

# ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2022-23 onwards



## Course Structure and II Year Syllabus for B.Tech. CSE (Internet of Things) Programme. (MR22 Regulations – Effective from Academic Year 2022-23 onwards)



For  
B.Tech. - Four Year Degree Programme

**MALLA REDDY ENGINEERING COLLEGE**  
(An UGC Autonomous Institution, Approved by AICTE and Affiliated to JNTUH,  
Hyderabad)

Recognized under section 2(f) &12 (B) of UGC Act 1956, Accredited III Cycle by NAAC  
with 'A++' Grade, NIRF Rank Band 201-250, ARIIA Band Performer, NBA Tier-I  
Accredited (B.Tech.- CE, EEE, ME, ECE &CSE, M.Tech. - SE, EPS, TE)  
Maisammaguda (H), Dhulapally (Post Via Kompally), Medchal - Malkajgiri District,  
Secunderabad– 500100.

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**MALLA REDDY ENGINEERING COLLEGE (Autonomous)**  
**COURSE STRUCTURE – B.Tech. CSE (Internet of Things) Programme.**  
**(MR22 Regulations - Effective from Academic Year 2022 – 23 onwards)**

<b>MR22 I SEMESTER</b>							
<b>S. No</b>	<b>Category</b>	<b>Course Code</b>	<b>Name of the Subject</b>	<b>Contact hours/week</b>			<b>Credits</b>
				<b>L</b>	<b>T</b>	<b>P</b>	
1.	BSC	C0B01	Linear Algebra and Numerical Methods	3	1	-	4
2.	BSC	C0B17	Engineering Chemistry	3	1	-	4
3.	ESC	C0501	Programming for Problem Solving	3	-	-	3
4.	ESC	C0305	Engineering Drawing	2	-	2	3
5.	BSC	C0B09	Semiconductor Physics	3	1	-	4
6.	ESC	C0502	Programming for Problem Solving Lab	-	-	2	1
7.	BSC	C0B11	Applied Physics Lab	-	-	2	1
8.	BSC	C0B18	Engineering Chemistry Lab	-	-	2	1
<b>Total</b>				<b>14</b>	<b>3</b>	<b>8</b>	<b>21</b>
<b>Total Contact Hours</b>				<b>25</b>			

<b>MR22 II SEMESTER</b>							
<b>S. No</b>	<b>Category</b>	<b>Course Code</b>	<b>Name of the Subject</b>	<b>Contact hours/week</b>			<b>Credits</b>
				<b>L</b>	<b>T</b>	<b>P</b>	
1.	HSMC	C0H01	English	3	-	-	3
2.	ESC	C0201	Basic Electrical and Electronics Engineering	3	-	-	3
3.	BSC	C0B02	Probability and Statistics	3	-	-	3
4.	ESC	C0504	Python Programming	3	1	-	4
5.	ESC	C0506	Python Programming Lab	-	-	2	2
6.	HSMC	C0H02	English Language and Communication Skills Lab	-	-	2	1
7.	ESC	C0202	Basic Electrical and Electronics Engineering Lab	-	-	2	1
8.	ESC	C1201	Engineering and IT Workshop	-	-	2	2
<b>Total</b>				<b>12</b>	<b>1</b>	<b>8</b>	<b>19</b>
<b>Total Contact Hours</b>				<b>21</b>			

MR22 III SEMESTER							
S. No	Category	Course Code	Course Title	L	T	P	Credits
1	PCC	C0507	Discrete Mathematics	3	-	-	3
2	PCC	C0509	Computer Organization and Architecture	3	-	-	3
3	PCC	C0510	Data Structures	3	-	-	3
4	PCC	C0409	Sensors & Devices	3	-	-	3
5	PCC	C0511	Object Oriented Programming through Java	3	-	-	3
6	PCC	C0512	Data Structures Lab	-	-	3	1.5
7	PCC	C6914	Sensors & Devices Lab	-	1	2	2
8	PCC	C0513	Object Oriented Programming through Java Lab	-	-	3	1.5
9	MC	C00M1	Gender Sensitization	-	-	2	-
<b>Total</b>				<b>15</b>	<b>1</b>	<b>10</b>	<b>20</b>
<b>Total Contact Hours</b>				<b>26</b>			

MR22 IV SEMESTER							
S. No	Category	Course Code	Course Title	L	T	P	Credits
1	BSC	C0B07	Applied Statistics and Optimization Techniques	4	-	-	4
2	PCC	C0515	Database Management Systems	3	-	-	3
3	PCC	C0517	Design and Analysis of Algorithms	3	-	-	3
4	PCC	C6901	Internet of Things Fundamentals	3	-	-	3
<b>Professional Elective –I</b>							
5	PEC-I	<b>C6601</b>	<b>Fundamentals of Artificial Intelligence</b>	3	-	-	3
		C0518	Free and Open Source Technologies				
		C6902	Object Oriented Analysis and Design				
6	PCC	C0519	Database Management Systems Lab	-	-	2	1
7	PCC	C1205	Design and Analysis of Algorithms Lab	-	-	2	1
8	PCC	C6903	Internet of Things Fundamentals Lab	-	-	2	1
9	PCC	C6921	Real-time Research Project/ Societal Related Project	-	-	2	1
10	PCC	C0522	Node JS/ React JS/ Django Lab	-	-	2	1
11	MC	C00M2	Environmental Science	2	-	-	-
<b>Total</b>				<b>18</b>	<b>-</b>	<b>10</b>	<b>21</b>
<b>Total Contact Hours</b>				<b>28</b>			

MR22 V SEMESTER							
S. No	Category	Course Code	Course Title	L	T	P	Credits
1	PCC	C1211	Automata Theory and Compiler Design	3	-	-	3
2	PCC	C0410	Microprocessors & Microcontrollers	3	-	-	3
3	PCC	C0516	Operating System	3	-	-	3
4	HSMC	C0H08	Business Economics and Financial Analysis	3	-	-	3
<b>Professional Elective – I</b>							
5	PEC-I	<b>C6904</b>	<b>Architecting Smart IoT Devices</b>	3	-	-	3
		C6905	Data Analytics for IoT				
		C6906	IoT System Architectures				
		C6907	Operating Systems for IoT				
		C0517	Design and Analysis of Algorithms				
6	PCC	C0520	Operating Systems Lab	-	-	2	1
7	PCC	C0462	Microprocessors & Microcontrollers Lab	-	-	2	2
8	HSMC	C0H03	Advanced English Communication Skills Lab	-	-	2	1
9	PCC	C0530	UI design – Flutter	-	-	2	1
10	MC	C00M5	Constitution of India	3	-	-	0
11	MC	C00M3	Quantitative And Verbal Reasoning-I	2	-	-	0
<b>Total</b>				<b>20</b>	<b>-</b>	<b>8</b>	<b>20</b>
<b>Total Contact Hours</b>				<b>28</b>			

MR22 VI SEMESTER							
S.No	Category	Course Code	Course Title	L	T	P	Credits
1	PCC	C6908	Applications of IoT	3	-	-	3
2	PCC	C6909	Programming Languages for IoT	3	-	-	3
3	PCC	C6625	Machine Learning	3	-	-	3
<b>Professional Elective – III</b>							
4	PEC-III		Computer Vision and Robotics	3	-	-	3
		C1215	Real Time Systems				
			Embedded Hardware Design				
			Energy Sources and Power Mangement/Disaster Management & Mitigation				
		C0518	Software Engineering & Modelling				
5	OEC-I		<b>Open Elective-I</b>	3	-	-	3
6	PCC	C6910	Applications of IoT Lab	-	-	2	1
7	PCC	C6626	Machine Learning Lab	-	-	2	1
8	PRJ	C00P1	Industrial Oriented Mini Project/ Internship/ Skill Development Course (Big data-Spark)	-	-	4	2
9	MC	C00M6	Intellectual Property Rights	3	-	-	0
10	MC	C00M4	Quantitative Aptitude and Verbal Reasoning – II	3	-	-	0
<b>Total</b>				<b>21</b>	<b>-</b>	<b>8</b>	<b>19</b>
<b>Total Contact Hours</b>				<b>29</b>			

MR 22 VII SEMESTER							
S. No.	Category	Course Code	Name of the Course	Contact Hours / week			Credits
				L	T	P	
1	PCC	C6911	IoT Cloud and Data Analytics	3	-	-	3
2	PCC	C1215	Data Mining	3	-	-	3
<b>Professional Elective-VI</b>							
3	PEC-IV	C6912	Mobile Application Development for IoT	3	-	-	3
		C0536	Software Testing Methodologies				
		C0546	Cloud Computing				
		C6618	Artificial Intelligence				
		C6203	Cryptography and Network Security				
4	PEC-V	C0523	Quantum Computing	3	-	-	3
			Wireless Networks				
		C1220	Augmented Reality & Virtual Reality				
		C6913	IoT Automation				
		C0560	Human Computer Interaction				
5	OEC-II		Open Elective-II	3	-	-	3
6	PCC	C6915	IoT Cloud and Data Analytics Lab	-	-	2	1
7	PCC	C0562	Cloud Computing Lab	-	-	2	1
8	PRJ	C00P2	Project Stage - I	-	-	6	3
<b>Total</b>				<b>15</b>	<b>-</b>	<b>10</b>	<b>20</b>
<b>Total Contact Hours</b>				<b>25</b>			

MR 22 VIII SEMESTER							
S. No.	Category	Course Code	Name of the Course	Contact Hours / week			Credits
				L	T	P	
1	PEC-VI		Embedded Software Design	3	-	-	3
		C6916	5G & IoT Technologies				
		C7328	Cognitive Computing				
		C0559	Distributed Systems				
		<b>C6919</b>	<b>Edge Analytics</b>				
2	PEC-VII	C6920	Industrial IoT	3	-	-	3
			Fog Computing				
			Smart Sensor Technologies				
		C6215	Digital Forensics				
		<b>C0550</b>	<b>Blockchain Technology</b>				
3	OEC-III		Open Elective-III	3	-	-	3
4	PRJ	C00P3	Project Stage – II including Seminar	-	-	22	11
<b>Total</b>				<b>9</b>	<b>-</b>	<b>22</b>	<b>20</b>
<b>Total Contact Hours</b>				<b>31</b>			

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. I Semester</b>		
<b>Code: C0B01</b>	<b>Linear Algebra and Numerical Methods (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 4</b>		<b>3</b>	<b>1</b>	<b>-</b>

**Prerequisites:** Matrices, Differentiation and Integration.

**Course Objectives:**

1. To learn types of matrices, Concept of rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if exist.
2. To learn concept of Eigen values and Eigen vectors of a matrix, diagonalization of a matrix, Cayley Hamilton theorem and reduce a quadratic form into a canonical form through a linear transformation.
3. To learn various methods to find roots of an equation.
4. To learn Concept of finite differences and to estimate the value for the given data using interpolation.
5. To learn Solving ordinary differential equations and evaluation of integrals using numerical techniques.

**MODULE I: MATRIX ALGEBRA**

**[12 PERIODS]**

Vector Space, basis, linear dependence and independence (Only Definitions)

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew- Hermitian; orthogonal matrices; Unitary Matrices; Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; solving system of Homogeneous and Non-Homogeneous linear equations, LU – Decomposition Method.

**MODULE II: Eigen Values and Eigen Vectors**

**[12 Periods]**

Eigen values, Eigen vectors and their properties; Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); Finding inverse and power of a matrix by Cayley-Hamilton Theorem; Singular Value Decomposition.

**Quadratic forms:** Nature, rank, index and signature of the Quadratic Form, Linear Transformation and Orthogonal Transformation, Reduction of Quadratic form to canonical forms by Orthogonal Transformation Method.

**MODULE III: Algebraic & Transcendental equations**

**[12 Periods]**

(A) Solution of Algebraic and Transcendental Equations: Introduction-Errors, types of errors. Bisection Method, Method of False Position, Newton-Raphson Method.

(B) The Iteration Method, Ramanujan’s method to find smallest root of Equation. Jacobi’s Iteration method. Gauss seidel Iteration method.

**MODULE IV: Interpolation**

**[12 Periods]**

Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences -Central differences - Symbolic relations and separation of symbols. Differences of a polynomial-Newton’s formulae for interpolation; Central difference interpolation

Formulae – Gauss Central Difference Formulae; Interpolation with unevenly spaced points- Lagrange's Interpolation formula.

## **MODULE V: Numerical solution of Ordinary Differential Equations and Numerical Integration [12 Periods]**

**Numerical solution of Ordinary Differential Equations:** Introduction-Solution of Ordinary Differential Equation by Taylor's series method - Picard's Method of successive Approximations - Euler's Method-Modified Euler's Method – Runge-Kutta Methods.

**Numerical Integration:** Trapezoidal Rule, Simpson's  $1/3^{\text{rd}}$  Rule, Simpson's  $3/8$  Rule.

### **TEXT BOOKS**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. M . K Jain, S R K Iyengar, R.K Jain, Numerical Methods for Scientific and Engineering Computation, New age International publishers.
5. S.S. Sastry, Introductory Methods of Numerical Analysis, 5<sup>th</sup> Edition, PHI Learning Private Limited

### **REFERENCES**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 3. Reprint, 2008.
4. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

### **E – RESOURCES**

1. [https://www.youtube.com/watch?v=sSjB7ccnM\\_I](https://www.youtube.com/watch?v=sSjB7ccnM_I) (Matrices – System of linear Equations)
2. <https://www.youtube.com/watch?v=h5urBuE4Xhg> (Eigen values and Eigen vectors)
3. [https://www.youtube.com/watch?v=9y\\_HcckJ96o](https://www.youtube.com/watch?v=9y_HcckJ96o) (Quadratic forms)
4. [https://www.youtube.com/watch?v=3j0c\\_FhOt5U](https://www.youtube.com/watch?v=3j0c_FhOt5U) (Bisection Method)
5. <https://www.youtube.com/watch?v=6vs-pymcsqk> (Regula Falsi Method and Newton Raphson Method )
6. <https://www.youtube.com/watch?v=1pJYZX-tgi0> (Interpolation)
7. <https://www.youtube.com/watch?v=Atv3IsQsak8&pbjreload=101> (Numerical Solution of ODE)
8. <https://www.youtube.com/watch?v=iviiGB5vxLA> (Numerical Integration)

### **NPTEL**

1. [https://www.youtube.com/watch?v=NEpvTe3pFIk&list=PLLy\\_2iUCG87BLK18eISe4fHKdE2\\_j2B\\_T&index=5](https://www.youtube.com/watch?v=NEpvTe3pFIk&list=PLLy_2iUCG87BLK18eISe4fHKdE2_j2B_T&index=5) (Matrices – System of linear Equations)
2. <https://www.youtube.com/watch?v=wrSJ5re0TAw> (Eigen values and Eigen vectors)
3. <https://www.youtube.com/watch?v=yuE86XeGhEA> (Quadratic forms)
4. <https://www.youtube.com/watch?v=WbmLBRbp0zA> (Bisection Method)
5. <https://www.youtube.com/watch?v=0K6olBTdcSs> (Regula Falsi and Newton Raphson Method)

6. <https://www.youtube.com/watch?v=KSFnfUYcxoI> (Interpolation)
7. <https://www.youtube.com/watch?v=QugqSa3G1-w&t=2254s> (Numerical Solution of ODE)
8. [https://www.youtube.com/watch?v=NihKCpJx2\\_0&list=PLbMVogVj5nJRILpJJO7KrZa8Ttj4\\_ZAgl](https://www.youtube.com/watch?v=NihKCpJx2_0&list=PLbMVogVj5nJRILpJJO7KrZa8Ttj4_ZAgl)
9. (Numerical Solution of ODE)
10. <https://www.youtube.com/watch?v=hizXlwJO1Ck> (Numerical Integration)

**Course Outcomes:**

1. The student will be able to find rank of a matrix and analyze solutions of system of linear equations.
2. The student will be able to find Eigen values and Eigen vectors of a matrix, diagonalization a matrix, verification of Cayley Hamilton theorem and reduce a quadratic form into a canonical form through a linear transformation.
3. The student will be able to find the root of a given equation by various methods.
4. The student will be able to estimate the value for the given data using interpolation.
5. The student will be able to find the numerical solutions for a given ODE's and evaluations of integrals using numerical techniques.

**CO- PO Mapping**

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
COS	Programme Outcomes(POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	3	3				2			1
CO2	2	2	2	3	2				2			1
CO3	2	2	2	3	2				2			1
CO4	3	2	2	3	3				2			2
CO5	2	2	2	3	3				2			2



<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech II Semester</b>		
<b>Code: C0B17</b>	<b>Engineering Chemistry (Common for CE, EEE, ME, ECE, CSE, CSE (AIML), CSE (DS), CSE (CS), CSE (IOT), IT, AI and Min.E))</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 4</b>		<b>3</b>	<b>1</b>	<b>-</b>

### Course objectives:

The purpose of this course is to emphasize the relevance of fundamentals of chemical sciences in the field of engineering and to provide basic knowledge on atomic- molecular orbital's, electrochemistry, batteries, corrosion and the role of water as an engineering material in domestic-industrial use. They will also impart the knowledge of stereochemistry, understanding the chemical reaction path way mechanisms and synthesis of drugs. Listing out various types of fuels and understanding the concept of calorific value and combustion.

