), Few Top Analytics Tools.

**UNIT III HADOOP**

**9**

Introduction Hadoop, RDBMS versus Hadoop, Distributed Computing Challenges ,History of Hadoop , Hadoop Overview, Use Case of Hadoop ,Hadoop Distributors ,HDFS (Hadoop Distributed File System),Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator),Interacting with Hadoop Ecosystem, MapReduce Programming -Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression

#### **UNIT IV NO SQL DATABASES**

**9**

Cassandra :Apache Cassandra - An Introduction , Features of Cassandra, CQL Data types, CQLSH, Keyspaces, CRUD (Create, Read, Update and Delete) Operations, Collections, Using a Counter, Time to Live (TTL), Alter Commands, Import and Export, Querying System Tables, Practice Examples- MongoDB, Terms Used in RDBMS and MongoDB, Data Types in MongoDB , MongoDB Query Language

#### **UNIT V HIVE AND PIG**

**9**

**Hive:** Introduction to Hive, Hive Architecture, Hive Data Types, Hive File Format, Hive Query Language (HQL), RCFile Implementation, SerDe, User-defined Function(UDF).

**Pig:** Introduction to Pig, The Anatomy of Pig, Pig on Hadoop , Pig Philosophy, Use Case for Pig: ETL Processing, Pig Latin Overview , Data Types in Pig ,Running Pig , Execution Modes of Pig ,HDFS Commands ,Relational Operators ,Eval Function ,Complex Data Types ,Piggy Bank, User-Defined Functions (UDF) ,Parameter Substitution , Diagnostic Operator , Word Count Example using Pig,Pig versus Hive

**Total: 45 hours**

#### **TEXT BOOKS:**

1. **Big Data and Analytics**, Seema Acharya, Subhashini Chellappan, Infosys Limited, Publication: Wiley India Private Limited,1st Edition 2015(Chapters 1,2,3,4,5,6,7,8,9,10)

#### **REFERENCE BOOKS:**

1. **Hadoop in Practice**, Alex Holmes, Manning Publications Co., September 2014, Second Edition.
2. **Programming Pig**, Alan Gates, O'Reilly, Kindle Publication.
3. **Programming Hive**, Dean Wampler, O'Reilly, Kindle Publication.

**COURSE OUTCOMES:****At the end of the course the students will be able to**

1. Provide an overview of cloud computing
2. Explain the various tasks in developing cloud services
3. Analyze the provision of cloud computing services to different users
4. Configure the various cloud services according to the environment.
5. Analyze various ways to collaborate online

<b>CO / PO, PSO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	2	1	2	0	1	0	2	1	2	2	2
CO2	2	1	2	3	3	2	0	1	1	2	2	3	3	3
CO3	2	1	3	3	3	2	0	1	0	3	3	2	3	3
CO4	2	1	2	3	3	2	0	1	0	2	3	3	3	3
CO5	2	2	3	3	3	1	0	1	0	2	3	2	3	3

**UNIT I Understanding Cloud Computing****6**

Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services

**UNIT II Developing Cloud Services****10**

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon – Google App Engine – IBM Clouds

**UNIT III Cloud Computing for Everyone****10**

Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation

**UNIT IV Using Cloud Services****10**

Collaborating on Calendars, Schedules and Task Management – Exploring Online Calendar Applications- Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Spread sheets- Collaborating on Databases – Storing and Sharing Files



## **UNIT V Other Ways to Collaborate Online**

**9**

Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis

**Total: 45 hours**

### **TEXT BOOK:**

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.

### **REFERENCE BOOK:**

1. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

**Preamble**

- Learn about the need for data science, with emphasis on data; Visualization in data science and engineering processes; various application of data science

**COURSE OUTCOMES****At the end of the course the students will be able to**

- Comprehend Data science process
- Write R Programs for simple application
- Apply descriptive statistics to describe various features of data
- Perform exploratory data analysis for different models
- Implement Statistical models for real time application

<b>CO / PO, PSO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	0	0	2	0	1	0	2	1	2	1	1
CO2	2	2	2	2	2	2	1	1	1	2	2	3	2	3
CO3	2	2	2	3	2	2	0	1	0	3	2	2	3	2
CO4	2	1	2	3	3	2	1	1	0	2	2	3	2	2
CO5	2	2	2	3	3	1	0	1	0	2	2	2	3	3

**UNIT I INTRODUCTION TO DATA SCIENCE**

9

What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication  
 - Current landscape of perspectives - Skill sets needed -Data science project – Defining the goal - Data collection and management - Modeling - Model evaluation and critique - Presentation and documentation - Model deployment and maintenance