### Module I: Water and its treatment

[10 Periods]

Introduction to water, hardness of water, causes of hardness, expression of hardness, units and types of hardness-Numerical Problems. Alkalinity of water, specifications of potable water (BIS); Estimation of temporary & permanent hardness of water by EDTA method. Boiler troubles - Scale & Sludge, Priming and foaming, caustic embrittlement and boiler corrosion; Treatment of boiler feed water - Internal treatment (colloidal, phosphate, carbonate and calgon conditioning). External treatment - Lime Soda process (cold & hot) and ion exchange process, Numerical Problems. Disinfection of water by chlorination and ozonization. Desalination by Reverse osmosis and its significance.

### Module II: Molecular structure and Theories of Bonding:

[10 Periods]

Introduction to Molecular orbital Theory. Linear Combination of Atomic Orbital's (LCAO), significance of bonding and anti-bonding molecular orbital, Conditions for the formation of molecular orbital's. Molecular orbital energy level diagrams of diatomic molecules -, N<sub>2</sub>, O<sub>2</sub> and F<sub>2</sub>. Introduction to coordination compounds-ligand-coordination number (CN) - spectrochemical series. Salient features of crystal field theory, Crystal field splitting of transition metal complexes in octahedral ( [CoF<sub>6</sub>]<sup>3-</sup> and [Co(CN)<sub>6</sub>]<sup>3-</sup> ) and tetrahedral ([NiCl<sub>4</sub>]<sup>2-</sup> and [Ni (CO)<sub>4</sub>] ) fields - magnetic properties of complexes. Band structure of solids and effect of doping on conductance.

### Module III: Electrochemistry and Corrosion

#### A. Electrochemistry:

[7 Periods]

Introduction to Electrochemistry-Conductance (Specific and Equivalent) and units. Types of cells-electrolytic & electrochemical cells (Galvanic Cells)-Electrode potential- cell potential (EMF).Electrochemical series and its applications, Nernst equation its applications and numerical problems. Reference electrodes - Calomel Electrode and Glass electrode-determination of pH using glass electrode. Batteries: Primary (dry cells) and secondary (Lead-Acid cell, Ni-Cd cell) - applications of batteries. Fuel cells: Hydrogen - Oxygen fuel cell and its applications.

#### B. Corrosion:

[7 Periods]

Causes and effects of corrosion: Theories of corrosion - Chemical & Electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion: Galvanic and Water-line corrosion. Factors affecting rate of corrosion-Nature of metal and Nature of Environment, Corrosion control methods -

Cathodic protection (Sacrificial anodic and impressed current cathodic methods). Surface coatings: Methods of metallic coatings - hot dipping (Galvanization), Electroplating (Copper) and Electroless plating (Nickel).

#### **Module IV: Stereochemistry, Reaction mechanism & synthesis of drug molecules and NMR spectroscopy: [12 Periods]**

Introduction to Isomers - classification of isomers - structural (chain, positional & functional) and stereoisomerism-geometrical (cis-trans & E-Z system) - characteristics of geometrical isomerism, optical isomerism (chirality - optical activity, specific rotation, enantiomers and diastereomers) of tartaric acid and lactic acid. Conformational isomerism of n-Butane. Introduction to bond cleavage (homo & hetero cleavage) - reaction intermediates and their stability. Types of organic reactions - Mechanism of substitution ( $SN^1$  &  $SN^2$ ) and ( $E_1$  &  $E_2$ ) reactions with suitable example. Ring opening (Beckmann rearrangement), oxidation and reduction (Cannizaro reaction), cyclization (Components of Diels-Alder reaction-Mechanism of Diels-Alder reaction with suitable example) reactions. Synthesis of Paracetamol, Aspirin and their applications.

Introduction to Spectroscopy, Basic concepts of nuclear magnetic resonance spectroscopy, chemical shift and spin-spin splitting.

#### **Module V :FUELS AND COMBUSTION**

**[08 PERIODS]**

**Fuels:** Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking – types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG. **Combustion:** Definition, Calorific value of fuel – HCV, LCV; Calculation of air quantity required for combustion of a fuel. Determination of calorific value by Junkers gas calorimeter-Numerical problems on combustion.

#### **Text Books:**

1. P.C.Jain and Monica Jain, “**A Text Book of Engineering Chemistry**”, DhanpatRai Publications, New Delhi, 16th Edition 2014.
2. S.S. Dara and S.S. Umare, “**A Text Book of Engineering Chemistry**”, S Chand Publications, New Delhi, 12th Edition 2010.
3. A.Jaya Shree, “Text book of Engineering Chemistry”, Wiley, New Delhi, 2018.

#### **Reference Books:**

1. B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath, “**Text Book of Engineering chemistry**”, Cengage Learning India Pvt.Ltd,2016.
2. M.G. Fontana and N. D. Greene, “**Corrosion Engineering**”, McGraw Hill Publications, New York, 3<sup>rd</sup> Edition, 1996.
3. K. P. C. Vollhardt and N. E. Schore, “**Organic Chemistry: Structure and Function**”, 5<sup>th</sup> Edition, 2006.

#### **e-Resources:**

##### **a) Concerned Website links:**

- 1) <https://books.google.co.in/books?isbn=0070669325> (Engineering chemistry by Sivasankar).
- 2) <https://www.youtube.com/watch?v=yQUD2vzfg8> (Hot dipping Galvanization).
- 3) [https://archive.org/stream/VollhardtOrganicChemistryStructureFunction6th/Vollhardt\\_Organic\\_Chemistry\\_Structure\\_Function\\_6th\\_djvu.txt](https://archive.org/stream/VollhardtOrganicChemistryStructureFunction6th/Vollhardt_Organic_Chemistry_Structure_Function_6th_djvu.txt).

##### **b) Concerned Journals/Magazines links:**

- 1) <http://americanhistory.si.edu/fuelcells/sources.htm> (Fuel Cell Information Sources)

2) <https://www.abctlc.com/downloads/courses/WaterChemistry.pdf> (Water Chemistry)

**c) NPTEL Videos:**

1) [nptel.ac.in/courses/113108051/](https://nptel.ac.in/courses/113108051/) (corrosion & electrochemistry web course)

2) <https://www.youtube.com/watch?v=V7-8EOfZKeE> (Stereochemistry)

**Course Outcomes:**

After completion of the course students will be able to:

1. Understand water treatment, specifically hardness of water and purification of water by various methods.
2. Analyze microscopic chemistry in terms of atomic and molecular orbital's splitting and band theory related to conductivity.
3. Acquire knowledge on electrochemical cells, fuel cells, batteries and their applications.
4. Acquire basic knowledge on the concepts of stereochemistry, reaction mechanisms and interpretation of NMR in organic molecules.
5. Acquire the knowledge of various fuels and identify a better fuel source of less pollution.

<b>CO- PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
COs	Programme Outcomes (POs)											PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	2	2	3		3				1		1	2	2	1	
CO2	2	2	2		3		1					1	1		
CO3	2		2		2							3			2

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. I Semester</b>		
<b>Code: C0501</b>	<b>Programming for Problem Solving (Common for CE, EEE, ME, ECE, CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI, IT and Mi.E)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:** NIL

**Course Objectives:**

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of the C programming language.
4. To learn the usage of structured programming approaches in solving problems

**MODULE I: Introduction to Programming**

**[10 Periods]**

Compilers, compiling and executing a program.

Representation of Algorithm - Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number  
Flowchart/Pseudocode with examples, Program design and structured programming

**Introduction to C Programming Language:** variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators

**Conditional Branching and Loops:** Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops

**I/O:** Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

**MODULE II: ARRAYS, STRINGS, STRUCTURES AND POINTERS:**

**[09 PERIODS]**

**Arrays:** one and two dimensional arrays, creating, accessing and manipulating elements of arrays  
**Strings:** Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

**Structures:** Defining structures, initializing structures, unions, Array of structures

**Pointers:** Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self- referential structures, usage of self referential structures in linked list (no implementation)  
Enumeration data type

**MODULE III: Preprocessor and File handling in C:**

**[10 Periods]**

**Preprocessor:** Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef  
**Files:** Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

**MODULE IV: Function and Dynamic Memory Allocation:**

**[09 Periods]**

**Functions:** Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing

arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

**Recursion:** Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions  
**Dynamic memory allocation:** Allocating and freeing memory, Allocating memory for arrays of different data types

**MODULE V: Searching and Sorting:**

**[10 Periods]**

Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs.

**TEXTBOOKS**

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

**REFERENCES**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum’s Outline of Programming with C, McGraw-Hill

**E-RESOURCES**

1. <http://oxford.universitypress.ac.in/eBooks/> Programming in C.
2. <https://www.journals.elsevier.com/science-of-computer-programming>
3. <http://www.ejournalofsciences.org>
4. [http://onlinecourses.nptel.ac.in/iiitk\\_cs-101](http://onlinecourses.nptel.ac.in/iiitk_cs-101)
5. <http://onlinevideolecture.com/ebooks/?subject=C-Programming>

**Outcomes:**

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

1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C programs.
3. To code and test a given logic in the C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings and structures to write C programs.
6. Searching and sorting problems.

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. II Semester</b>		
<b>Code: C0305</b>	<b>ENGINEERING DRAWING (Common for CSE, IT, CSE (Cyber Security), CSE (AI and ML), CSE (Data Science), CSE (IoT) and AI)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>2</b>	<b>-</b>	<b>2</b>

**Course Objectives:**

To develop in students, graphic skills for communication of concepts and ideas of engineering products.

**MODULE I:**

**10 Periods**

Introduction to Engineering Drawing, Principles of Engineering Graphics and their significance, Lettering.

**Geometrical Constructions:** Regular polygons only. Conic Sections: Ellipse, Parabola, Hyperbola– General method only Cycloid and Involutives.

**Scales:** Plane Scale, Diagonal scale.

**MODULE II:**

**10 Period**

**Orthographic Projections:** Principles of Orthographic Projections – Conventions – First and Third Angle projections.

**Projection of Points:** Projection of points including all four quadrants.

**Projection of Lines:** Projection of Lines - parallel, perpendicular, inclined to one reference plane.

**MODULE III:**

**9 Periods**

**Projection of Planes:** Axis inclined to one reference plane.

**Projection of Solids:** Projections of regular solids like cube, prism, pyramid, cylinder and cone by rotating object method. Axis inclined one reference plane.

**MODULE IV:**

**10 Periods**

**Section of Solids:** Sectioning of single solid with the cutting plane inclined to one plane and perpendicular to the other - true shape of section.

**Development of Surfaces:** Development of lateral surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone.

**MODULE V:**

**9 Periods**

**Isometric Projections:** Principles of Isometric Projection – Isometric Scale, Isometric Views– Conventions –Plane Figures, Simple Solids.

**Transformation of Projections:** Conversion of Isometric Views to Orthographic Views and vice versa– simple objects.

## TEXT BOOKS

1. K.L.Narayana, S.Bheemanjaneyulu “Engineering Drawing with Auto CAD-2016” New Age International Publishers, 1st Edition, 2018.
2. N.D. Bhat, “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2014.

## REFERENCES

1. K.L.Narayana, P.Kannaiah, “Engineering Drawing”, SciTech Publishers. 2nd Edition, 2017
2. K.Venugopal, “Engineering Drawing”, NewAge International Publishers, 3rd Edition, 2014.
3. K. V. Natarajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, 2015.
4. M.S. Kumar, “Engineering Graphics”, D.D. Publications, 2011.
5. Trymbaka Murthy, “Computer Aided Engineering Drawing”, I.K. international Publishing House, 3rd Edition, 2011.

## RESOURCES

1. <http://nptel.ac.in/courses/112103019/>
2. <https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing>
3. <https://www.wiziq.com/tutorials/engineering-drawing>
4. <http://freevidelectures.com/Course/3420/Engineering-Drawing>
5. <http://www.worldcat.org/title/journal-of-engineering-graphics/oclc/1781711>
6. <http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphicsnit-jalandhar> (EG MECI102)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3		3		2	2			1
CO2	3	3	3		2			2	1	1	1
CO3	3	2	3		2	1	1	1			1
CO4	3	2	2	2	2	2		3	1	1	3
CO5	3	3	2	1	3	1	2	2	1	1	3

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. II Semester</b>		
<b>Code: C0B09</b>	<b>Semiconductor Physics (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 4</b>		<b>3</b>	<b>1</b>	<b>-</b>

**Prerequisites:** Fundamentals of Physics

**Course Objectives:**

1. To outline the dual nature of matter
2. To elaborate the significance of the Kronig-Penney model in classifying the materials
3. To illustrate the working of p-n junction diode, photodiode, LED and solar cell
4. To compare the working of Ruby laser, He-Ne laser and semiconductor laser, besides illustrating the working principle of optical fibre and elaborate its applications.
5. To explain various logic gates.

**Module – I: Quantum Mechanics**

**[8 Periods]**

Introduction, Plank's theory of black body radiation, deduction of Wien's law and Ralygien's law; Louis de Broglie's concept of matter waves; Davisson and Germer experiment; G.P. Thomson Experiment; Heisenberg's uncertainty principle and its application (electron cannot exist inside the nucleus); Schrodinger's time-independent wave equation, Physical significance and properties of wave function; Particle in a one-dimensional infinite potential well.

**Module – II: Band Theory of Solids**

**[8 Periods]**

Introduction, Postulates and drawbacks of Classical and Quantum free electron theory, Fermi Dirac distribution function; Density of energy states; Bloch theorem; Qualitative treatment of Kronig - Penney model; E Vs k relationship; Origin of energy bands; Classification of materials into Conductors, Semiconductors and insulators; Concept of Effective mass.

**Module –III: Semiconductor Physics**

**[13 Periods]**

A: Introduction, Intrinsic and Extrinsic Semiconductors; Expression for carrier concentration in intrinsic and extrinsic semiconductors; Variation of Fermi energy level in Intrinsic and extrinsic semiconductors with respect to temperature and doping concentration.

B: Direct and indirect bandgap semiconductors; Carrier generation and Recombination; Drift and Diffusion mechanisms; Equation of Continuity; P-N Junction diode, Energy band diagram, V-I Characteristics; Construction and Working of Photodiode, LED & Solar cell and their applications.

**Module – IV**

**[12 Periods]**

LASER: Introduction, Characteristics of LASER; Absorption, Spontaneous and Stimulated emission; Einstein's coefficients; Population inversion; Pumping mechanisms; Basic components of a LASER system; Types of Lasers: Ruby LASER, He-Ne LASER, Semiconductor diode LASER (Homo junction and hetero junction); Applications of LASER - Computers, Medical, Military.

Optical Fibers: Introduction to Optical fibers; Total Internal Reflection; Acceptance angle and acceptance cone, Numerical aperture; types of optical fibers; Losses in optical fibers - absorption losses, scattering losses and bending losses; Applications of optical fibers - Communications, Level Sensor, LASER angioplasty.



## **Module – V: Introduction to Digital Electronics**

**[9 Periods]**

**Different types of number systems, Binary logic;** Boolean algebra - Basic theorems and properties of Boolean algebra; Boolean functions; logic gates – construction and working of AND, OR, NOT, NAND, NOR and XOR using discrete components.

**Integrated circuits:** Levels of integration - SSI, MSI, LSI and VLSI; basic IC logic gates - AND, OR, NOT, NAND, NOR and XOR.

### **Course Outcomes:**

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

1. Explain the dual nature of the matter and evaluate the energy of a particle trapped in 1D infinite potential well.
2. Classify the materials into conductors, semiconductors and insulators based on the outcomes of Kronig - Penney model.
3. Analyze the working of semiconductor devices like PN junction diode, Photodiode, LED and Solar cell.
4. Compare and contrast Ruby, He-Ne, Semiconductor Lasers and discover the working principle of optical fibers besides and elucidating their applications.
5. Describe the Boolean algebra and examine various logic gates.

### **Text Books:**

1. K Vijaya Kumar, S Chandralingam, “Modern Engineering Physics” Volume I & II, S. Chand, 1<sup>st</sup> Edition, 2017.
2. Jasprit Singh, “Semiconductor Optoelectronics: Physics and Technology”, McGraw-Hill, 1995.
3. Morris Mano, "Digital Design", Prentice - Hall, 1995.