**UNIT II INTRODUCTION TO R**

9

R objects and Classes: Vector – List – Factor – Matrix – Array – Dataframe – Manipulating Objects – Input/output - R Constructs – Functions in R – Charts and Graphs – Hands on practice in R – libraries – datasets in R

**UNIT III DESCRIPTIVE STATISTICS**

10

Central tendency – Mean, Median, Mode – Measure of Dispersion: Variance, Standard deviation – Measure of Shape- Skewness, Kurtosis, Percentile – Association analysis: Covariance, Correlation, Types of Correlation: Pearson Correlation, Spearman Correlation, Kendall Correlation -Populations and samples - Statistical modeling, probability distributions, fitting a model

## **UNIT IV EXPLORATORY DATA ANALYSIS**

**9**

Visualization before analysis – Dirty data – Visualizing a single variable – Examining multiple variable – Data exploration Vs. Presentation - Hypothesis testing – Difference of means – Wilcoxon Rank-Sum test – Type I and Type II errors – Power and Sample size and ANOVA

## **UNIT V CASE STUDY**

**8**

Clustering - clustering Iris data - Classification - classifying personal income - Regression - Predicting price of pre-owned cars

**Total: 45 Hours**

### **Text Book**

1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014
2. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, “Practical Data Science Cookbook”, Packt Publishing Ltd., 2014

### **Reference**

1. Noreen Burlingame and Lars Nielsen, “A Simple Introduction to DATA SCIENCE”, 2012.
2. Mark Gardener, “Beginning R - The Statistical Programming Language”, John Wiley & Sons, Inc., 2012.
3. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.
4. <http://bigdatauniversity.com>
5. [http://www.johndcook.com/R\\_language\\_for\\_programmers.html](http://www.johndcook.com/R_language_for_programmers.html)

**COURSE OUTCOMES**

At the end of the course the students will be able to

- Explain development framework and the need for mobile applications.
- Develop apps that use Android’s messaging, multitasking, connectivity and media services to design full-featured apps primarily for mobile devices.
- Create applications with clean, effective user interfaces that take advantage of Android’s rich UI frameworks.
- Leverage Android’s effective frameworks and techniques to perform or schedule data retrieval/storage efficiently in a mobile environment.
- Understand the debugging tools in Android Studio and test the execution of a running program to create more reliable and robust apps.

<b>CO / PO, PSO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	1	2	1	2	2	2	1	2	2	2	3
CO2	3	3	2	3	3	2	2	3	3	3	2	3	3	3	3
CO3	3	3	3	3	3	2	3	1	2	3	3	2	3	3	3
CO4	2	3	2	3	3	2	1	1	3	3	3	3	3	3	3
CO5	2	3	3	3	3	1	2	3	2	3	3	2	3	3	3

**UNIT I INTRODUCTION****9**

Android: An Open Platform for Mobile Development– Android SDK Features- Introducing the development framework - Standard development environment for Android applications – Creating Your First Android Application – Types of Android Application- Android Development Tools

**UNIT II ANDROID CORE****9**

Android Basic Building Blocks - Toast or Snackbar – Notifications – localize an app – Job Scheduler - Android Application Lifecycle – Activities and their lifecycle

**UNIT III USER INTERFACE****9**

Introducing Layouts - Intents - Fundamental Android UI Design - Custom View – RecyclerView – Menu based navigation – Drawer navigation

**UNIT IV DATA MANAGEMENT****9**

Introducing Adapters - Shared Preferences – Working with the file systems: Reading/writing local data, accessing the Internal File system, Accessing SD card - Introducing Android Databases- Introducing SQLite- Content Values and Cursors- Working with SQLite Databases

## **UNIT V DEBUGGING AND TESTING**

**9**

Debugging in Android studio – Fixing issues in Android - fundamentals of testing - JUnit tests - Espresso UI - writing useful automated Android tests - Monetizing, Promoting, and Distributing Applications

**Total: 45 hour**

### **TEXT BOOK**

1. Reto Meier, "Professional Android Application Development", 4<sup>th</sup> Edition, Wiley, 2014
2. <https://developers.google.com/certification/associate-android-developer/study-guide/>

### **REFERENCE**

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester VII under Regulations 2019**  
**Branch: Computer Science and Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
<b>Theory</b>							
1	U19CS701	Blockchain Technologies	3	0	0	3	45
2	U19CS702	Cryptography	3	0	0	3	45
3	U19CS703	Internet of Things	3	0	0	3	45
4	U19CS925	<b>Professional Elective</b> : Web Development	3	0	0	3	45
	U19CS934	<b>Professional Elective</b> : Cyber Law and Ethics					
5	U19GE702	<b>Professional Elective</b> : Professional Readiness for Innovation Employability and Entrepreneurship	0	0	6	3	90
6		<b>Open Elective</b>	3	0	0	3	45
	U19CE1004	Disaster Management					
	U19EE1004	Renewable Energy Systems					
	U19EE1003	Innovation, IPR and Entrepreneurship Development					
	U19FT1001	Fundamentals of Fashion Design					
	U19FT1002	Garment Manufacturing Technology					
	U19EC1002	Embedded and Real Time Systems					
	U19EC1001	Biomedical Instrumentation And Measurements					
	U19EE1005	Electrification In Building Construction					
	U19EE1001	Electric Mobility					
	U19EC1005	Signal and Image Processing					
	U19MC1004	Fundamentals of Robotics					
	U19MC1003	Smart Automation					
	U19EE1002	Energy Conservation and Management					
U19EC1003	Sensors and Smart Structures Technologies						



**COURSE OUTCOMES**

At the end of the course, the student should be able to

- Comprehend the basic principles of network security and analyze the various classical encryption techniques
- Compare the performance of different symmetric key encryption algorithms
- Analyze the working of different public key cryptographic algorithms
- Analyze the applications of message authentication and integrity schemes in network security
- Examine the different specific security applications

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
<b>COs</b>	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>P09</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
CO1	3	3	2	2	1	2	1	2	2	2	3	3	1	2	3
CO2	3	3	2	2	2	2	1	2	2	2	3	3	1	2	3
CO3	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3
CO4	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3
CO5	3	3	2	2	2	2	1	2	2	2	3	3	3	2	3

**UNIT I INTRODUCTION****9**

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

**UNIT II SYMMETRIC KEY CRYPTOGRAPHY****9**

Mathematics Of Symmetric Key Cryptography: Algebraic structures – Modular arithmetic-Euclid's algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard .



**UNIT III PUBLIC KEY CRYPTOGRAPHY****9**

Mathematics of Asymmetric Key Cryptography: Primes – Primality Testing –Factorization – Euler’s totient function, Fermat’s and Euler’s Theorem - Chinese Remainder Theorem – Exponentiation and logarithm – Asymmetric Key Ciphers: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange -ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.

**UNIT IV MESSAGE AUTHENTICATION AND INTEGRITY****9**

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications – Kerberos-X.509.

**UNIT V SECURITY PRACTICE AND SYSTEM SECURITY****9**

Electronic Mail security – PGP, S/MIME – IP security – Web Security – SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls.

**Total: 45 hours****TEXT BOOK**

1. William Stallings, “Cryptography and Network Security: Principles and Practice”, Pearson Ed, 7<sup>th</sup> Edition, 2017.

**REFERENCES**

1. Behrouz A. Ferouzan, “Cryptography and Network Security”, Tata McGraw Hill, 3<sup>rd</sup> Edition, 2015.
2. Hans Delfs, Helmut Knebl,” Introduction to Cryptography: Principles and Applications”,Springer Nature,3<sup>rd</sup> Edition,2015
3. Richard A. Mollin,” An Introduction to Cryptography”, Chapman and Hall/CRC,2<sup>nd</sup> Edition,2006
4. Charlie Kaufman, Radia Perlman, and Mike Speciner, “Network Security: PRIVATE Communication in a PUBLIC World”, Pearson Ed, 2<sup>nd</sup> Edition, 2016.
5. Atul Kahate, “Cryptography and Network Security”, McGraw Hill, 4<sup>th</sup> edition, 2019.
6. Wenbo Mao, “Modern Cryptography: Theory and Practice”, Pearson Ed, 1<sup>st</sup> edition, 2004.
7. Bruce Schneier, “Applied Cryptography: Protocols, Algorithms and Source Code in C”, Wiley publications, 2<sup>nd</sup> edition, 2007.

**COURSE OUTCOMES**

**At the end of the course, the students will be able to**

- Apply Block chain technologies to secure data.
- Analyze Bitcoin and its limitations by comparing with other alternative coins.
- Develop solution using the Ethereum model
- Build the Hyperledger architecture and the consensus mechanism applied in the Hyperledger.
- Solve real-time problems using various block chain technologies.

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
<b>Cos</b>	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>P09</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
CO1	3	3	3	3	2	2	2	2	2	1	2	3	2	2	3
CO2	3	2	3	3	2	1	2	2	1	2	2	3	2	1	3
CO3	3	3	2	3	2	2	2	2	2	2	1	3	1	2	2
CO4	3	2	2	3	2	2	2	1	2	2	2	3	3	3	2
CO5	3	3	2	3	2	2	2	2	2	2	2	3	3	3	3

**UNIT I INTRODUCTION TO BLOCKCHAIN****9**

History of Blockchain – Types of Blockchain – Consensus – Decentralization using Blockchain – Blockchain and Full Ecosystem Decentralization – Platforms for Decentralization–Introduction to cryptographic concepts.