### **Reference Books:**

1. P K Palanisamy, “**Engineering Physics**”, SciTech Publication, 4<sup>th</sup> Edition, 2014.
2. B K Pandey and S. Chaturvedi, “**Engineering Physics**” Cengage Learning India Revised Edition, 2014.
3. P Horowitz and W. Hill, “The Art of Electronics” Cambridge University Press, 3<sup>rd</sup> edition, 2015.
4. D K Bhattacharya, Poonam Tandon, “**Engineering Physics**”, Oxford University Press, 1<sup>st</sup> Edition, 2015.
5. P Bhattacharya, “**Semiconductor Optoelectronic Devices**”, Prenticehall of India, 1997

### **e-RESOURCES**

1. [https://www.researchgate.net/publication/259574083\\_Lecture\\_Notes\\_on\\_Engineering\\_Physics](https://www.researchgate.net/publication/259574083_Lecture_Notes_on_Engineering_Physics)
2. [https://www.researchgate.net/publication/292607115\\_Applied\\_Physics](https://www.researchgate.net/publication/292607115_Applied_Physics)
3. <https://www.livescience.com/33816-quantum-mechanics-explanation.html>

### **Journals :**

1. <http://www.springer.com/physics/theoretical%2C+mathematical+%26+computational+physics/journal/40094>
2. <http://www.springer.com/physics/journal/340>

### **NPTEL VIDEOS:**

1. <http://nptel.ac.in/courses/113104012/>

2. [https://www.youtube.com/watch?v=9seDKvbaoHU&list=PLzJaFd3A7DZse2tQ2qUFC](https://www.youtube.com/watch?v=9seDKvbaoHU&list=PLzJaFd3A7DZse2tQ2qUFC<hSiCj7jBidO0&index=29)
3. <https://www.youtube.com/watch?v=4a0FbQdH3dY>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3		3		2	2			1
CO2	3	3	3		2			2	1	1	1
CO3	3	2	3		2	1	1	1			1
CO4	3	2	2	2	2	2		3	1	1	3
CO5	3	3	2	1	3	1	2	2	1	1	3

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. I Semester</b>		
<b>Code: C0502</b>	<b>Programming for Problem Solving Lab (Common for ALL)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		-	-	<b>2</b>

**Prerequisites: NIL**

**Software Requirements: C**

[Note: The programs may be executed using any available Open Source/ Freely available IDE  
Some of the Tools available are:

CodeLite: <https://codelite.org/> Code:Blocks: <http://www.codeblocks.org/>

DevCpp : <http://www.bloodshed.net/devcpp.html> Eclipse: <http://www.eclipse.org>

This list is not exhaustive and is NOT in any order of preference]

**Objectives:** The students will learn the following:

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. To Write programs using the Dynamic Memory Allocation concept.
6. To create, read from and write to text and binary files

**List of Programs:**

Practice sessions:

- a. Write a simple program that prints the results of all the operators available in C (including pre/post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
- b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.

Simple numeric problems:

- a. Write a program for finding the max and min from the three numbers.
- b. Write the program for the simple, compound interest.
- c. Write a program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
- d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
- e.  $5 \times 1 = 5$
- f.  $5 \times 2 = 10$
- g.  $5 \times 3 = 15$
- h. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

- a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula  $s =$

$ut + \frac{1}{2}at^2$  where  $u$  and  $a$  are the initial velocity in m/sec ( $= 0$ ) and acceleration in  $m/sec^2$  ( $= 9.8 m/s^2$ ).

b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators  $+$ ,  $-$ ,  $*$ ,  $/$ ,  $\%$  and use Switch Statement)

c. Write a program that finds if a given number is a prime number

d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first  $n$  terms of the sequence.

f. Write a C program to generate all the prime numbers between 1 and  $n$ , where  $n$  is a value supplied by the user.

g. Write a C program to find the roots of a Quadratic equation.

h. Write a C program to calculate the following, where  $x$  is a fractional value.  $i. 1 - x/2 + x^2/4 - x^3/6$

i. j. Write a C program to read in two numbers,  $x$  and  $n$ , and then compute the sum of this geometric progression:  $1 + x + x^2 + x^3 + \dots + x^n$ . For example: if  $n$  is 3 and  $x$  is 5, then the program

j. computes  $1 + 5 + 25 + 125$ .

Arrays, Pointers and Functions:

a. Write a C program to find the minimum, maximum and average in an array of integers.

b. Write a function to compute mean, variance, Standard Deviation, sorting of  $n$  elements in a single dimension array.

c. Write a C program that uses functions to perform the following:

d. Addition of Two Matrices

e. Multiplication of Two Matrices

f. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be the same.

g. Write C programs that use both recursive and non-recursive functions

h. To find the factorial of a given integer.

i. To find the GCD (greatest common divisor) of two given integers.

j. To find  $x^n$

k. Write a program for reading elements using a pointer into an array and display the values using the array.

l. Write a program for display values reverse order from an array using a pointer.

m. Write a program through a pointer variable to sum of  $n$  elements from an array.

Files:

a. Write a C program to display the contents of a file to standard output device.

b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.

c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

d. Write a C program that does the following:

It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using `atoi` function)

Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function)

The program should then read all 10 values and print them back.

- a. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

**Strings:**

- a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
- b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
- c. Write a C program that uses functions to perform the following operations:
- d. To insert a sub-string into a given main string from a given position.
- e. To delete n Characters from a given position in a given string.
- f. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
- g. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
- h. Write a C program to count the lines, words and characters in a given text.

Miscellaneous:

- a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

- b. Write a C program to construct a pyramid of numbers as follows:

1	*	1	1	*
1 2	* *	2 3	2 2	* *
1 2 3	* * *	4 5 6	3 3 3	* * *
			4 4 4 4	* * * *
				*

**Sorting and Searching:**

- a. Write a C program that uses non recursive function to search for a Key value in a given
- b. list of integers using linear search method.
- c. Write a C program that uses non recursive function to search for a Key value in a given
- d. sorted list of integers using binary search method.
- e. Write a C program that implements the Bubble sort method to sort a given list of
- f. integers in ascending order.
- g. Write a C program that sorts the given array of integers using selection sort in descending order
- h. Write a C program that sorts the given array of integers using insertion sort in ascending order
- i. Write a C program that sorts a given array of names

**TEXT BOOKS:**

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

**REFERENCES:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. YashavantKanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

**Outcomes:**

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

1. formulate the algorithms for simple problems
2. translate given algorithms to a working and correct program
3. correct syntax errors as reported by the compilers
4. identify and correct logical errors encountered during execution
5. represent and manipulate data with arrays, strings and structures
6. use pointers of different types
7. create, read and write to and from simple text and binary files
8. modularize the code with functions so that they can be reused

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
Cos	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO <sub>2</sub>	PS
CO <sub>1</sub>	3	2	3										2	2	
CO <sub>2</sub>	3	3	3										2	2	
CO <sub>3</sub>	2	2	2										2	2	

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. II Semester</b>		
<b>Code: C0B11</b>	<b>Applied Physics Lab (Common for CSE, CSE (AI &amp; ML), CSE (CS), CSE (IoT), CSE (Data Science), IT, ECE and EEE)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		-	-	<b>2</b>

**Course objectives:**

The main objective of this course is to provide the necessary exposure to the practical aspects, which is an essential component for learning science.

**List of Experiments:**

**1. Planck's constant**

To determine Planck's constant using Photo electric effect.

**2. Energy band –gap of a semiconductor**

To determine the energy band gap of a semiconductor.

**3. V-I and P-I characteristics of light emitting diode**

Plot V-I and P-I characteristics of light emitting diode.

**4. Laser diode**

To study the Characteristics of Laser diode.

**5. Solar Cell**

To study the V-I Characteristics of solar cell.

**6. LCR Circuit**

To determination of resonant frequency, bandwidth and quality factor of RLC circuit.

**7. Numerical Aperture of an Optical fiber**

To determine the Numerical aperture of the given fiber.

**8. Bending Loss of a Fiber**

To determine the bending loss of the given fiber.

**9. Light Dependent Resistance (LDR)**

To determine the characteristics of a LDR.

**10. Stewart and Gee's experiment**

Determination of Magnetic field along the axis of current carrying circular coil.

**11. B-H Curve**

To study the magnetization of ferromagnetic material in presence of magnetic field.

**12. Sonometer**

To verify the frequency of AC Supply.

13. Construction of fundamental logic gates using discrete components and verification of truth tables

14. Verification of truth tables of fundamental logic gates using ICs

15. Construction of fundamental logic gates using universal logic gates.

**Course Outcomes:**

1. At the end of the course, students will able to
2. Develop skills to impart practical knowledge in real time solution.
3. Understand principle, concept, working, application and comparison of results with theoretical calculations.
4. Design new instruments with practical knowledge.
5. Understand measurement technology.
6. Use new instruments and real time applications in engineering studies.

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



<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. I Semester</b>		
<b>Code: C0B18</b>	<b>Engineering Chemistry Lab (Common for CE, EEE, ME, ECE, CSE, CSE(AIML), CSE(DS), CSE (CS), CSE(IOT), IT and Min.E)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		-	-	<b>2</b>

**Course Objectives:**

To provide the students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**List of Experiments:**

1. Calibration of Volumetric apparatus.
2. Estimation of Total Hardness of water by EDTA Method.
3. Estimation of an acid by P<sup>H</sup>metry.
4. Estimation of alkalinity of water.
5. Estimation of strength of an acid by Conductometry.
6. Estimation of strength of an acid by Potentiometry.
7. Estimation of Mn<sup>+2</sup> ion in KMnO<sub>4</sub> by Colorimetry.
8. Determination of viscosity of given liquids by Ostwald's viscometer.
9. Determination of surface tension of given sample using stalagmometer.
10. Estimation of iron (II) by dichrometry.
11. Determination of rate constant of hydrolysis of methyl acetate.
12. Preparation of Aspirin.

**Course outcomes:**

After completion of the course, students will be able to:

1. Estimate the hardness of given water samples.
2. Select lubricants for various purposes.
3. Prepare advanced polymers & drug materials.
4. Know the strength of an acid present in batteries.
5. Calculate the amount of Mn<sup>+2</sup> present in unknown substances/ores using instrumental methods.

<b>CO- PO, PSO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 <sub>0</sub>	PO11	PO1 <sub>2</sub>	PSO1	PSO2	PSO3
CO1	2		3		3				1		1	2	2	1	
CO2	2		2		3							1	1		
CO3	2		2		2							3			2

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. II Semester</b>		
<b>Code: C0H01</b>	<b>ENGLISH</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>	<b>(Common for CE, EEE, ME, ECE, CSE, CSE (AIML), CSE (DS), CSE (CS), CSE(IOT), IT and Min.E)</b>	<b>3</b>	<b>-</b>	<b>-</b>

**Course Objectives:** This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

**Course Outcomes:** Students will be able to:

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
6. Acquire basic proficiency in reading and writing modules of English.

#### **MODULE – I**

Chapter entitled '*Toasted English*' by R.K.Narayan from "*English: Language, Context and Culture*" published by Orient BlackSwan, Hyderabad.

**Poem:** "Mother to Son" by Langston Hughes

\*This poem is for internal evaluation purpose(s).

**Vocabulary:** The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

**Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions.

**Reading:** Reading and Its Importance- Techniques for Effective Reading.

**Writing:** Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents

#### **MODULE – II**

Chapter entitled '*ApproJRD*' by Sudha Murthy from "*English: Language, Context and Culture*" published by Orient BlackSwan, Hyderabad.

**Vocabulary:** Words Often Misspelt - Homophones, Homonyms and Homographs

**Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

**Reading:** Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

**Writing:** Nature and Style of Writing- Defining /Describing People, Objects, Places and Events

– Classifying- Providing Examples or Evidence.

### Module – III

Chapter entitled ‘**Lessons from Online Learning**’ by **F.HaiderAlvi, Deborah Hurst et al** from “*English: Language, Context and Culture*” published by Orient BlackSwan, Hyderabad.

**Poem:** “Father Returning Home” by DilipChitre

\*This poem is for internal evaluation purpose(s).

**Vocabulary:** Words Often Confused - Words from Foreign Languages and their Use in English.

**Grammar:**Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

**Reading:** Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

**Writing:** Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

### MODULE – IV

Chapter entitled ‘**Art and Literature**’ by **Abdul Kalam** from “*English: Language, Context and Culture*” published by Orient BlackSwan, Hyderabad.

**Vocabulary:**Standard Abbreviations in English

**Grammar:**Redundancies and Clichés in Oral and Written Communication.

**Reading:** Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

**Writing:** Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

### MODULE – V

Chapter entitled “After Twenty Years” by O’ Henry

**Vocabulary:** Technical Vocabulary and their Usage

**Grammar:** Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)

**Reading:** Reading Comprehension-Exercises for Practice

**Writing:** Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report

**Note:** Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.

**Note:** 1. As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is **Open-ended**, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

**Note:** 2. Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents. They are advised to teach 40 percent of each topic from the syllabus in blended mode.

**TEXTBOOK:**

1. “English: Language, Context and Culture” by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

**Reference Books:**

1. MREC English Complementary Materials.
2. Effective Academic Writing by Liss and Davis (OUP)
3. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
4. Wood,F.T. (2007). Remedial English Grammar. Macmillan.
5. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2<sup>nd</sup> ed.). Sage Publications India Pvt. Ltd.
6. (2019). Technical Communication. Wiley India Pvt. Ltd.
7. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
8. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

**Related Websites:**

1. <http://www.slideshare.net/aszardini/word-formationroot-words-prefixes-and-suffixes>
2. <http://www.scribd.com/doc/37085980/Circulars-Circular-Letters-Notices-Memo#scribd>.
3. <http://www.zsme.tarnow.pl/językiobce/wp-content/uploads/2013/11/writing-letters1.pdf>.

**Course Outcomes:**

After completion of the course, students will be able to:

1. use written and spoken English considerably well for academic purposes.
2. communicate in English accurately and fluently.
3. employ extensive and intensive reading skills.
4. gain confidence in writing for academic and real life situations.

<b>CO- PO, PSO Mapping</b>											
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>											
<b>Programme Outcomes(POs)</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>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>
<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>				<b>2</b>			<b>1</b>
<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>				<b>2</b>			<b>1</b>
<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>				<b>2</b>			<b>1</b>
<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>				<b>2</b>			<b>2</b>
<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>				<b>2</b>			<b>2</b>

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. II Semester</b>		
<b>Code: C0201</b>	<b>BASIC ELECTRICAL AND ELECTRONICS ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>	<b>(Common for CE, EEE, ME, ECE, CSE, CSE (AIML), CSE (DS), CSE (CS), CSE(IOT), IT and Min.E)</b>	<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites: NIL**

**Course Objectives:**

To introduce the concept of electrical circuits and its components. To introduce the characteristics of various electronic devices. To impart the knowledge of various configurations, characteristics and applications of electrical & electronic components.

**MODULE I: DC Circuits**

**[09 Periods]**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws - Series, parallel, series-parallel, star-to-delta and delta-to-star transformation-analysis of simple circuits with dc excitation. Superposition, Thevenin's and Maximum Power Transfer Theorems with DC excitation.

**MODULE II: AC Circuits**

**[09 Periods]**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel).

**MODULE III: Introduction to Electrical Machines**

**[10 Periods]**

**A: DC Machines:** Construction & Principle of Operation of DC Generators – E.M.F Equation. Principle of operation DC Motors – Back E.M.F. - Torque equation – Brake Test - Characteristics.

**B: AC Machines:** Construction and Principle of operation of Transformer- EMF Equation. Construction and Principle of Operation of 3 Phase Induction Motors - Brake test on 3-Phase Induction Motor – Applications.

**MODULE IV: P-N Junction Diode**

**[10 Periods]**

**P-N Junction Diode:** Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances. Zener diode operation, Zener diode as voltage regulator.

**Rectifiers:** P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier.

**Filters:** Filters – Inductor Filters, Capacitor Filters, L- section Filters,  $\pi$ - section Filters.

**MODULE V: BJT and Junction Field Effect Transistor (JFET)**

**[10 Periods]**

**Bipolar Junction Transistor (BJT):** Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations and Input-Output Characteristics, Comparison of CE, CB and CC configurations

**Junction Field Effect Transistor and MOSFET:** Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET.

### TEXT BOOKS

1. M.SuryaKalavathi, Ramana Pilla, Ch. Srinivasa Rao, Gulinindala Suresh, “Basic Electrical and Electronics Engineering”, S.Chand and Company Limited, New Delhi, 1<sup>st</sup> Edition, 2017.
2. R.L.Boylestad and Louis Nashlesky, “Electronic Devices & Circuit Theory”, Pearson Education, 2007.

### REFERENCES

1. V.K. Mehtha and Rohit Mehta, “Principles of Electrical Engineering and Electronics”, S.Chand& Co., 2009.
2. Jacob Milliman, Christos C. Halkias, Satyabrata Jit (2011), “Electronic Devices and Circuits”, 3rd edition, Tata McGraw Hill, New Delhi.
3. Thomas L. Floyd and R. P. Jain, “Digital Fundamentals”, Pearson Education, 2009.
4. David A. Bell, “Electronic Devices and Circuits”, Oxford University Press, 2008.
5. Nagrath I.J. and D. P. Kothari, “Basic Electrical Engineering”, Tata McGraw Hill, 2001.
6. Mittle N., “Basic Electrical Engineering”, Tata McGraw Hill Education, New Delhi, 2<sup>nd</sup> Edition, 2005.

### E - RESOURCES

1. <https://www.electrical4u.com/ohms-law-equation-formula-and-limitation-of-ohms-law/>
2. <https://www.eeweb.com/passives>
3. <http://nptel.ac.in/courses/108108076/>
4. <http://nptel.ac.in/downloads/108105053/>

### Course Outcomes:

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

1. Apply basic laws in electrical circuit.
2. Analyze the single phase circuits
3. Comprehend the construction and Operation of DC and AC machines
4. Know the practical importance of Diode and its characteristics
5. Recognize the construction and operation of BJT and JFET

CO- PO,PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak																
COs	Programme Outcomes (POs)												PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
CO1	2		3		3				1		1	2	2	1		
CO2			2		3							1	1			
CO3			2		2							2			2	
CO4	1	2	3	2	3		1		3		1	2			3	
CO5					3						1	2			2	

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. II Semester</b>		
<b>Code: C0B02</b>	<b>Probability and Statistics (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:** Basic Probability

**Course Objectives:**

1. Define event, outcome, trial, simple event, sample space and calculate the probability that an event will occur.
2. To learn the random variables and its distributions.
3. Statistical analyses are very often concerned with the difference between means.
4. Investigate the variability in sample statistics from sample to sample
5. Identify the direction and strength of a linear correlation between two factors.