**UNIT II CRYPTOCURRENCIES****9**

Bitcoin – Digital Keys and Addresses – Transactions – Mining – Bitcoin Networks and Payments – Wallets – Alternative Coins – Theoretical Limitations – Bitcoin limitations –Name coin – Prime coin – Zcash – Smart Contracts – Ricardian Contracts – Use cases of Bitcoin Blockchain scripting language in micropayment.

**UNIT III ETHEREUM****9**

The Ethereum Network – Components of Ethereum Ecosystem – Ethereum Programming Languages: Runtime Byte Code-Blocks and Blockchain-Fee Schedule – Supporting Protocols – Solidity Language-Case study: Designing smart contracts using Solidity.

Introduction to Web3 – Contract Deployment – POST Requests – Development Frameworks– Hyperledger as a Protocol – The Reference Architecture – Hyperledger Fabric –Distributed Ledger – Corda–Use cases – Hyperledger, Corda.

**UNIT V ALTERNATIVE BLOCKCHAINS AND NEXT EMERGING TRENDS**

Kadena – Ripple – Rootstock – Quorum – Tendermint – Scalability – Privacy – Blockchain Research and Challenges– Case Studies: Blockchain in E-Governance, Land Registration, Medical Information Systems, Finance and Industry.

**Total: 45 hours**

**TEXTBOOK**

1. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Second Edition, Packt Publishing, 2018.

**REFERENCES**

1. Andreas M. Antonopoulos,”Mastering Bitcoin 2/Ed Programming The Open Blockchain” O’Reilly Publications, 2018.
2. Arshdeep Bahga, Vijay Madiseti, “Blockchain Applications: A Hands on Approach”, VPT, 2017.
3. Antony Lewis, “The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them (Cryptography, Crypto Trading, Digital Assets, NFT)”,Mango publisher, 2018.
4. A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, 2016.
5. Alex Leverington, “Ethereum Programming” Packt Publishing, 2017.
6. Debajani Mohanty, "Ethereum for Architects and Developers: With Case Studies and Code Samples in Solidity", 1st Edition, Apress, 2018.
7. Andreas M. Antonopoulos, Gavin Wood, "Mastering Ethereum", 1st Edition, O’Reilly Publications, 2018.

**COURSE OUTCOMES:****At the end of the course the students will be able to**

- Describe the characteristics, physical and logical designs, domains and architecture
- Analyze the various IoT network architectures and design methodology
- Design an IoT Hardware device using various IoT hardware elements
- Build IoT applications
- Implement IoT applications for real-time environment

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
<b>Cos</b>	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>P09</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
CO1	3	3	2	2	1	1	1	2	2	2	3	2	3	3	3
CO2	3	3	3	3	1	2	2	1	3	2	1	3	2	2	3
CO3	3	2	3	2	2	1	1	2	1	1	3	3	3	3	3
CO4	3	3	3	3	1	1	1	2	1	1	3	3	3	3	3
CO5	3	3	2	1	2	1	1	2	2	2	3	3	3	3	3

**UNIT I FUNDAMENTALS OF IoT****9**

Introduction - Definition and Characteristics of IoT - Physical design - IoT Protocols - Logical design - IoT communication models-IoT Communication APIs - Enabling technologies - Wireless Sensor Networks-Cloud Computing-Big data analytics, Communication protocols-Embedded Systems. IoT Levels and Templates - Domain specific IoTs - IoT Architectural view.

**UNIT II IoT DESIGN METHODOLOGY****9**

Software Defined Networks - Network Function Virtualization - IoT systems management – Needs – NETCONF-YANG - IoT design methodology-Case study on Home Automation -Weather monitoring.

**UNIT III ELEMENTS OF IoT****9**

Sensors- Sensor classes- Sensor types- Sensor selection Criteria- Actuators- Actuators types - Arduino – Board details, IDE programming- Interfacing of Sensors and actuators with Arduino – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.

**UNIT IV BUILDING IoT APPLICATIONS****9**

Communication modules – Zigbee - LoRa - RFID - Wi-Fi- 6LoWPAN- IoT platforms –IoT physical servers and cloud offerings- Introduction to cloud storage models and communication APIs- Xively cloud for IoT.

**UNIT V CHALLENGES AND APPLICATION****9**

Security Concerns and Challenges - Real time applications of IoT – Automatic lighting – Home intrusion detection – Cities – Smart parking – Environment – Weather monitoring system – Agriculture – Smart irrigation.

**TOTAL: 45****TEXT BOOK:**

1. Arshdeep Bahga, Vijay Madiseti, "Internet of Things-A hands-on approach", Universities Press, 2015.
2. Surya Durbha and Jyoti Joglekar, "Internet of Things", Oxford University Press, 2021.

**REFERENCES:**

1. Shriram K Vasudevan , Abhishek S Nagarajan, RMD Sundaram-"Internet of Things", Wiley Publications, 2020.
2. Raj Kamal, "Internet of Things–Architecture and Design Principles", Mc Graw Hill Education Pvt. Ltd., 2017
3. Hwaiyu Geng, P.E, "Internet of Things and Data Analytics", Wiley Publications, 2017
4. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.
5. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley Publications, 2012.
6. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key applications and Protocols", Wiley Publications 2nd edition, 2013.

**COURSE OUTCOMES**

At the end of the course, students will be able to

- Design a simple Internet of Things (IoT) application using Arduino/Raspberry Pi, sensors and actuators
- Design an IoT application using Arduino/Raspberry Pi and appropriate sensor and actuator
- Build an IoT system using mobile app as a mini project

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
<b>Cos</b>	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>P09</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
CO1	3	3	3	3	2	2	3	1	3	2	2	2	2	2	2
CO2	3	3	3	3	2	2	3	1	3	2	2	2	3	3	3
CO3	3	3	3	3	3	2	3	1	3	2	2	2	3	3	3

**I. LIST OF EXPERIMENTS**

1. Turn ON and OFF the LEDs.
2. Identify the objects using IR and PIR sensor.
3. Measure the moisture level of soil using soil moisture sensor.
4. Measure the distance between the ultrasonic sensor and the obstacle.
5. Identify the leakage of gas/smoke in the environment.
6. Measure the humidity and moisture value of the environment.
7. Transfer the sensor data using Bluetooth/ Zigbee/ 6LoWPAN.
8. Control a LED using relay switch.
9. Sensor data storage in the Cloud.

**II. Mini project on various real time applications.**

**Total: 60 hours**

**COURSE OUTCOMES**

**At the end of the course, the students will be able to**

- Design simple web pages using HTML and XHTML
- Design and implement dynamic web pages using DHTML, JavaScript and Cascading style sheets
- Write programs to create multi-tier application using model view controller pattern
- Design and develop real-time web applications using PHP
- Writing simple applications using Java web services

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
<b>Cos</b>	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>P09</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
CO1	1	2	3	1	3	1	1	1	2	1	1	2	1	3	1
CO2	1	2	3	1	2	1	1	1	2	1	2	1	2	3	1
CO3	2	3	3	2	3	1	1	2	3	2	2	2	2	3	2
CO4	2	3	3	2	3	1	1	2	3	2	2	2	2	3	2
CO5	2	3	3	1	3	1	1	1	1	1	2	3	2	2	2

**UNIT I WEB BASICS AND HTML****9**

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics -Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-HTML 5.0.

**UNIT II CSS****8**

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout Beyond the Normal Flow-CSS3.0.

### **UNIT III CLIENT SIDE SCRIPTING**

**9**

The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax-Variables and Data Types-StatementsOperators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers. Introduction to the Document Object Model-DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling.

### **UNIT IV SERVER SIDE SCRIPTING**

**10**

Introduction to PHP – Programming in Web Environment – Variables – Constants – Data Type – Operators – Statements – Functions – Arrays – OOP – String Manipulation and Regular Expression – File Handling and Data Storage – PHP and SQL Database – PHP and LDAP – PHP Connectivity – Sending and Receiving E-mails – Debugging and Error Handling.

### **UNIT V AJAX AND WEB SERVICES**

**9**

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods - Overview of Java Web Services – Creating, Publishing, Testing and Describing a Web services (WSDL) - JAX-WS – RESTful Web Services.

**Total: 45 hours**

### **TEXT BOOK**

1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Fifth Edition, Pearson Education, 2018.

### **REFERENCES**

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2017.
2. HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery) 2Ed. Paperback – 2016 by DT Editorial Services.
3. Robert. W. Sebesta, "Programming the World Wide Web", Eighth Edition, Pearson Education, 2020.
4. Marty Hall and Larry Brown," Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
5. Gopalan N.P. and Akilandeswari.J, "Web Technology", Prentice Hall of India, 2014.