**MODULE I: Probability:**

**[12 Periods]**

Introduction to Probability: Events, sample space, mutually exclusive events. Exhaustive events. Addition theorem for 2 & n events and their related problems. Dependent and Independent events, conditional probability, multiplication theorem. Boole's inequality, Baye's Theorem.

**MODULE II: Random variables:**

**[12 Periods]**

Discrete Probability distributions. Bernoulli, Binomial, Poission, Geometric distributions of their mean and variance, moment generating function-related problems. Continuous probability distributions: Normal distribution, Uniform distribution of their mean and variance, moment generating function, Central Limit theorem.

**MODULE III: Sampling Distributions:**

**[14 Periods]**

(A) Definitions of population-sampling-statistic, parameter. Types of sampling, expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance. Parameter estimations – likelihood estimate, point estimation and interval estimation

(B) **Testing of hypothesis:** Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, and Level of significance. One sided test, two-sided test.

**Large sample tests:**

- (i) Test of significance for single mean
- (ii) Test of significance for difference of means
- (iii) Test of significance for single proportion
- (iv) Test of significance for difference of proportions

**MODULE IV: Small sample tests:**

**[12 Periods]**

Student t-distribution, its properties and its assumptions, Test of significance difference between sample mean and population mean; difference between means of two small samples, Snedecor's, F- distribution and its properties. Test of equality of two population variances, Chi-square distribution, its properties, Chi-square test of goodness of fit, Independence of attributes.

**MODULE V: Correlation, Regression:**

**[10 Periods]**

Correlation, Coefficient of correlation, the rank correlation. Regression, Regression Coefficient, The lines of regression: simple regression. Multiple regression for three variables.

**TEXT BOOKS**

1. Walpole, Probability & Statistics, for Engineers & Scientists, 8th Edition, Pearson Education.
2. Paul A Mayer Introductory Probability and Statistical Applications, John Wiley Publications.

3. Monte Geometry, “Applied Statistics and Probability for Engineers”, 6th Edition, Wiley Publications.

**REFERENCES**

1. P. G. Hole, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint).
2. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

**E – RESOURCES**

**a) Concerned Website links:**

1. <http://www.csie.ntu.edu.tw/~sclin/download/Probability%20&%20Statistics.pdf>(Probability & Statistics for Engineers & Scientists text book)
2. [http://www.stat.pitt.edu/stoffer/tsa4/intro\\_prob.pdf](http://www.stat.pitt.edu/stoffer/tsa4/intro_prob.pdf) (Random variables and its distributions)
3. <http://users.wfu.edu/Cottrell/ecn215/sampling.pdf> (Notes on Sampling and hypothesis testing)

**b) Concerned Journals/ Magazines links:**

1. <http://www.pnas.org/content/93/9/3772.full.pdf> (Hypothesis testing and earthquake prediction)
2. <http://nsuworks.nova.edu/cgi/viewcontent.cgi?article=2373&context=tqr>(Sampling Theory)
3. <https://sci-hub.cc/10.1111/j.1540-6261.1996.tb05219.x> (probability Distributions)

**c) NPTEL Videos:**

1. <http://nptel.ac.in/courses/117105085/> (Introduction to theory of probability)
2. <http://nptel.ac.in/courses/117105085/9> (Mean and variance of random variables)
3. <http://nptel.ac.in/courses/111105041/33> (Testing of hypothesis)

**Course Outcomes:**

1. The students will understand and appreciate the role of P&S in data analytics and big data analysis.
2. Students would be able to find the Probability in certain realistic situation
3. Students would be able to identify distribution in certain realistic situation. It is mainly useful for circuit as well as non-circuit branches of engineering. Also able to differentiate among many random variables Involved in the probability models. It is quite useful for all branches of engineering.
4. The student would be able to calculate mean and proportions (large and small sample) and to make Important decisions from few samples which are taken out of unmanageably huge populations.
5. Students will understand how to forecast the future observations.

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CO1	3	3	3		3		2	2			1
	CO2	3	3	3		2			2	1	1	1
	CO3	3	2	3		2	1	1	1			1
	CO4	3	2	2	2	2	2		3	1	1	3
	CO5	3	3	2	1	3	1	2	2	1	1	3



<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. II Semester</b>		
<b>Code: C0504</b>	<b>Python Programming (Common for CSE, IT, CSE (Cyber Security), CSE (AI and ML), CSE (Data Science), CSE (IoT) and AI)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 4</b>		<b>3</b>	<b>1</b>	<b>-</b>

**Prerequisites:** Nil

**Course Objectives:** This course will enable students to

1. Learn syntax and semantics along with the basic data structures of Python
2. Python functions to facilitate code reuse, Handle modules
3. Use Python to read and write files, Explore Python's object-oriented features
4. Understand Exception handling and multithreaded programming in Python.
5. Build GUI programming in Python.

### **MODULE - I**

**[10 Periods]**

**Introduction:** Introduction to Python, Input and Output Functions, Comments, Variables, Data Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Type conversions, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.

**Data Structures:** Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries.

### **MODULE - II**

**[9 Periods]**

**Functions:** Functions, Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables, Lambda Functions Recursion.

**Modules:** Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules.

### **MODULE - III**

**[10 Periods]**

**Files:** File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules.

**Classes and Object-Oriented Programming (OOP):** OOP, Classes, Class Attributes, Instances, Instance Attributes, Binding and Method Invocation, Composition, Subclassing and Derivation, Inheritance, Built-in Functions for Classes, Instances, and Other Objects, Types vs. Classes/Instances, Customizing Classes with Special Methods, Privacy, Delegation and Wrapping.

### **MODULE – IV**

**[10 Periods]**

**Exceptions:** Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Exceptions and the sys Module.

**Multithreaded Programming:** Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules.

## **MODULE - V**

**[9 Periods]**

**GUI Programming:** Introduction, Tkinter and Python Programming, Creating Your First Python GUI Application With Tkinter, Adding a Widget, Text and Images With Label Widgets, Clickable Buttons With Button Widgets, User Input With Entry Widgets, Multiline User Input With Text Widgets, Widgets to Frames With Frame Widgets, Standard attributes, Layout Controlling With Geometry Managers, pack(),place()grid().

## **TEXT BOOKS**

1. Wesley J. Chun, Core Python Programming, Second Edition, Prentice Hall, 2007.
2. Kenneth A. Lambert, Fundamentals of Python: First Programs, Cengage Learning, 2011.

## **REFERENCE BOOKS**

1. Allen B. Downey, “Think Python, How to think like a Computer Scientist”, First Edition, O’reilly Publishing, 2018.
2. Vamsi Kurama, “Python Programming: A Modern Approach”, Pearson India, 2017.
3. Mark Lutz, “Learning Python”, Fifth Edition, O’rielly Publishers, 2013.
4. Reema Thareja, Python Programming: Using Problem Solving Approach, OUP, 2017.

## **E-RESOURCES**

1. “Learn Python - Free Interactive Python Tutorial”, <https://www.learnpython.org/>
2. “Free Python Tutorial - Python For Beginner,” <https://www.udemy.com/share/101EfoBUcccV1SQHw>
3. “Basics of Python for Data Science”, <https://olympus.greatlearning.in/courses/11265>
4. “Beginners Guide / Programmers - Python Wiki”, <https://wiki.python.org/moin/BeginnersGuide/Programmers>
5. “Introduction to Python”, <https://www.datacamp.com/courses/intro-to-python-for-data-science>

## **Course Outcomes**

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

1. Learn syntax and semantics along with the basic data structures of Python
2. Handle modules, files and exceptions in Python.
3. Understand regular expressions and multithreaded programming in Python
4. Implement Object Oriented Programming concepts in Python.
5. Implement regular expressions and exemplary applications related to GUI Programming in Python.

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. II Semester</b>		
<b>Code: C0506</b>	<b>Python Programming Lab (Common for CSE, IT, CSE (Cyber Security), CSE (AI and ML), CSE (Data Science) and CSE (IoT))</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 2</b>		-	-	<b>2</b>

**Prerequisites: NIL**

**Course Objectives:**

- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

**Software Requirements: Python**

**List of Programs:**

**Week -1:**

1. i) Use a web browser to go to the Python website <http://python.org>. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.  
ii) Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator. 3.
- i) Write a program to calculate compound interest when principal, rate and number of periods are given.  
ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points
4. Read name, address, email and phone number of a person through keyboard and print the details.

**Week - 2:**

1. Print the below triangle using for loop. 5  
4 4  
3 3 3  
2 2 2 2  
1 1 1 1 1
2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop
4. Python program to print all prime numbers in a given interval (use break)

**Week - 3:**

1. i) Write a program to convert a list and tuple into arrays.  
ii) Write a program to find common values between two arrays.
2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.  
3. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

**Week - 4:**

1. Write a function called is\_sorted that takes a list as a parameter and returns True if the list is

sorted in ascending order and False otherwise.

2. Write a function called `has_duplicates` that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
  - i). Write a function called `remove_duplicates` that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
  - ii). The wordlist I provided, `words.txt`, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
  - iii). Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.
3.
  - i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
  - ii) Remove the given word in all the places in a string?
  - iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
4. Writes a recursive function that generates all binary strings of n-bit length

### **Week - 5:**

1.
  - i) Write a python program that defines a matrix and prints
  - ii) Write a python program to perform addition of two square matrices
  - iii) Write a python program to perform multiplication of two square matrices
2. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
3. Use the structure of exception handling all general purpose exceptions.

### **Week-6:**

1.
  - a. Write a function called `draw_rectangle` that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
  - b. Add an attribute named `color` to your Rectangle objects and modify `draw_rectangle` so that it uses the `color` attribute as the fill color.
  - c. Write a function called `draw_point` that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.
  - d. Define a new class called `Circle` with appropriate attributes and instantiate a few Circle objects. Write a function called `draw_circle` that draws circles on the canvas.
2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritances.
3. Write a python code to read a phone number and email-id from the user and validate it for correctness.

### **Week- 7**

1. Write a Python code to merge two given file contents into a third file.
2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
3. Write a Python code to Read text from a text file, find the word with most number of occurrences
4. Write a function that reads a file *file1* and displays the number of words, number of

vowels, blank spaces, lower case letters and uppercase letters.

**Week - 8:**

1. Import numpy, Plotpy and Scipy and explore their functionalities.
2. a) Install NumPy package with pip and explore it.
3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder
5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

**TEXT BOOKS**

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

**REFERENCE BOOKS**

1. Python for Data Science, Dr. Mohd. Abdul Hameed, Wiley Publications - 1<sup>st</sup> Ed. 2021.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
4. Programming with Python, A User’s Book, Michael Dawson, Cengage Learning, India Edition
5. Think Python, Allen Downey, Green Tea Press
6. Core Python Programming, W. Chun, Pearson
7. Introduction to Python, Kenneth A. Lambert, Cengage

**Course Outcomes**

After completion of the course, the student should be able to

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Verify programs using modular approach, file I/O, Python standard library
- Implement Digital Systems using Python

Note: The lab experiments will be like the following experiment examples

<b>CO- PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
COs	Programme Outcomes (POs)										PSOs				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	2		3		3				1		1	2	2	1	
CO2			2		3							1	1		
CO3			2		2							3			2

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
<b>Code: C0H02</b>	<b>English Language and Communication skills Lab (Common for CE, EEE, ME, ECE, CSE, CSE(AIML), CSE(DS), CSE (CS), CSE(IOT),IT and Min.E)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		-	-	<b>2</b>

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

**Course Objectives:**

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize the impact of dialects.
- To train students to use language appropriately for public speaking, group discussions and interviews

**Listening Skills:**

**Objectives:**

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language to be able to recognize them, awareness regarding stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

**Speaking Skills:**

**Objectives:**

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.
  - Oral practice
  - Describing objects/situations/people
  - Role play – Individual/Group activities
  - Just A Minute (JAM) Sessions.

The following course content is prescribed for the **English Language and Communication Skills Lab. Exercise – I**

**CALL LAB:**

*Understand: Listening Skill-* Its importance – Purpose- Process- Types- Barriers- Effective Listening. *Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- Testing Exercises

**ICS LAB:**

*Understand:* Spoken vs. Written language- Formal and Informal English.

*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

**EXERCISE –**

**II CALL LAB:**

*Understand:* Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.

*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - Testing Exercises

**ICS LAB:**

*Understand:* Features of Good Conversation – Strategies for Effective Communication.

*Practice:* Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

**EXERCISE - III CALL LAB:**

*Understand:* Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).

*Practice:* Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -Testing Exercises

**ICS LAB:**

*Understand:* Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing

*Practice:* Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

**EXERCISE – IV CALL LAB:**

*Understand:* Listening for General Details.

*Practice:* Listening Comprehension Tests - Testing Exercises

**ICS Lab:**

*Understand:* Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.

*Practice:* Making a Short Speech – Extempore- Making a Presentation.

**EXERCISE – V CALL LAB:**

*Understand:* Listening for Specific Details.



Practice: Listening Comprehension Tests -Testing Exercises

**ICS Lab:**

Understand: Group Discussion

Practice: Group Discussion

MINIMUM REQUIREMENT OF INFRASTRUCTURAL FACILITIES FOR ELCS LAB:

1. COMPUTER ASSISTED LANGUAGE LEARNING (CALL) LAB:

**THE COMPUTER ASSISTED LANGUAGE LEARNING LAB HAS TO ACCOMMODATE 40 STUDENTS WITH 40 SYSTEMS, WITH ONE MASTER CONSOLE, LAN FACILITY AND ENGLISH LANGUAGE LEARNING SOFTWARE FOR SELF- STUDY BY STUDENTS.**

SYSTEM REQUIREMENT (HARDWARE COMPONENT):

**COMPUTER NETWORK WITH LAN FACILITY (MINIMUM 40 SYSTEMS WITH MULTIMEDIA) WITH THE FOLLOWING SPECIFICATIONS:**

- i) **COMPUTERS WITH SUITABLE CONFIGURATION**
- ii) **HIGH FIDELITY HEADPHONES**

2. INTERACTIVE COMMUNICATION SKILLS (ICS) LAB :

**The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio- visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

SOURCE OF MATERIAL (MASTER COPY):

*Exercises in Spoken English. Part 1,2,3.* CIEFL and Oxford University Press

**Note:** Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

SUGGESTED SOFTWARE:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10<sup>th</sup> Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

**Reference Books:**

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.*

Cengage Learning India Pvt. Ltd.

2. Shobha, KN&Rayen, J. Lourdes. (2019). *Communicative English – A workbook*. Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook*. Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities*.
5. Orient Black Swan Pvt. Ltd.
6. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach*. Cambridge University Press

**Websites:**

1. <http://www.mindtools.com/CommSkill/ActiveListening.htm>
2. <http://www.slideshare.net/alisonkis/dialogue-and-roleplay-activity>
3. [http://www.hse.ru/pubs/lib/data/access/ram/ticket/2/14309868938d576a532b71360b7354268380727a22/An%20article%20for%20Monika%20\(2010\).pdf](http://www.hse.ru/pubs/lib/data/access/ram/ticket/2/14309868938d576a532b71360b7354268380727a22/An%20article%20for%20Monika%20(2010).pdf)

**Course Outcomes:**

**Course Outcomes:** Students will be able to:

- Understand the nuances of English language through audio- visual experience and group activities
- Neutralise their accent for intelligibility
- Speak with clarity and confidence which in turn enhances their employability skills

<b>CO- PO, PSO Mapping</b>															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 0	PO 1	PO 2	PSO 1	PSO 2	PSO 3
CO 1	2	1	3		3				1		1	2	2	1	
CO 2	2	1	2		3							1	1		
CO 3	2		2		2							3			2

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. II Semester</b>		
<b>Code: C0202</b>	<b>Basic Electrical and Electronics Engineering Lab (Common for ALL)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		<b>-</b>	<b>-</b>	<b>2</b>

**Prerequisites: NIL**

**Course Objectives:**

To get practical knowledge about basic electrical circuits, electronic devices like Diodes, BJT, JFET and also analyse the performance of DC Motors, AC Motors and Transformers.

**List of Experiments:**

1. Verification of Kirchhoff's Laws.
2. Verification of Maximum Power Transfer Theorem.
3. Determination of Phase Angle for RC series circuit.
4. Brake Test on DC-Shunt Motor. Determination of Performance curves
5. Load Tests on Single Phase Transformer
6. Brake Test on Three Phase Induction Motors. Determination of Performance curves
7. V-I Characteristics of PN junction Diode
8. V-I Characteristics of Zener Diode
9. Half Wave Rectifier and Full Wave rectifier.
10. Input and Output characteristics of BJT with CE configuration
11. Input and Output characteristics of BJT with CB configuration
12. Input and Output Characteristics of JFET.

**Course Outcomes:**

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

1. Analyze electrical circuits by applying basic laws
2. Analyze the performance of DC Motor, three phase Induction motor and transformer
3. Understand V-I Characteristics of various diodes
4. Design Different Rectifier Circuits
5. Differentiate the Transistors and their Operations

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. II Semester</b>		
<b>Code: C1201</b>	<b>Engineering and IT Workshop (Common for CSE and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 2</b>		<b>-</b>	<b>-</b>	<b>2</b>

**Pre requisites:** NIL

**Course Objectives:**

The Engineering and IT Workshop for engineers is a training lab course spread over 60 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, PowerPoint and Publisher and Engineering workshop trades.