**COURSE OUTCOMES**

At the end of the course, students will be able to

- Comprehend various Cyber laws in cyberspace
- Apply the cryptographic technologies in Information Technology Act
- Describe Information Technology act and Related Legislation
- Analyze the issues in electronic business
- Interpret the issues of Cyber Ethics in Information Society

<b>CO / PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
<b>COs</b>	<b>Programme Outcomes (POs) and Programme Specific Outcome (PSOs)</b>														
	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>P09</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
CO1	2	2	1	3	1	3	3	3	2	3	2	3	2	2	2
CO2	3	3	3	3	3	2	3	3	3	3	2	3	3	3	3
CO3	3	3	3	3	3	2	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

**UNIT I INTRODUCTION TO CYBER LAW****9**

Evolution of computer technology - emergence of cyber space - Cyber Jurisprudence- Jurisprudence and law- Doctrinal approach- Consensual approach- Real Approach- Cyber Ethics- Cyber Jurisdiction- Hierarchy of courts- Civil and criminal jurisdictions- Cyberspace-Web space- Web hosting and web Development agreement- Legal and Technological Significance of domain Names- Internet as a tool for global access.

**UNIT II INFORMATION TECHNOLOGY ACT****9**

Overview of IT Act- 2000- Amendments and Limitations of IT Act-Digital Signatures- Cryptographic Algorithm-Public Cryptography-Private Cryptography- Electronic Governance-Legal Recognition of Electronic Records-Legal Recognition of Digital Signature-Certifying Authorities-Cyber Crime and Offences-Network Service Providers Liability-Cyber Regulations Appellate Tribunal-Penalties and Adjudication.

### **UNIT III CYBER LAW AND RELATED LEGISLATION**

**9**

Patent Law-Trademark Law-Copyright- Software – Copyright or Patented-Domain Names and Copyright disputes-Electronic Data Base and its Protection-IT Act and Civil Procedure Code-IT Act and Criminal Procedural Code-Relevant Sections of Indian Evidence Act- Relevant Sections of Bankers Book Evidence Act-Relevant Sections of Indian Penal Code- Relevant Sections of Reserve Bank of India Act-Law Relating To Employees And Internet- Alternative Dispute Resolution -Online Dispute Resolution (ODR).

### **UNIT IV ELECTRONIC BUSINESS AND LEGAL ISSUES**

**9**

Evolution and development in E-commerce-paper vs paper less contracts E-Commerce models- B2B-B2C-E security. Business-taxation-electronic payment-supply chain-EDI-E-markets-Emerging Trends.

### **UNIT V CYBER ETHICS**

**9**

The Importance of Cyber Law-Significance of cyber Ethics-Need for Cyber regulations and Ethics. Ethics in Information society-Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles-Diversity Equity and Inclusion (DEI) and Data driven Bias in AI model-Introduction to Block chain Ethics.

**Total: 45 hours**

### **TEXT BOOK**

1. Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher

### **REFERENCES**

1. Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
2. Information Security policy & Implementation Issues, NIIT, PHI
3. Computers, Internet and New Technology Laws, Karnika Seth, Lexis Nexis Butterworths Wadhwa Nagpur.
4. Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi,
5. Cyber Law, Jonthan Rosenoer, Springer, New York, (1997).,
6. The Information Technology Act, 2005: A Handbook, OUP Sudhir Naib,, New York, (2011)
7. Information Technology Act, 2000, S. R. Bhansali,, University Book House Pvt. Ltd., Jaipur (2003).

**COURSE OUTCOMES:**

**At the end of the course the students will be able to**

- Compare and analyze different types of digital data characteristics of Big Data
- Implement programs using Hadoop open source software framework
- Design and develop programs using NoSQL Databases like Mongo DB and Cassandra
- Apply MapReduce programming for various big data based problems.
- Implement programs using Hive and Pig Databases

CO / PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	2	0	1	0	2	1	2	2	2
CO2	2	1	2	2	3	2	0	1	1	2	2	2	2	2
CO3	2	1	2	3	3	2	1	1	1	2	3	2	2	3
CO4	3	1	2	3	3	2	0	1	0	2	3	2	2	3
CO5	2	2	3	3	3	1	0	1	0	2	3	2	3	3

**UNIT I INTRODUCTION TO BIG DATA****9**

Types of Digital Data: Classification of Digital Data Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, Characteristics of Big Data ,Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment , A Typical Hadoop Environment.

**UNIT II BIG DATA ANALYTICS****9**

Introduction -Big Data Analytics, Classification of Analytics, Challenges in Big Data, Technologies to handle Challenges Posed by Big Data- Data Science- Data Scientist, Terminologies Used in Big Data Environments, Basically Available Soft State Eventual Consistency (BASE), Few Top Analytics Tools.

### UNIT III HADOOP

9

Introduction Hadoop, RDBMS versus Hadoop, Distributed Computing Challenges ,History of Hadoop , Hadoop Overview, Use Case of Hadoop ,Hadoop Distributors ,HDFS (Hadoop Distributed File System),Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator),Interacting with Hadoop Ecosystem, MapReduce Programming -Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression

### UNIT IV NO SQL DATABASES

9

Cassandra :Apache Cassandra - An Introduction , Features of Cassandra, CQL Data types, CQLSH, Keyspaces, CRUD (Create, Read, Update and Delete) Operations, Collections, Using a Counter, Time to Live (TTL), Alter Commands, Import and Export, Querying System Tables, Practice Examples- MongoDB, Terms Used in RDBMS and MongoDB, Data Types in MongoDB , MongoDB Query Language

### UNIT V HIVE AND PIG

9

**Hive:** Introduction to Hive, Hive Architecture, Hive Data Types, Hive File Format, Hive Query Language (HQL), RCFile Implementation, SerDe, User-defined Function(UDF).

**Pig:** Introduction to Pig, The Anatomy of Pig, Pig on Hadoop , Pig Philosophy, Use Case for Pig: ETL Processing, Pig Latin Overview , Data Types in Pig ,Running Pig , Execution Modes of Pig ,HDFS Commands ,Relational Operators ,Eval Function ,Complex Data Types ,Piggy Bank, User-Defined Functions (UDF) ,Parameter Substitution , Diagnostic Operator , Word Count Example using Pig,Pig versus Hive

**Total: 45 hours**

### TEXT BOOKS:

1. **Big Data and Analytics**, Seema Acharya, Subhashini Chellappan, Infosys Limited, Publication: Wiley India Private Limited,1st Edition 2015(Chapters 1,2,3,4,5,6,7,8,9,10)

### REFERENCE BOOKS:

1. **Hadoop in Practice**, Alex Holmes, Manning Publications Co., September 2014, Second Edition.
2. **Programming Pig**, Alan Gates, O'Reilly, Kindle Publication.
3. **Programming Hive**, Dean Wampler, O'Reilly, Kindle Publication.

**COURSE OUTCOMES:****At the end of the course the students will be able to**

1. Provide an overview of cloud computing
2. Explain the various tasks in developing cloud services
3. Analyze the provision of cloud computing services to different users
4. Configure the various cloud services according to the environment.
5. Analyze various ways to collaborate online

CO / PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	2	1	2	0	1	0	2	1	2	2	2
CO2	2	1	2	3	3	2	0	1	1	2	2	3	3	3
CO3	2	1	3	3	3	2	0	1	0	3	3	2	3	3
CO4	2	1	2	3	3	2	0	1	0	2	3	3	3	3
CO5	2	2	3	3	3	1	0	1	0	2	3	2	3	3

**UNIT I Understanding Cloud Computing****6**

Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services

**UNIT II Developing Cloud Services****10**

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon – Google App Engine – IBM Clouds

**UNIT III Cloud Computing for Everyone****10**

Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation

## **UNIT IV Using Cloud Services**

**10**

Collaborating on Calendars, Schedules and Task Management – Exploring Online Calendar Applications-  
Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word  
Processing - Collaborating on Spread sheets- Collaborating on Databases – Storing and Sharing Files

## **UNIT V Other Ways to Collaborate Online**

**9**

Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web  
Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis

**Total:45 hours**

### **TEXT BOOK:**

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.

### **REFERENCE BOOK:**

1. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

**Preamble**

- Learn about the need for data science, with emphasis on data; Visualization in data science and engineering processes; various application of data science

**COURSE OUTCOMES****At the end of the course the students will be able to**

- Comprehend Data science process
- Write R Programs for simple application
- Apply descriptive statistics to describe various features of data
- Perform exploratory data analysis for different models
- Implement Statistical models for real time application

CO / PO, PSO Mapping														
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	0	0	2	0	1	0	2	1	2	1	1
CO2	2	2	2	2	2	2	1	1	1	2	2	3	2	3
CO3	2	2	2	3	2	2	0	1	0	3	2	2	3	2
CO4	2	1	2	3	3	2	1	1	0	2	2	3	2	2
CO5	2	2	2	3	3	1	0	1	0	2	2	2	3	3

**UNIT I INTRODUCTION TO DATA SCIENCE**

9

What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed -Data science project – Defining the goal - Data collection and management - Modeling - Model evaluation and critique - Presentation and documentation - Model deployment and maintenance

**UNIT II INTRODUCTION TO R**

9

R objects and Classes: Vector – List – Factor – Matrix – Array – Dataframe – Manipulating Objects – Input/output - R Constructs – Functions in R – Charts and Graphs – Hands on practice in R – libraries – datasets in R