**Engineering Workshop:**

**Problem 1: Trades for Exercises**

**At least two exercises from each trade**

1. House-wiring
2. Soldering

**Problem 2: Trades for Demonstration & Exposure**

1. Carpentry
2. Wood working lathe

**PC Hardware:**

**Task 1:** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Task 2:** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Task 3:** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**INTERNET & WORLD WIDE WEB**

**Task1: Orientation & Connectivity Boot Camp:** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Task 2: Web Browsers, Surfing the Web:** Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Task 3: Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

**Task 4: Cyber Hygiene:** Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

### **LaTeX and WORD**

**Task 1 – Word Orientation:** The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX

and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

**Task 2: Using LaTeX and Word** to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

**Task 3: Creating project abstract** Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

**Task 4: Creating a Newsletter:** Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

### **Excel**

**Excel Orientation:** The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

**Task 1: Creating a Scheduler** - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Task 2 : Calculating GPA** - .Features to be covered:- Cell Referencing, Formulae in

excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

**Task 3:** Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Powerpoint

**Task 1:** Students will be working on basic power point utilities and tools which help them create basic powerpoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

**Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

**Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

**REFERENCE BOOKS:**

1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, WILEY Dreamtech
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. PC Hardware - A Handbook – Kate J. Chase PHI (Microsoft)
5. LaTeX Companion – Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan– CISCO Press, Pearson Education.

**Course Outcomes:**

- Perform Hardware troubleshooting
- Understand Hardware components and inter dependencies
- Safeguard computer systems from viruses/worms
- Document/ Presentation preparation
- Perform calculations using spreadsheets
- Perform Engineering workshop practice.

<b>CO- PO, PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
COs	Programme Outcomes (POs)										PSOs				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1		3							3	2		
CO2	3	3	1		3							3	2		
CO3	3	3	1		3							3	2		

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code: C0507	Discrete Mathematics (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE(DS), CSE(IOT), AIML and IT)	L	T	P
Credits: 3		3	-	-

**Prerequisites:** NIL

**Course Objectives:**

- Introduces elementary discrete mathematics for computer science and engineering.
- Topics include formal logic notation, methods of proof, induction, sets, relations, algebraic structures, elementary graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

**MODULE I:** [10 Periods]

**Mathematical logic:** Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

**MODULE II:** [09 Periods]

**Set theory:** Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions

**MODULE III:** [09 Periods]

**Algebraic Structures:** Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

**MODULE IV:** [10 Periods]

**Elementary Combinatorics:** Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

**MODULE V:** [10 Periods]

**Graph Theory:** Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

**TEXT BOOKS:**

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe I. Mott, Abraham Kandel, Theodore P. Baker, Prentis Hall of India, 2nd ed.

**REFERENCES:**

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

**E-RESOURCES:**

1. <http://www.cse.iitd.ernet.in/~bagchi/courses/discrete-book/fullbook.pdf>
2. <http://www.medellin.unal.edu.co/~curmat/matdiscretas/doc/Epp.pdf>
3. <http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7xPG734QA9tMJN2ncqS12ZbN7pUSSiWCxSgPOZJEokyWJlxQLYsrFyeITA70W9C8Pg>
4. <http://nptel.ac.in/courses/106106094/>

**Course Outcomes:**

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

- Understand and construct precise mathematical proofs
- Apply logic and set theory to formulate precise statements
- Analyze and solve counting problems on finite and discrete structures
- Describe and manipulate sequences
- Apply graph theory in solving computing problems

<b>CO- PO, PSO Mapping</b>															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	2				3							2	3		
CO 2	3											2	3		
CO 3		3										2	3		
CO 4	3	3	2	3								2		3	
CO 5					3							2		3	



<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. III Semester</b>		
<b>Code: C0509</b>	<b>Computer Organization and Architecture (Common for CSE, CSE(DS), CSE (AI and ML), CSE(Cyber Security), CSE(IOT), AIML and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:** A Course on “DLD”.

### **Objectives**

1. The purpose of the course is to introduce principles of Digital fundamentals computer organization and the basic architectural concepts.
2. It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
3. Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors.

### **MODULE – I**

**[10 Periods]**

**Digital Computers:** Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture. Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.  
Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

### **MODULE – II**

**[10 Periods]**

**Micro programmed Control:** Control memory, Address sequencing, micro program example, design of control unit. Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

### **MODULE – III**

**[9 Periods]**

**Data Representation:** Data types, Complements, Fixed Point Representation, Floating Point Representation. Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

### **MODULE – IV**

**[10 Periods]**

**Input-Output Organization:** Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access. Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

### **MODULE – V**

**[9 Periods]**

**Reduced Instruction Set Computer:** CISC Characteristics, RISC Characteristics. Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor. Multi

Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

**Textbook:**

1. Computer System Architecture, M. Moris Mano, 3rd Edition, Pearson/PHI.

**References:**

1. Computer Organization, Car Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer Organization and Architecture, William Stallings 6th Edition, Pearson/PHI.
3. Structured Computer Organization, Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

**E-Resources:**

1. <https://books.google.co.in/books?isbn=8131700704>
2. [http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7Eh9eBOsT1ELoYpKlg\\_xngrkluevXOJLs1TbxS8q2icgUs3hL4\\_KAi5So5FgXcVg](http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7Eh9eBOsT1ELoYpKlg_xngrkluevXOJLs1TbxS8q2icgUs3hL4_KAi5So5FgXcVg)
3. [http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7xAYUzYSIXl4zudlsolr-e7wQNrNXLxbgGFxbkoyx1iN3YbHuFrzI2jc\\_70rWMEwQ](http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7xAYUzYSIXl4zudlsolr-e7wQNrNXLxbgGFxbkoyx1iN3YbHuFrzI2jc_70rWMEwQ)
4. <http://nptel.ac.in/courses/106106092/>

**Outcomes:**

1. Understand the basics of instructions sets and their impact on processor design.
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
4. Design a pipeline for consistent execution of instructions with minimum hazards.
5. Recognize and manipulate representations of numbers stored in digital computers.

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. III Semester</b>		
<b>Code: C0510</b>	<b>Data Structures (Common for CSE, CSE (DS), CSE (AI and ML), CSE (Cyber Security), CSE (IOT), AIML and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:** A course on “Programming for Problem Solving “

**Course Objectives:**

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms

**MODULE-I:**

**[10 Periods]**

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

**MODULE-II:**

**[09 Periods]**

**Dictionaries:** linear list representation, skip list representation, operations - insertion, deletion and searching.

**Hash Table Representation:** hash functions, collision resolution-separate chaining, open addressing- linear probing, quadratic probing, double hashing, rehashing, extendible hashing

**MODULE-III:**

**[10 Periods]**

**Search Trees:** Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, B- Trees, B+ Trees, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

**MODULE-IV:**

**[10 Periods]**

**Graphs:** Graph Implementation Methods. Graph Traversal Methods.

**Sorting:** Quick Sort, Heap Sort, External Sorting- Model for external sorting, Merge Sort.

**MODULE-V:**

**[09 Periods]**

**Pattern Matching and Tries:** Pattern matching algorithms-Brute force, the Boyer – Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

**TEXT BOOKS:**

1. Fundamentals of Data Structures in C, 2 nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education

**REFERENCES:**

1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning

**E-RESOURCES:**

1. <http://gvpce.azurewebsites.net/pdf/data.pdf>
2. <http://www.sncwgs.ac.in/wp-content/uploads/2015/11/Fundamental-Data-Structures.pdf>
3. <http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv247-Page1.htm>
4. <http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgYe1qwH9xY7-3lcmoMApVUMmjIExpIb1zste4YXX1pSpX8a2mLgDzZ-E41CJ6PVmY4S0MqVbxsFQ>
5. <http://nptel.ac.in/courses/106102064/1>

**Course Outcomes:**

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

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

<b>CO- PO,PSO Mapping</b>															
<b>(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak</b>															
COs	Programme Outcomes (POs)										PSOs				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	2	3	2										2	3	
CO2	2	2	3										3	2	
CO3		2	2											2	1
CO4		2	3										2	3	
CO5	2	3	3										2	3	

<b>2022-23 Onwards( MR22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE (Autonomous)</b>	<b>B.Tech. III Semester</b>		
<b>Code:C0409</b>	<b>SENSORS &amp; DEVICES</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

PRE-REQUISITES:NIL.

**Course Objectives:** To introduce the terminology, technology and its applications of sensors, To introduce Arduino which is used in many IoT devices, To introduce the Raspberry PI platform, that is widely used in IoT applications. To introduce the basics of IoT devices

**MODULE I: INTRODUCTION TO SENSORS [10 PERIODS]**

Introduction to Sensors: Sensors, Criteria to choose a Sensor, Generation of Sensors, Electronic and Optical properties of semiconductor as sensors, Fiber optic sensors, Thermal detectors, photoconductive detectors. Strain, Force, Torque and Pressure sensors, Piezo-resistive and capacitive pressure sensor, optoelectronic pressure sensors, vacuum sensors.

**MODULE II: TYPES OF SENSORS AND APPLICATIONS [9 Periods]**

Level sensors, Velocity and Acceleration sensors, voltage sensor, Light sensor, Temperature sensors, Temperature and Humidity Sensor DHT11, Piezoelectric temperature sensor, unipolar and bipolar Stepper motors Sensors-, Motion Detection Sensors, Wireless Bluetooth Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor.

**MODULE III: PHYSICAL DEVICES AND ENDPOINTS- [9 PERIODS]**

**A: Controlling Hardware-** Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors  
**B: Basics of Arduino:** Introduction to Arduino, Arduino IDE, Basic Commands for Arduino, Connecting LEDs with Arduino, Connecting LCD with Arduino.

**MODULE IV: Raspberry Pi [10 Periods]**

Basics of Raspberry Pi: Introduction to Raspberry pi, Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins, Getting the static IP address of Raspberry Pi, Run a Program on Raspberry Pi.

**MODULE V: [10 Periods]**

Introduction to Internet of Things- Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry

**TEXTBOOKS:**

1. J. Fraden, Handbook of Modern Sensors: Physical, Designs, and Applications, AIP Press, Springer, Fourth Edition, 2010.
2. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, Internet of Things with Raspberry Pi and Arduino, CRC Press
3. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madiseti, Universities Press, 2015, ISBN: 9788173719547 2.

**REFERENCE BOOKS:**

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759 3.
2. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

**E-RESOURCES:**

1. <https://www.edx.org/course/iot-sensors-and-devices>
2. <https://behrtech.com/blog/top-10-iot-sensor-types/>
3. <http://nptel.ac.in/courses/108101037/>

**COURSE OUTCOMES:**

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

1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules.
3. Market forecast for IoT devices with a focus on sensors.
4. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi.

<b>CO-PO,PSOMapping</b> (3/2/1indicatesstrengthofcorrelation)3-Strong, 2-Medium,1-Weak															
<b>COS</b>	<b>ProgrammeOutcomes(POs)</b>												<b>PSOs</b>		
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	3	3	3								3	1		1
<b>CO2</b>	3	3	3	3								3	1		1
<b>CO3</b>	3	3	3	3								3	1		1
<b>CO4</b>	3	3	3	3								3	1		1
<b>CO5</b>	3	3	3	3								3	1		1

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. III Semester</b>		
<b>Code: C0511</b>	<b>Object Oriented Programming through Java (Common for CSE, CSE (DS), CSE (AI and ML), CSE (Cyber Security), CSE (IOT) and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:** Computer Programming

**Course Objectives:**

- To understand the basic object-oriented programming concepts and apply them in problem solving.
- To illustrate inheritance concepts for reusing the program.
- To demonstrate multitasking by using multiple threads and event handling
- To develop data-centric applications using JDBC.
- To understand the basics of java console and GUI based programming

**MODULE-I:**

**[10 Periods]**

**Object oriented thinking and Java Basics-** Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

**Module II:**

**[10 Periods]**

**Inheritance and Packages**– Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

**MODULE III:**

**[09 Periods]**

**Interfaces** - Defining an interface, differences between classes and interfaces, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

**Exception handling and Multithreading--** Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. String handling, Exploringjava.util. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads,

inter thread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

**MODULE IV:** [10 Periods]

**Event Handling:** Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices,

**lists panels** – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

**MODULE V:** [09 Periods]

**Applets** – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

**TEXT BOOKS:**

1. Java the complete reference, 7th edition, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

**REFERENCES:**

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley& sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.
9. Maurach's Beginning Java2 JDK 5, SPD.

**E-RESOURCES:**

1. [http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVIXBW-RPf64\\_TFk2i4LJhgQFPQ WAEt-Zobbm3twyubjRA1YOe9WVwkN2qGcxBwdHaPdi\\_mMQ](http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVIXBW-RPf64_TFk2i4LJhgQFPQ WAEt-Zobbm3twyubjRA1YOe9WVwkN2qGcxBwdHaPdi_mMQ)
2. [https://ndl.iitkgp.ac.in/result?q={\"t\":\"search\",\"k\":\"object%20oriented%20programming\",\"s\":\[\"type=\\\"video\\\"\"\],\"b\":{\"filters\":\[\]}}](https://ndl.iitkgp.ac.in/result?q={\)



3. <http://www.rehancodes.com/files/oop-using-c++-by-joyce-farrell.pdf>
4. <http://www.nptel.ac.in/courses/106103115/36>

**Course Outcomes:**

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

- Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
- Use multithreading concepts to develop inter process communication.
- Understand the process of graphical user interface design and implementation using AWT or swings.
- Develop applets that interact abundantly with the client environment and deploy on the server.

COs	ProgrammeOutcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3			3			2			2	3	3
CO2	3	3		1	3		3			2			3	3	3
CO3	3	3		3			3			3			3	3	3
CO4	2	1					3			3			2		
CO5	2						3			1					

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. III Semester</b>		
<b>Code: C0512</b>	<b>Data Structures Lab (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1.5</b>		<b>-</b>	<b>-</b>	<b>3</b>

**Prerequisites:** A Course on “Programming for problem solving”

**Objectives:**

1. To learn linear data structures such as linked list, stack and queues with its operations
2. Ability to learn programs on binary search tree and graph traversal strategies.
3. To understand the pattern matching and hashing techniques.

**Software Requirements: Turbo C / C++**

**List of Programs:**

1. Write a program that uses functions to perform the following operations on singly linked list.:
  - i) Creation
  - ii) Insertion
  - iii) Deletion
  - iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
  - i) Creation
  - ii) Insertion
  - iii) Deletion
  - iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
  - i) Creation
  - ii) Insertion
  - iii) Deletion
  - iv) Traversal
4. Write a program that implement stack (its operations) using
  - i) Arrays
  - ii) Pointers
5. Write a program that implement Queue (its operations) using
  - i) Arrays
  - ii) Pointers
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
  - i) Quick sort
  - ii) Heap sort
  - iii) Merge sort
7. Write a program to implement the tree traversal methods( Recursive and Non Recursive).
8. Write a program to implement
  - i) Binary Search tree
  - ii) B Trees
  - iii) B+ Trees
  - iv) AVL trees
  - v) Red - Black trees
9. Write a program to implement the graph traversal methods.
10. Implement a Pattern matching algorithms using Boyer- Moore, Knuth-Morris-Pratt

**TEXT BOOKS**

1. Fundamentals of Data Structures in C, 2<sup>nd</sup> Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

## REFERENCES

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

### Outcomes:

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

- Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
- Ability to Implement searching and sorting algorithms

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. III Semester</b>		
<b>Code: C6914</b>	<b>Sensors &amp; Devices Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 2</b>		<b>-</b>	<b>1</b>	<b>2</b>

**Prerequisite:** Course on Sensors and Devices.

**List of Experiments:**

1. Demonstrate Arduino Uno, Node MCU and Raspberry Pi.
2. Connect an LED to GPIO pin 25 and control it through the command line.
3. Connect an LED to GPIO pin 24 and a Switch to GPIO 25 and control the LED with the switch.
4. The state of LED should toggle with every press of the switch. Use DHT11 temperature sensor and print the temperature and humidity of the room with an interval of 15 seconds.
5. Write a Program to control the brightness of an LED using Arduino.
6. Use Light Dependent Resistor (LDR) and control an LED that should switch-on/off depending on the light.
7. Create a traffic light signal with three colored lights (Red, Orange and Green) with a duty cycle of 5-2-10 seconds.
8. Switch on and switch off a DC motor based on the position of a switch.
9. Convert an analog voltage to digital value and show it on the screen.
10. Perform Experiment using Arduino Uno to measure the distance of any object using Ultrasonic Sensor.
11. Control a 230V device (Bulb) with Raspberry Pi using a relay.
12. Control a 230V device using a threshold temperature, using a temperature sensor.

**TEXTBOOKS:**

1. Internet of Things – A Hands on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
3. Raspberry Pi Cook book, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 9789352133895

**REFERENCE BOOKS:**

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015. Editors Ovidiu Vermesan
2. Peter Friess, 'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
3. N. Ida, Sensors, Actuators and Their Interfaces, Sci Tech Publishers, 2014.

**Course Outcomes:**

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	2	3	2										3	2	
CO 2	2	2	3										2	3	
CO 3		2	3										2	3	1

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. III Semester</b>		
<b>Code: C0513</b>	<b>Object Oriented Programming through JavaLab (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1.5</b>		<b>-</b>	<b>-</b>	<b>3</b>

**Prerequisites: NIL**

**Software Requirements: JDK**

**Course Objectives:**

- To write programs using abstract classes.
- To write programs for solving real world problems using the java collection framework.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform.
- To impart hands-on experience with java programming.

Note:

1. Use LINUX and MySQL for the Lab Experiments. Though not mandatory, encourage the use of the Eclipse platform.
2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

**List of Programs:**

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, \*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. A) Develop an applet in Java that displays a simple message.  
B) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named “Compute” is clicked.
4. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception.

Display the exception in a message dialog box.

5. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

6. Write a Java program for the following:

Create a doubly linked list of elements.

Delete a given element from the above list.

Display the contents of the list after deletion.

7. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “Stop” or “Ready” or “Go” should appear above the buttons in the selected color. Initially, there is no message shown.
8. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas.  
Write a java program to display the table using Labels in Grid Layout.
10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
11. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
12. Write a Java program that correctly implements the producer – consumer problem using the concept of inter thread communication.
13. Write a Java program to list all the files in a directory including the files present in all its subdirectories.

#### **TEXT BOOKS:**

1. Herbert Schildt, “**Java The complete reference**”, TMH, 8<sup>th</sup> edition, 2011.
2. T. Budd, “**Understanding OOP with Java**”, Pearson Education, updated edition, 1998.

**REFERENCES:**

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

**Course Outcomes:**

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

- Able to write programs for solving real world problems using the java collection framework.
- Able to write programs using abstract classes.
- Able to write multithreaded programs.
- Able to write GUI programs using swing controls in Java.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	ProgrammeOutcomes (POs)											PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1		2	3										3	2	
CO 2			3		2								2	3	
CO 3		2	2		2									2	



<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. III Semester</b>		
<b>Code: C00M1</b>	<b>GENDER SENSITIZATION (An Activity-based Course) (Common for CE, EEE, ME, ECE, MiE, CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: NIL</b>		-	-	<b>2</b>

**Prerequisites:** NIL

### **COURSE DESCRIPTION**

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical

questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

### **Objectives of the Course:**

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

### **MODULE I: UNDERSTANDING GENDER [06 Periods]**

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men- Preparing for Womanhood. Growing up Male. First lessons in Caste.

### **MODULE II: GENDER ROLES AND RELATIONS [06 Periods]**

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

### **MODULE III: GENDER AND LABOUR [07 Periods]**

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction.

Unrecognized and Unaccounted work.-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.

#### **MODULE IV: GENDER - BASED VIOLENCE**

**[07 Periods]**

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: “*Chupulu*”. Domestic Violence: Speaking Out Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-“I Fought for my Life....”

#### **MODULE V: GENDER AND CULTURE**

**[06 Periods]**

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**

➤ *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on “Gender”.*

➤ **ESSENTIAL READING:** The Textbook, “*Towards a World of Equals: A Bilingual Textbook on Gender*” written by A.Suneetha, Uma Bhugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharupublished by **Telugu Akademi, Telangana Government in 2015.**

#### **ASSESSMENT AND GRADING:**

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

#### **TEXT BOOKS:**

1. Towards a World of Equals: A bilingual Textbook on Gender, A Suneetha -etall

#### **REFERENCES:**

1. Sen, Amartya. "More than One Million Women are Missing.' New York Review of Books 37.20 (20 December 1990). Print. We Were Making History...' Life Stories of Women in the ToIrmgana People's Struggle. New Delhi: Kali for Women, 1989.
2. TriptiLahiri. "By the Numbers: Where Indian Women Work." Women's Studios Journal (14 November 2012) Available online at: <http://blogs.visj.com/India-real-time/2012/11/14/by-the-numbers-where-Indan-womenworkP>
3. K. Satyanarayana and Susie Thant (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada <http://harooreollins.co.in/BookDetail.asp?FlookCndet,3732>

4. Vimata. "Vantillu (The Kitchen)". Women Writing in India: 600 BC to the Present. Volume II: The 20th Century. Ed. Susie Thaw and K. Lalita. Delhi: Oxford University Press 1995. 599-601.
5. Shatrughna, Veena et al. Women's Work and its Impact on Child Health and Nutrition, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana. 'We Were Making History ....' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.

**E-RESOURCES:**

1. [http://www.actforyouth.net/resources/rf/rf\\_gender1\\_1213.cfm](http://www.actforyouth.net/resources/rf/rf_gender1_1213.cfm) (UNDERSTANDING GENDER)
2. <https://www.simplypsychology.org/gender-biology.html>(GENDER AND BIOLOGY)
3. <http://www.yourarticlelibrary.com/essay/essay-on-gender-issues-in-labour-market-in-india/40442/> (GENDER AND LABOUR)
4. <http://journals.sagepub.com/doi/abs/10.1177/1077801200006007004> (ISSUES OF VIOLENCE)
5. <http://www.nordiclabourjournal.org/emner/likestilling> (GENDER AND BIOLOGY)

**Course Outcomes:**

At the end of the course,

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

<b>CO- PO, PSO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)										PSOs				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
CO 1						3		3	3		2	3	1		
CO 2						3		3	3		2	3	2		
CO 3						3		3	3		2	3	1		

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. IV Semester</b>		
<b>Code: C0B07</b>	<b>Applied Statistics and Optimization Techniques (Common for CSE, CSE(Cyber Security), CSE(AI and ML), CSE(DS), CSE(IOT) and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 4</b>		<b>4</b>	<b>-</b>	<b>-</b>

**Module – I** **[12 Periods]**

**Analysis of Variance & Analysis of Co-variance**

**Analysis of Variance (ANOVA):** one-way & two-way ANOVA and multiple comparisons. Introduction to Factorial design -  $2^2$  and  $2^n$ . Factorial design, Analysis of Co-variance (ANCOVA). Conducting ANCOVA

**Module – II** **[12 Periods]**

**Design of Experiments**

Importance and applications of design of experiments. Principles of experimentation, Analysis of Completely randomized Design (C.R.D), Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) including one missing observation, expectation of various sum of squares. Comparison of the efficiencies of above designs.

**Module III** **[13 Periods]**

**Transportation and Assignment**

**Transportation:** Optimal Solution by North West Corner Method- VAM- Least Cost Method- MODI Method.

**Assignment:** Formulation-Unbalanced Assignment Problem-Hungarian Algorithm-Travelling Salesman Problem.

**Module IV: Game Theory** **[13 Periods]**

Game Theory, Theory of Games, Competitive games, rules for game theory, Saddle point – minmax (maxmin) method of optimal strategies, mixed strategies –Value of the game- two-person zero sum game, method of dominance, graphical method

**Method V: Queuing Theory** **[10Periods]**

Structure of a queuing system, operating Characteristics of queuing system. Transient and Steady states, Terminology of Queuing systems. Arrival and service Processes, Pure Birth-Death process.

**Deterministic queuing Models (M/M/1):**( $\infty$ : FIFO)Model, (M/M/1):(N: FIFO)Model.

**Proposed Text Books:**

1. Monte Gomery, “Applied Statistics and Probability for Engineers”, 6<sup>th</sup> Edition, Wiley Publications.
2. J K Sharma, “Operations research Theory and applications” Macmillan publishers india limited, 4<sup>th</sup> edition.
3. Paul A Maeyer Introductory Probability and Statistical Applications, John Wiley Publicaitons.

**Proposed Reference Books:**

1. Willam Feller: “Introduction to Probability theory and its applications”. Volume–I,Wiley
2. Goon AM, Gupta MK, Das Gupta B: “Fundamentals of Statistics”, Vol-I, the World Press Pvt. Ltd. ,Kolakota.

3. V.K. Kapoor and S.C. Gupta: “Fundamentals of Mathematical Statistics”, Sultan Chand & Sons, New Delhi

<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)</b>												<b>PSOs</b>		
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	2	2			3				2		3	3	3	
<b>CO2</b>	3	3	3			3				3		3	3	3	
<b>CO3</b>	3	3	3			2				3		2	3	3	
<b>CO4</b>	3	2	1			1				1		1			
<b>CO5</b>	3	1	1			1						1			

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. IV Semester</b>		
<b>Code: C0515</b>	<b>Database Management Systems (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Prerequisites

1. A course on “Data Structures”

### The purpose of learning this course is to:

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques

### MODULE I: [10 Periods]

**Database System Applications:** A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

**Introduction to Database Design:** Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

### MODULE II: [09 Periods]

**Introduction to the Relational Model:** Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views.

Relational Algebra, Tuple relational Calculus, Domain relational calculus.

### MODULE III: [10 Periods]

**SQL: QUERIES, CONSTRAINTS, TRIGGERS:** form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.

**Schema Refinement:** Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

### MODULE IV: [10 Periods]

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions.

### MODULE V: [09 Periods]

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing,

Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM),  
B+ Trees: A Dynamic Index Structure.

**TEXT BOOKS:**

1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill

**REFERENCES:**

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, ElmasriNavrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

**E-RESOURCES:**

1. <https://kakeboksen.td.org.uit.no/Database%20System%20Concepts%206th%20edition.pdf>
2. <http://agce.sets.edu.in/cse/ebook/DBMS%20BY%20RAGHU%20RAMAKRISHNAN.pdf>
3. <http://airccse.org/journal/ijdms/ijdms.html>
4. <http://www.springer.com/computer/database+management+%26+information+retrieval?SGWID=0-153-12-114576-0>
5. <http://textofvideo.nptel.iitm.ac.in/video.php?courseId=106106093>
6. <http://www.nptelvideos.in/2012/11/database-management-system.html>

**Course Outcomes:**

- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. IV Semester</b>		
<b>Code: C0517</b>	<b>Design and Analysis of Algorithms (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:** Data Structures

**Course Objectives:**

1. To Learn fundamental concepts an algorithm, Pseudo code, performance analysis, time complexity, disjoint sets, spanning trees and connected components.
2. To Learn and Understanding of divide and conquer, applications, binary search, sorting and Strassen's matrix, greedy method, job sequencing, spanning trees and shortest path problem.
3. To Learn and understanding dynamic programming, matrix chain, optimal binary search, knapsack problem and optimization methods, all pairs shortest path, travelling sales problem and reliability design.
4. To Learn and understanding backtracking, n-queen problems, subset problem, graph coloring, Hamiltonian cycles and branch bound methods, travelling sales, knapsack problem, branch and bound, FIFO branch.
5. To Learn and understanding of NP Hard and NP complete problems

**MODULE I: Basics of Algorithm Design**

**[09 Periods]**

**Introduction** -Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations, Amortized analysis.

**Disjoint Sets** -Disjoint set operations, union and find algorithms, spanning trees, connected components and bi connected components.

**MODULE II: Algorithm Methods**

**[10 Periods]**

**Divide and Conquer** - General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication, Huffman coding.

**Greedy method** General method, applications-Job sequencing with deadlines, general knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

**MODULE III: Dynamic Programming and Optimization Techniques**

**[10 Periods]**

**A: Dynamic Programming** - General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, Longest Common Subsequence.

**B: Optimization Techniques** - All pairs shortest path problem, travelling sales person problem, Reliability design.

**MODULE IV: Backtracking and Branch and Bound**

**[10 Periods]**

**Backtracking**-General method, n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles

**Branch and Bound** - General method, applications: Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.



**MODULE V: NP-Hard and NP-Complete problems****[09 Periods]**

**NP-Hard and NP-Completeness:** Basic concepts, NP - Hard and NP Complete classes, Cook's theorem, Deterministic and Non-Deterministic algorithms, NP-hard graph problems and scheduling problem

**TEXTBOOKS:**

1. Ellis Horowitz, SatrajSahni and Rajasekharan, "**Fundamentals of Computer Algorithms**" Galgotia publications pvt. Ltd
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "**Introduction to Algorithms**", second edition, PHI Pvt. Ltd./ Pearson Education

**REFERENCES:**

1. M.T.Goodrich and R.Tomassia "**Algorithm Design, Foundations, Analysis and Internet examples**", John wiley and sons.
2. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, "**Introduction to Design and Analysis of Algorithms A strategic approach**", Mc Graw Hill.
3. Parag Himanshu Dave, Himanshu BalchandraDave, "**Design and Analysis of algorithms**" Pearson

**E-RESOURCES:**

1. <https://comsciers.files.wordpress.com/2015/12/horowitz-and-sahani-fundamentals-of-computer-algorithms-2nd-edition.pdf>
2. <https://books.google.co.in/books?id=7qKXCzF1XC8C&printsec=frontcover&dq=T.H.Cormen,C.E.Leiserson,+R.L.Rivest,and+C.Stein,+%22Introduction+to+Algorithms%22,+second+edition,+PHI+Pvt.+Ltd./+Pearson+Education,ebook,pdf&hl=en&sa=X&ved=0ahUKEwjFupORxdXTAhXLQo8KHU7FC5cQ6AEIKjAB#v=onepage&q&f=false>
3. [http://en.cnki.com.cn/Article\\_en/CJFDTOTAL-JFYZ200208019.htm](http://en.cnki.com.cn/Article_en/CJFDTOTAL-JFYZ200208019.htm)
4. <http://nptel.ac.in/courses/106101060/>

**Course Outcomes:**

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

1. **Analyze** performance of algorithms using asymptotic notations, performance analysis, disjoint sets, spanning trees and connected components
2. **Describe and analyze** paradigms for designing good algorithms using Divide-and-Conquer and Greedy Techniques, applications, binary search, sorting and Strassen's matrix, greedy method, job sequencing, spanning trees and shortest path problem.
3. **Synthesize** dynamic-programming algorithms and analyze matrix chain, optimal binary search, knapsack problem and optimization methods, all pairs shortest path, travelling sales problem and reliability design.
4. **Apply** backtracking and branch and bound techniques to solve some complex problems, n-queen problems, subset problem, graph coloring, Hamiltonian cycles and branch bound methods, travelling sales, knapsack problem, branch and bound, FIFO branch
5. **Apply** algorithm design techniques to solve certain NP-complete problems.

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. IV Semester</b>		
<b>Code: C6901</b>	<b>Internet of Things Fundamentals (Common for CSE, CSE(Cyber Security), CSE(AI and ML), CSE(DS), CSE(IOT) and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Pre-requisite of course:** Python Programming

**Objective:** In this course, student will explore various components of Internet of things such as Sensors, internetworking and cyber space. In the end they will also be able to design and implement IoT circuits and solutions.

**Course Outcomes:** After successful completion of this course, student will be able to

- Understand general concepts of Internet of Things (IoT) (Understand)
- Recognize various devices, sensors and applications (Knowledge)
- Apply design concept to IoT solutions (Apply)
- Analyze various M2M and IoT architectures (Analyze)
- Evaluate design issues in IoT applications (Evaluate)
- Create IoT solutions using sensors, actuators and Devices (Create)

**Module I: Introduction to IoT**

**[9 Periods]**

Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs.

**Module II: M2M to IoT**

**[10 Periods]**

The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

**Module III: M2M vs IoT An Architectural Overview**

**[10 Periods]**

**A:** Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

**B:** Reference Architecture and Reference Model of IoT

**Module IV: IoT Reference Architecture**

**[10 Periods]**

Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. Constraints affecting design in IoT world- Introduction, Technical design Constraints.

**Domain specific applications of IoT:** Home automation, Industry applications, Surveillance applications, Other IoT application.

**Module V: Developing IoT solutions:**

**[9 Periods]**

Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi Implementation of IoT with Arduino and Raspberry, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT.

**Text Books:**

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
2. Vijay Madiseti and ArshdeepBahga, “Internet of Things (A Hands-on Approach)”, 1st Edition, VPT, 2014
3. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013
4. Cuno Pfister, Getting Started with the Internet of Things, O’Reilly Media, 2011, ISBN: 978-1-4493- 9357-1

**Reference Books:**

1. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press,2012.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet ofThings”, Springer, 2011.
3. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a HighlyConnected World”, Cambridge University Press, 2010.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applicationsand Protocols”, Wiley, 2012.

<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)</b>												<b>PSOs</b>		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2			3				2		3	3	3	
CO2	3	3	3			3				3		3	3	3	
CO3	3	3	3			2				3		2	3	3	
CO4	3	2	1			1				1		1			
CO5	3	1	1			1						1			

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. IV Semester</b>		
<b>Code: C6601</b>	<b>Fundamentals of Artificial Intelligence [Professional Elective - I] (Common for CSE, CSE(Cyber Security), CSE(AI and ML), CSE(DS), CSE(IOT) and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### PRE-REQUISITES

- Basic Programming in Python
- Data Structures

### OBJECTIVES

Artificial Intelligence is a major step forward in how computer system adapts, evolves and learns. It has widespread application in almost every industry and is considered to be a big technological shift, similar in scale to past events such as the industrial revolution, the computer age, and the smart phone revolution.

This course will give an opportunity to gain expertise in one of the most fascinating and fastest growing areas of Computer Science through classroom program that covers fascinating and compelling topics related to human intelligence and its applications in industry, defence, healthcare, agriculture and many other areas. This course will give the students a rigorous, advanced and professional graduate-level foundation in Artificial Intelligence.

### LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Build intelligent agents for search and games.
- Solve AI problems through programming with Python.
- Learning optimization and inference algorithms for model learning.
- Design and develop programs for an agent to learn and act in a structured environment.

### DETAIL CONTENTS

#### 1. Introduction

[9 Hours]

Concept of AI, history, current status, scope, agents, environments, Problem

Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

#### 2. Search Algorithms

[10 Hours]

Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A\* algorithm, Game Search.

#### 3. Probabilistic Reasoning

[10 Hours]

Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.

**4. Markov Decision process**

**[10 Hours]**

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

**5. Reinforcement Learning**

**[9 Hours]**

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

**LIST OF SUGGESTED BOOKS**

- Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 3<sup>rd</sup>Edition, Prentice Hall
- Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill
- Trivedi, M.C., “A Classical Approach to Artificial Intelligence”, Khanna Publishing House, Delhi.
- Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011
- David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010.