### **UNIT III DESCRIPTIVE STATISTICS**

**10**

Central tendency – Mean, Median, Mode – Measure of Dispersion: Variance, Standard deviation – Measure of Shape- Skewness, Kurtosis, Percentile – Association analysis: Covariance, Correlation, Types of Correlation: Pearson Correlation, Spearman Correlation, Kendall Correlation -Populations and samples - Statistical modeling, probability distributions, fitting a model

### **UNIT IV EXPLORATORY DATA ANALYSIS**

**9**

Visualization before analysis – Dirty data – Visualizing a single variable – Examining multiple variable – Data exploration Vs. Presentation - Hypothesis testing – Difference of means – Wilcoxon Rank-Sum test – Type I and Type II errors – Power and Sample size and ANOVA

### **UNIT V CASE STUDY**

**8**

Clustering - clustering Iris data - Classification - classifying personal income - Regression - Predicting price of pre-owned cars

**Total : 45 Hours**

#### **Text Book**

1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014
2. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, “Practical Data Science Cookbook”, Packt Publishing Ltd., 2014

#### **Reference**

1. Noreen Burlingame and Lars Nielsen, “A Simple Introduction to DATA SCIENCE”, 2012.
2. Mark Gardener, “Beginning R - The Statistical Programming Language”, John Wiley & Sons, Inc., 2012.
3. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.
4. <http://bigdatauniversity.com>
5. [http://www.johndcook.com/R\\_language\\_for\\_programmers.html](http://www.johndcook.com/R_language_for_programmers.html)



**COURSE OUTCOMES**

At the end of the course the students will be able to

- Explain development framework and the need for mobile applications.
- Develop apps that use Android’s messaging, multitasking, connectivity and media services to design full-featured apps primarily for mobile devices.
- Create applications with clean, effective user interfaces that take advantage of Android’s rich UI frameworks.
- Leverage Android’s effective frameworks and techniques to perform or schedule data retrieval/storage efficiently in a mobile environment.
- Understand the debugging tools in Android Studio and test the execution of a running program to create more reliable and robust apps.

CO / PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	1	2	1	2	2	2	1	2	2	2	3
CO2	3	3	2	3	3	2	2	3	3	3	2	3	3	3	3
CO3	3	3	3	3	3	2	3	1	2	3	3	2	3	3	3
CO4	2	3	2	3	3	2	1	1	3	3	3	3	3	3	3
CO5	2	3	3	3	3	1	2	3	2	3	3	2	3	3	3

**UNIT I INTRODUCTION**

**9**

Android: An Open Platform for Mobile Development– Android SDK Features- Introducing the development framework - Standard development environment for Android applications – Creating Your First Android Application – Types of Android Application- Android Development Tools

**UNIT II ANDROID CORE**

**9**

Android Basic Building Blocks - Toast or Snackbar – Notifications – localize an app – Job Scheduler - Android Application Lifecycle – Activities and their lifecycle

**UNIT III USER INTERFACE**

**9**

Introducing Layouts - Intents - Fundamental Android UI Design - Custom View – RecyclerView – Menu based navigation – Drawer navigation

**UNIT IV DATA MANAGEMENT****9**

Introducing Adapters - Shared Preferences – Working with the file systems: Reading/writing local data, accessing the Internal File system, Accessing SD card - Introducing Android Databases- Introducing SQLite- Content Values and Cursors- Working with SQLite Databases

**UNIT V DEBUGGING AND TESTING****9**

Debugging in Android studio – Fixing issues in Android - fundamentals of testing - JUnit tests - Espresso UI - writing useful automated Android tests - Monetizing, Promoting, and Distributing Applications

**Total: 45 hour****TEXT BOOK**

1. Reto Meier, "Professional Android Application Development", 4<sup>th</sup> Edition, Wiley, 2014
2. <https://developers.google.com/certification/associate-android-developer/study-guide/>

**REFERENCE**

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for B.E/B.Tech. Semester VIII Regulations 2019**  
**Branch: Computer Science and Engineering**

<b>S. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credit</b>	<b>Total Contact Hours</b>
<b>Practical</b>							
1	U19CS801	Project Work	0	0	24	12	360
<b>Total Credits</b>						<b>12</b>	

**Approved By**

**Chairperson, Computer Science and Engineering BoS**  
**Dr.B.Sathiyabhama**

**Member Secretary, Academic Council**  
**Dr.R.Shivakumar**

**Chairperson, Academic Council & Principal**  
**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Computer Science and Engineering, Eighth Semester BE CSE Students and Staff, COE