**WEBSITES FOR REFERENCE**

- <https://nptel.ac.in/courses/106105077>
- <https://nptel.ac.in/courses/106106126>
- <https://aima.cs.berkeley.edu>
- [https://ai.berkeley.edu/project\\_overview.html](https://ai.berkeley.edu/project_overview.html) (for Practical’s)

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. IV Semester</b>		
<b>Code: C0519</b>	<b>Database Management Systems Lab (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		<b>-</b>	<b>-</b>	<b>2</b>

**Co-requisites:** “Database Management Systems”

**Course Objectives:**

- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

**Software Requirements: MySQL**

**List of Experiments:**

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A. Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)  
B. Nested, Correlated subqueries
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

**Course Outcomes:**

- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers

**TEXT BOOKS:**

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3<sup>rd</sup> Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

**REFERENCE BOOKS:**

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7<sup>th</sup> Edition.
2. Fundamentals of Database Systems, ElmasriNavrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education

4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.

Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. IV Semester</b>		
<b>Code: C1204</b>	<b>Design and Analysis of Algorithms Lab (Common for CSE, CSE(Cyber Security), CSE(AI and ML), CSE(DS), CSE(IOT) and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		<b>-</b>	<b>-</b>	<b>2</b>

#### **COURSE OBJECTIVES:**

This course will make students

1. To analyze asymptotic performance of algorithms, understand different methods postfix, infix expressions, spanning tree algorithms, Strassen's matrix multiplication.
2. To develop solutions to Job sequencing problems, Knapsack algorithm, shortest path algorithms.
3. To implement solutions traveling sales person.
4. To apply dynamic programming method N-Queen's Problem.
5. To learn and apply synthesizing branch and bound, NP problems.

#### **Software Requirements: Turbo C**

#### **LIST OF PROGRAMS:**

1. Write a program to evaluate a postfix expression E. Assume E is presented as a string.
2. Write a program to obtain the postfix form of an infix expression E. Again assume E has only the binary operators +, -, \*, /, ^.
3. Implement the minimum cost spanning tree algorithm (Kruskal's algorithm).
4. Implement the minimum cost spanning tree algorithm (Prim's algorithm).
5. Implement Strassen's matrix multiplication.
6. Implement Job sequencing problem with deadlines.
7. Implement the Knapsack Algorithm.
8. Implement the shortest path Dijkstra's Algorithm.
9. Implement SSSP (Single Source Shortest Path) in DAG (Directed Acyclic Graphs).
10. Implement travelling sales person problem.
11. Implement N-Queen's Problem using Backtracking.
12. Implement sum of subsets problem.

#### **TEXTBOOKS**

1. Ellis Horowitz, Satraj Sahni and Rajasekharan, "**Fundamentals of Computer Algorithms**" Galgotia publications pvt. Ltd
2. T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, "**Introduction to Algorithms**", second edition, PHI Pvt. Ltd./ Pearson Education
3. Parag Himanshu Dave, Himanshu Balchandra Dave, "**Design and Analysis of algorithms**" Pearson.

#### **REFERENCES**

1. M.T. Goodrich and R. Tomassia "**Algorithm Design, Foundations, Analysis and Internet examples**", John Wiley and Sons.
2. R.C.T. Lee, S.S. Tseng, R.C. Chang and T. Tsai, "**Introduction to Design and Analysis of Algorithms A strategic approach**", Mc Graw Hill.

#### **COURSE OUTCOMES:**

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



1. **Analyze** asymptotic performance of algorithms, understand different methods
2. **Develop** solutions to Job sequencing problems, Knapsack algorithm, shortest path algorithms,
3. **Implement** solutions traveling sales person.
4. **Apply** dynamic programming method N-Queen's Problem.
5. **Apply** synthesizing branch and bound NP problems.

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. IV Semester</b>		
<b>Code: C6903</b>	<b>Internet of Things Fundamentals Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		<b>-</b>	<b>-</b>	<b>2</b>

**List of Programs:**

- Introduction to various sensors and various actuators & its Application (Students have to prepare Report for the same). Perform Experiment using Arduino Uno to measure the distance of any object using Ultrasonic Sensor.
  - PIR Motion Sensor.
  - Rain Drop Sensor.
  - Moisture Sensor.
  - Temperature Sensor.
  - Touch Sensor.
  - Infrared Sensor.
  - Servo Moto.
  - RFID Sensor.
  - Bluetooth Module.
  - Wi-Fi Module.
- Demonstrate NodeMCU and its working
- Getting Started with ESP8266 Wi-Fi SoC
- Hands-on with on-board peripherals of ESP8266
- Demonstrate Arduino and its pins.
- Perform Experiment using Arduino Uno to measure the distance of any object using Ultrasonic Sensor.
- Create a circuit using Arduino and sensors. Perform experiment using Arduino Uno to Learn Working of Servo Motor
- Creating a webpage and display the values available through Arduino.
- Demonstration of Setup & Working of Raspberry Pi. (Students have to prepare the Report for the same.).
- OPEN Ended problem: Students are required to submit an IOT based project using the Microcontroller or a Raspberry Pi and connecting various sensors and actuators. The data for the same should be displayed via a webpage or a web app.

<b>CO- PO, PSO Mapping</b> (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak																
CO s	Programme Outcomes (POs)												PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	
CO 1	3	3	3	2									3	3		
CO 2	3	3	3	2									3	2		
CO 3	3	3	3	2									3	2		

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. IV Semester</b>		
<b>Code: C69P1</b>	<b>Real-time Research Project/ Societal Related Project</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		<b>-</b>	<b>-</b>	<b>2</b>

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. IV Semester</b>		
<b>Code: C0522</b>	<b>NODE JS/ REACT JS/ DJANGO Lab (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		-	-	<b>2</b>

**Prerequisites:** Object Oriented Programming through Java, HTML Basics

**Course Objectives:**

- To implement the static web pages using HTML and do client side validation using JavaScript.
- To design and work with databases using Java
- To develop an end to end application using java full stack.
- To introduce Node JS implementation for server side programming.
- To experiment with single page application development using React.

**Software Requirements: JDK, Tomcat Server, PHP and WAMP Server.**

**Exercises:**

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed in experiment 1 and the database created in experiment 5.
8. Maintaining the transactional history of any user is very important. Explore the various session tracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
10. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)
11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.

13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
14. Create a TODO application in react with necessary components and deploy it into github.

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

- Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.
- Demonstrate Advanced features of JavaScript and learn about JDBC
- Develop Server – side implementation using Java technologies like
- Develop the server – side implementation using Node JS.
- Design a Single Page Application using React.

**REFERENCE BOOKS:**

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O’Reilly Media, 2nd Edition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2<sup>nd</sup> Edition, A Press.

**CO- PO, PSO Mapping**

**(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1									2	1		
CO2	2	2										2	2		
CO3	1	2										1	1		

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. IV Semester</b>		
<b>Code: C00M2</b>	<b>Environmental Science (Common for CE, EEE, ME, ECE, MiE, CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: NIL</b>		<b>2</b>	<b>-</b>	<b>-</b>

**Pre-Requisites:** NIL

### **Objectives**

An interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences, including geo systems, biology, chemistry, economics, political science and international processes. The ability to work effectively as a member of an interdisciplinary team on complex problem of environment.

#### **Module I: Ecosystems** | 5 Periods

Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy.

Activity: Plantation.

#### **Module II: Natural resources, Biodiversity and Biotic resources:**

##### **A: Natural Resources:** | 5 Periods

Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources—case studies. Energy resources: growing energy needs, introduction to renewable and non renewable energy sources.

##### **B: Biodiversity and Biotic resources:** | 4 Periods

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Threats to Biodiversity (habitat loss, poaching of wildlife, man-wild life conflicts). Conservation of Biodiversity (In-situ and Ex-situ conservation),

Activity: case studies.

#### **Module III: ENVIRONMENTAL POLLUTION AND CONTROL:** | 7 Periods

**A:** Classification of pollution and pollutants, Causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards.

**B:** Soil Pollution, Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, Coastal pollution due to sewage and marine disposal of industrial effluents.

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**E-waste and its management. Activity: Field visit.**

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**Module IV: Global Environmental Problems and Global effects:**

**6 Periods**

Green house effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions/Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

Activity: Poster Making.

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**Module V: Towards sustainable future:**

**5 Periods**

Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable Communities, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism(CDM).

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**Text Books:**

1. R. Rajagopalan, “**Environmental Studies from crisis to cure**”, Oxford University Press 2nd Edition, 2005.
2. Anubha Kaushik, C.P. Kaushik, “**Environmental studies**” New age International Publishers,4th Edition,2012

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**Reference Books:**

1. ErachBharucha, “**Environmental studies**” University Grants Commission, and University Press, I Edition, 2005.
2. M. Anji Reddy “**Text book of Environmental Science and Technology**” 3rd Edition, 2007
3. Richard T. Wright, “**Environmental Science: towards a sustainable future**” PHL Learning, Private Ltd. New Delhi, 2nd Edition., 2008
4. Gilbert McMasters and Wendell P. Ela, “**Environmental Engineering and science**”,3rd Edition, PHI Learning Pvt. Ltd.,2008.

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**E-Resources:**

1. <http://www.gdrc.org/uem/ait-terms.html> (Glossary of Environmental terms).
2. <http://www.environmentalscience.org/> (Environmental sciences Lectures series).
3. Journal of earth science and climatic change (OMICS International Journal).
4. Journal of pollution effects & control (OMICS International Journal).
5. [nptel.ac.in/courses/120108004/](http://nptel.ac.in/courses/120108004/) (Principles of Environment Management Lectures).
6. <http://www.nptelvideos.in/2012/12/fundamentals-of-environmental-pollution.html> (NPTEL online video courses IIT lectures).

### Course Outcomes:

After completion of the course, students will be able to:

1. To enable the students to realize the importance of ecosystem, its structure, services.  
To make the students aware of Different natural functions of ecosystem, which helps to sustain the life on the earth.
2. To use natural resources more efficiently.
3. To make the students aware of the impacts of human actions on the environment, its effects and minimizing measures to mitigate them.
4. To educate the students regarding environmental issues and problems at local, national and international level.
5. To know more sustainable way of living

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak																
CO S	Programme Outcomes (POs)												PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	
CO 1	3		1		1	2	1									
CO 2	2	3	2	3	1	3		2								
CO 3	3	3	2	3	2	2		1								
CO 4	3	2	2	1	2	1										
CO 5	2	1	1			1	3	3								



<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code: C1211</b>	<b>AUTOMATA THEORY AND COMPILER DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives

- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation

### UNIT-I

**Introduction to Finite Automata:** Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

**Non deterministic Finite Automata:** Formal Definition, an application, Text Search, Finite Automata with Epsilon - Transitions.

**Deterministic Finite Automata:** Definition of DFA, How DFA Process Strings, The language of DFA, Conversion of NFA with  $\epsilon$ - transitions to DFA without  $\epsilon$ -transitions. Conversion of NFA to DFA

### UNIT-II

**Regular Expressions:** Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

**Pumping Lemma for Regular Languages:**

Statement of the pumping lemma, Applications of the Pumping Lemma.

**Context-Free Grammars:** Definition of Context – Free Grammars, Derivations Using a Grammar, Left most and Right most Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

### UNIT-III

**Push Down Automata:** Definition of the Push down Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state

**Turing Machines:**

Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

**Undecidability:**

Undecidability, A Language that is Not Recursively Enumerable, An Undecidable

Problem That is RE, Undecidable Problems about Turing Machines

#### **UNIT-IV**

**Introduction:** The structure of a compiler

**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical – Analyzer Generator Lex

**Syntax Analysis:** Introduction, Context – Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom – Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers

#### **UNIT-V**

**Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

**Intermediate – Code Generation:** Variants of Syntax Trees, Three – Address Code

**Run-Time Environments:** Stack Allocation of Space, Access to Non local Data on the Stack, Heap Management

#### **TEXT BOOKS:**

1. Introduction to Automata Theory, Languages, and Computation, 3<sup>rd</sup> Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, Pearson Education.
2. Theory of Computer Science-Automata languages and computation, Mishra and Chandra shekaran, 2ndEdition, PHI.

#### **REFERENCEBOOKS:**

1. Compilers:Principles,TechniquesandTools,AlfredV.Aho,MonicaS.Lam,RaviSethi,Jeffrey D.Ullman,2<sup>nd</sup>Edition,Pearson.
2. IntroductiontoFormallanguagesAutomataTheory andComputation,KamalaKrithivasan,RamaR,Pearson.
3. IntroductiontoLanguagesandTheTheoryofComputation,JohnCMartin,TMH.
4. lex&yacc–JohnR. Levine,TonyMason,DougBrown,O'reilly
5. CompilerConstruction,KennethC.Louden,Thomson.CourseTechnology

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code: C0450</b>	<b>MICRO PROCESSORS &amp; MICRO CONTROLLERS</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Course Objectives:**

- To familiarize the architecture of microprocessors and microcontrollers
- To provide the knowledge about interfacing techniques of bus & memory.
- To understand the concepts of ARM architecture
- To study the basic concepts of Advanced ARM processors

**UNIT-I**

**8086 Architecture:** 8086 Architecture – Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

**Instruction Set and Assembly Language Programming of 8086:** Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

**UNIT-II**

**Introduction to Microcontrollers:** Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

**8051 Real Time Control:** Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

**UNIT-III**

**I/O And Memory Interface:** LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

**Serial Communication and Bus Interface:** Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232, USB.

**UNIT-IV**

**ARM Architecture:** ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

**UNIT-V**

**Advanced ARM Processors:** Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

**TEXTBOOKS:**

1. Advanced Microprocessors and Peripherals –  
A.K.Ray and K.M.Bhurchandani, TMH, 2<sup>nd</sup> Edition 2006.
2. ARM System Developers Guide, Andrew NSLOSS, Dominic SYMES, Chris WRIGHT,  
Elsevier, 2012

**REFERENCE BOOKS:**

1. The 8051 Microcontroller, Kenneth J. Ayala, Cengage Learning, 3<sup>rd</sup> Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2<sup>nd</sup> Edition 2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications –  
K. Uma Rao, Andhe Pallavi, Pearson, 2009.
4. Digital Signal Processing and Applications with the OMAP- L138 Experimenter,  
Donald Reay, WILEY 2012.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code: C0516</b>	<b>Operating Systems</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**PREREQUISITES:**

1. A course on "Computer Programming and Data Structures".
2. A course on "Computer Organization and Architecture".

**COURSE OBJECTIVES:**

- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

**MODULE I:** [10 PERIODS]

**Operating System** - Introduction, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

**Process** - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

**MODULE II:** [9 PERIODS]

**CPUScheduling**-Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling.

System call interface for process management-fork, exit, wait, waitpid, exec **Deadlocks** - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

**MODULE III:** [10 PERIODS]

**Process Management and Synchronization** - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, **Critical Regions, Monitors** **Interprocess Communication Mechanisms:** IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

**MODULE IV:** [10 PERIODS]

**Memory Management and Virtual Memory** - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

**MODULE V:** [08 Periods]

**File System Interface and Operations** - Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create,

read, write, close, lseek, stat, ioctl system calls.

**TEXT BOOKS:**

1. OperatingSystemPrinciples-AbrahamSilberchatz,PeterB.Galvin,GregGagne7th Edition, John Wiley.
2. AdvancedprogrammingintheUNIXenvironment, W.R.Stevens,Pearsoneducation.

**REFERENCES:**

1. OperatingSystems-InternalsandDesignPrinciples,WilliamStallings,FifthEdition– 2005, Pearson Education/PHI
2. OperatingSystemADesignApproach-Crowley, TMH.
3. ModernOperatingSystems,AndrewS.Tanenbaum 2ndedition, Pearson/PHI
4. UNIXprogrammingenvironment,Kernighan and Pike,PHI/PearsonEducation
5. UNIXInternals -TheNewFrontiers,U.Vahalia, PearsonEducation.

**Courseoutcomes**

- Willbeable to control access to acomputerandthefilesthatmaybeshared
- Demonstrate the knowledge of the components of computers and their respective roles in computing.
- Abilityto recognize andresolveuserproblems with standardoperatingenvironments.
- Gainpracticalknowledgeofhowprogramminglanguages,operatingsystems,and architectures interact and how to use each effectively.

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COs	ProgrammeOutcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1									2	1		2
CO2	2	2										2	1		
CO3	2														
CO4	2	2	1										2		
CO5	2	2	1										1		

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code: C0H08</b>	<b>BUSINESS ECONOMICS AND FINANCIAL ANALYSIS</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Course Objective:** To learn the basic Business types, impact of the Economy on Business and Firmsspecifically.ToanalyzetheBusiness fromtheFinancialPerspective.

### **UNIT-I**

#### **IntroductiontoBusinessandEconomics:**

**Business:** Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources ofCapital for aCompany, Non-Conventional Sources of Finance.

**Economics:** Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multi disciplinary nature of Business Economics.

### **UNIT-II**

#### **Demand and Supply Analysis:**

**Elasticity of Demand:** Elasticity, Types of Elasticity, Law of Demand, Measurement and Significanceof Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

**SupplyAnalysis :** Determinants of Supply, Supply Function & Law of Supply.

### **UNIT-III**

#### **Production, Cost, Market Structures & Pricing:**

**Production Analysis :** Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

**Costanalysis:** Types of Costs, Shortrun and Longrun Cost Functions.

**Market Structures:** Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

**Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

### **UNIT-IV**

**Financial Accounting:** Accounting concepts and Conventions, Accounting Equation, Double-Entrysystem of Accounting, Rules formaintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

## **UNIT-V**

**Financial Analysis through Ratios:** Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Introduction to Fund Flow and Cash Flow Analysis (simple problems).

### **TEXT BOOKS:**

1. D.D.Chaturvedi,S.L.Gupta,BusinessEconomics-  
TheoryandApplications,InternationalBookHousePvt.Ltd.2013.
2. DhaneshKKhatri,FinancialAccounting,TataMcGrawHill,2011.
3. Geethika Ghosh,Piyali Gosh, Purba Roy Choudhury,ManagerialEconomics, 2e,  
TataMcGrawHillEducationPvt.Ltd.2012.

### **REFERENCEBOOKS:**

1. PareshShah,FinancialAccountingforManagement2e,OxfordPress,2015.
2. S.N.Maheshwari,SunilKMaheshwari,SharadKMaheshwari,FinancialAccounting,5  
e,VikasPublications,2013.



<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code: C6904</b>	<b>ARCHITECTING SMART IOT DEVICES</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Course Objectives:**

- To understand the architectural overview of IoT devices.
- To acquire skills on data acquisition and communication in IoT.
- To understand the threats of IoT.

**UNIT-I**

**Design Principles of IoT**

Design principles of connected devices, data acquiring organizing and analytics in IoT, system architecture of IoT

**UNIT-II**

**Prototyping the Embedded Devices for IoT**

System hardware and prototyping, sensors and actuators for IoT, Radio module and wireless sensor network, gateways, internet and web, software components

**UNIT-III**

**Embedded Programming for IoT**

C and python for IoT, Programming connected sensors using Arduino and Raspberry Pi , Case study: Temperature controller, Smart irrigation system.

**UNIT-IV**

**Embedded RTOS**

Program structure and realtime, multitasking and scheduling, RTOS services, signals, semaphores, Nucleus SE, application timers, interrupts innucleus ES, Nucleus SE initialization and starn up

**UNIT-V**

**Tools for IoT**

Introduction, chef puppet, NETCONF-YANG

**IoT physical Devices**

Basic building blocks of an IoT device and end points, IoT devices-Arduino, Node MCU, Examples of IoT Devices, Raspberry Pi, pc Duino, Beagle bone black, cubie board, domains pecific IoTs

**TEXTBOOKS:**

1. RajKamal,InternetofThings,ArchitectureandDesignPrinciples,1stedition,McGraw HillEducation,May2017
2. ArsheapBagaandVijayMadisetti,InternetofThings:AHands-OnApproach,1stEdition,Universitiespress,2015

**REFERENCEBOOKS:**

1. David Etter, IoT (Intemet ofThingsProgramming: A simple and fast way ofLearning IoT,Kindleedition2016
2. FeiHU,SecurityandPrivacyinInternetofThings(loTs):Models,Algorithms,andImplementationsEdition,CRCPress,2016
3. ColinWalls,EmbeddedRTOSDesignInsightsandImplementation.1stedition.Elsevier.December2020

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code: C6905</b>	<b>DATA ANALYTICS FOR IOT</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

- To understand IoT Analytics and Challenges
- To Analyze the IoT data to infer the protocol and device characteristics
- To Explore and visualized ata, and techniques to understand data quality

### UNIT-I

#### Defining IoT Analytics and Challenges

Introduction to IoT, applications, IoT architectures, introduction to analytics, IoT analytics challenges

### UNIT-II

#### IoT Devices and Networking Protocols

IoT devices, Networking basics, IoT networking connectivity protocols, IoT networking data messaging protocols, Analyzing data to infer protocol and device characteristics

### UNIT-III

#### IoT Analytics for the Cloud

Introduction to elastic analytics, Decouple keycomponents, Cloud security and analytics, Designing data processing for analytics, Applying big data technology to storage

### UNIT-IV

#### Exploring IoT Data

Exploring and visualizing data, Techniques to understand data quality, Basic time series analysis, Statistical analysis

### UNIT-V

#### Data Science for IoT Analytics

Introduction to Machine Learning, Feature engineering with IoT data, Validation methods, Understanding the bias–variance tradeoff, Use cases for deeplearning with IoT data

### TEXTBOOK:

1. Minter, Andrew, Analytics for the Internet of Things (IoT), Packt Publishing Ltd. July 2017, ISBN9781787120730

### REFERENCEBOOKS:

1. KaiHwang, MinChen, Big-DataAnalyticsforCloud, IoTandCognitiveComputing, Wiley
2. HwaiyuGeng, InternetofThingsandDataAnalyticsHandbook, Wiley
3. JohnSoldatos, BuildingBlocksforIoTAnalyticsInternet-of-ThingsAnalytics, RiverPublishersGerardusBlokdyk,
4. IoTAnalyticsaCompleteGuide, 5starcooks.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code: C6906</b>	<b>IOT SYSTEM ARCHITECTURES</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Course Outcomes:**

- Understand IoT applications and IoT Architectures.
- Learn about IoT devices and event driven analysis
- Understand and analyze IoT.
- Understand safety and security testing of IoT systems

**UNIT-I**

**The IoT Landscape:** Introduction to IoT, Applications, Architectures, Wireless Networks, Devices, Security and Privacy, Event-Driven Systems

**IoT System Architectures:** Introduction, Protocols Concepts, IoT-Oriented Protocols, Databases, Time Bases, Security

**UNIT-II**

**IoT Devices & Event-Driven System Analysis:** The IoT Device Design Space, Cost of Ownership and Power Consumption, Cost per Transistor and Chip Size, Duty Cycle and Power Consumption, Platform Design

**Event Driven System Analysis:** Introduction, Motivating Example, IoT Network Model, Events, Networks, Devices and Hubs, Single – Hub Networks, Multi-hub Networks, Network Models and Physical Networks, IoT Event Analysis, Event Populations, Stochastic Event Populations, Environmental Interaction Modeling, Event Transport and Migration

**UNIT-III**

**Industrial Internet of Things:** Introduction, Industry 4.0, Industrial Internet of Things (IIoT), IIoT Architecture, Basic Technologies, Applications and Challenges

**UNIT-IV**

**Security and Safety:** Introduction, Systems Security, Network Security, Generic Application Security, Application Process Security and Safety, Reliable-and-Secure-by-Design IoT Applications, Run Time Monitoring, The ARMET Approach, Privacy and Dependability

**UNIT-V**

**Security Testing IoT Systems:** Introduction, Fuzz Testing for Security, White-Box Fuzzing, Black-Box Fuzzing, Fuzzing Industrial Control Network Systems, Fuzzing Modbus, The Modbus Protocol, Modbus / TCP Fuzzer

**TEXT BOOK:**

1. Dimitrios Serpanos, Marilyn Wol, Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies, ISBN 978-3-319-69714-7

**REFERENCEBOOKS:**

1. Internet of Things – A hands-on approach, ArshdeepBahga, Vijay Madiseti, Universities Press,2015
2. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick,OmarElloumiandWiley,2012(for Unit2).
3. “From Machine-to-Machine to the Internet of Things — Introduction to a New Age ofIntelligence”, Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, StefanAvesand.DavidBoyleand Elsevier,2014.
4. IoTFundamentals:NetworkingTechnologies,ProtocolsandUseCasesforInternetofT hings,David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, CiscoPress,2017.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code: C6907</b>	<b>OPERATING SYSTEMS FOR IOT</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Course Objective:**

- To learn various issue in the selection of Operating system for Internet of Things.

**Course Outcomes:**

- Revise the concepts of operating systems basics
- Learn best suitable architectures for CPU
- Understand software architectures for middleware
- Learn embedded operating systems
- Use embedded operating system for IoT

**UNIT-I**

**Selection of OS:** No OS and Strictly Polling, Co-routines, Interrupts, A Small Real-time Kernel, Non-preemptive Operating System, Full OS, Open Source, GNU licensing and Linux, OS constructs  
**Selection of CPU:** Overview, CPU Core, CPU Architecture, Word-Size, MMU—Memory Managed Unit, RAM, Cache, EEPROM and Flash, FPU—Floating Point Unit, DSP, Crypto-Engine

**UNIT-II**

**Software Architecture:** Design for Performance, Layers, Object Model, Case: CAN Open, Message Passing, Middleware

**UNIT-III**

**Introduction to Embedded OS:** Definitions of Embedded systems, embedded OS  
**History of Embedded OS:** VRTX, Theuc / osstory, Wind-River, Threadx  
 Open-source Embedded Operating System: Open-source and Embedded Operating System, Thoughts on Embedded system open-source software, Customize own Linux, Montavista and Embedded Linux

**UNIT-IV**

**Embedded Linux OS:** Real-Time Technologies in Embedded Linux, Improve clock precision, dynamic power management in embedded linux  
**Embedded OS in mobile phones:** Mobile phones: Symbian OS, open-source Mobile phone os, android and its competitors  
**Embedded Operating Applications:** Embedded communication products development, Embedded Linux in communication devices, Embedded linux for next generation of communication devices, Montavista Embedded linux  
**Wearable Devices and Embedded OS:** Wearable Device, OS on wearable devices

## **UNIT-V**

**Internet of things OS:** IoTos, Driveinto the IOT OS, IoToperating systems, Huawei LiteOS, Comparison of Operating Systems

**Embedded Technology and IoT:** Microcontroller Unit, MCU powers the development of IoT, EdgecomputinginIOT, IoT cloud platform, IoT OS, RISC-V

### **TEXT BOOKS:**

1. KLAUSELK:EmbeddedsoftwareforIoT,DeGruyter;3rdedition
2. AllanHeandLingyuanHe:EmbeddedOperatingSystem,HistoryandFutureintheInternetofThings,ElektorPublication

### **REFERENCE BOOKS:**

1. Jimcooling,Real-timeOperatingSystemsBook2-ThePractice:UsingSTMCube,FreeRTOSandtheSTM32DiscoveryBoard(EngineeringofReal-TimeEmbeddedSystems)Jimcooling,ISBN-10:1973409933,ISBN-13:978-1973409939
2. Charles Bell, MicroPython for the Internet of Things, A Beginner's Guide to Programming withPython on Microcontrollers, Apress, ISBN-13 (pbk): 978-1-4842-3122-7, ISBN-13 (electronic):978-1-4842-3123-4
3. Charles bell Windows 10 for the Internet of Things 1st Edition, Apress, ISBN-13 (pbk): 978-1-4842-2107-5 ISBN-13,(electronic):978-1-4842-2108-2.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code: C0517</b>	<b>Design and Analysis of Algorithms</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:** Data Structures

**COURSE OBJECTIVES:**

1. To Learn fundamental concepts an algorithm, Pseudo code, performance analysis, time complexity, disjoint sets, spanning trees and connected components.
2. To Learn and Understanding of divide and conquer, applications, binary search, sorting and Strassen,,s matrix, greedy method, job sequencing, spanning trees and shortest path problem.
3. To Learn and understanding dynamic programming, matrix chain, optimal binary search, knapsack problem and optimization methods, all pairs shortest path, travelling sales problem and reliability design.
4. To Learn and understanding backtracking, n-queen problems, subset problem, graph coloring, Hamiltonian cycles and branch bound methods, travelling sales, knapsack problem, branch and bound, FIFO branch.
5. To Learn and understanding of NP Hard and NP complete problems

**MODULE I: Basics of Algorithm Design [09 Periods]**

**Introduction** -Algorithm, Pseudo code for expressing algorithms, Performance Analysis- Space complexity, Time complexity, Asymptotic Notations, Amortized analysis.

**Disjoint Sets**-Disjoint set operations, union and find algorithms, spanning trees, connected components and bi connected components.

**MODULE II: Algorithm Methods [10 Periods]**

**Divide and Conquer** - General method, applications-Binary search, Quick sort, Merge sort, Strassen,,s matrix multiplication, Huffman coding.

**Greedy method** General method, applications-Job sequencing with deadlines, general knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

**MODULE III: Dynamic Programming and Optimization Techniques [10 Periods] A:**

**Dynamic Programming** - General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, Longest Common Subsequence.

**B: Optimization Techniques** - All pairs shortest path problem, travelling sales person problem, Reliability design.

**MODULE IV: Backtracking and Branch and Bound [10 Periods]**

**Backtracking**-General method, n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles

**Branch and Bound** - General method, applications: Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.

**MODULE V: NP-Hard and NP-Complete problems [09 Periods]**

**NP-Hard and NP-Completeness:** Basic concepts, NP - Hard and NP Complete classes, Cook,,s theorem, Deterministic and Non-Deterministic algorithms, NP-hard graph problems and scheduling problem

**TEXT BOOKS:**

1. Ellis Horowitz, SatrajSahni and Rajasekharan, "Fundamentals of Computer Algorithms"Galgotia publications pvt. Ltd
2. T.H.Cormen,C.E.Leiserson,R.L.Rivest,andC.Stein,"IntroductiontoAlgorithms", second edition, PHI Pvt. Ltd./ Pearson Education

**REFERENCES:**

1. M.T.GoodrichandR.Tomassia"AlgorithmDesign, Foundations, Analysisand Internetexamples", John wiley and sons.
2. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, "Introduction to Design and Analysis of Algorithms A strategic approach", Mc Graw Hill.
3. Parag Himanshu Dave, Himanshu BalchandraDave,"Design and Analysis of algorithms"Pearson

**E-RESOURCES:**

1. <https://comsciers.files.wordpress.com/2015/12/horowitz-and-sahani-fundamentals-of-computer-algorithms-2nd-edition.pdf>
2. <https://books.google.co.in/books?id=7qKXCzF1XC8C&printsec=frontcover&dq=T.H.Cormen,C.E.Leiserson,+R.L.Rivest,and+C.Stein,+%22Introduction+to+Algorithms%22,+second+edition,+PHI+Pvt.+Ltd./+Pearson+Education,ebook,pdf&hl=en&sa=X&ved=0ahUKEwjFupORxdXTAhXLQo8KHU7FC5cQ6AEIKjAB#v=onepage&q&f=false>
3. [http://en.cnki.com.cn/Article\\_en/CJFDTOTAL-JFYZ200208019.htm](http://en.cnki.com.cn/Article_en/CJFDTOTAL-JFYZ200208019.htm)
4. <http://nptel.ac.in/courses/106101060/>

**COURSE OUTCOMES:**

Attheendofthecourse, students will be able to

1. **Analyze** performance of algorithms using asymptotic notations, performance analysis, disjoint sets, spanning trees and connected components
2. **Describe and analyze** paradigms for designing good algorithms using Divide-and-Conquer and Greedy Techniques, applications, binary search, sorting and Strassen,,s matrix, greedy method, job sequencing, spanning trees and shortest path problem.
3. **Synthesize** dynamic-programming algorithms and analyze matrix chain, optimal binary search, knapsack problem and optimization methods, all pairs shortest path, travelling sales problem and reliability design.
4. **Apply** backtracking and branch and bound techniques to solve some complex problems, n-queenproblems,subsetproblem,graphcoloring,Hamiltoniancyclesandbranchbound methods, travelling sales, knapsack problem, branch and bound, FIFO branch
5. **Apply**algorithmdesigntechniquetosolvecertainNP-complete problems.

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
COs	ProgrammeOutcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2									3	2	
CO2	3	2	3	2									3	2	
CO3	3	2	3	2									3	2	
CO4	3	2	3	2									3	2	
CO5	3	2	3	2									3	2	



<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code: C0520</b>	<b>Operating Systems Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:1</b>		<b>-</b>	<b>-</b>	<b>2</b>

**Prerequisites:** A course on “Programming for Problem Solving”, A course on “Computer Organization and Architecture”.

**Co-requisite:** A course on “Operating Systems”.

#### **COURSE OBJECTIVES:**

- To provide an understanding of the design aspects of operating system concepts through simulation
- Introduce basic Unix commands, systemcall interface for process management, interprocess communication and I/O in Unix

**Software Requirements: UNIX /LINUX Operating System, Windows and Turbo C/C++**

#### **LIST OF EXPERIMENTS:**

1. Write C programs to simulate the following CPU Scheduling algorithms a)FCFS b) SJF c) Round Robin d) priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close,fcntl, seek, stat, opendir, readdir)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
4. Write a C program to implement the Producer –Consumer problem using semaphores using UNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms a)Pipes b) FIFOs
6. Write C programs to illustrate the following IPC mechanisms a)MessageQueues b)SharedMemory
7. Write C programs to simulate the following memory management techniques a) Paging b)Segmentation
8. Write C programs to simulate Page replacement policies a) FCFS b)LRU c)Optimal

#### **COURSE OUTCOMES:**

- Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
- Able to implement C programs using Unix system calls

#### **TEXT BOOKS:**

1. Operating System Principles-Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7<sup>th</sup> Edition, John Wiley
2. Advanced programming in the Unix environment, W.R. Stevens, Pearson education.

#### **REFERENCE BOOKS:**

1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition – 2005, Pearson Education/PHI
2. Operating System – A Design Approach – Crowley, TMH.

3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE</b>	<b>B.Tech. V Semester</b>		
<b>Code:C0451</b>	<b>MICRO PROCESSORS AND MICRO CONTROLLERS LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:2</b>		-	-	<b>2</b>

### Course Objectives:

To introduce programming skills related to micro controllers.

### LIST OF EXPERIMENTS

1. Arithmetic operations of 8-bit numbers using 8085.
2. Logical operations of 8-bit numbers using 8085.
  - a) Binary to BCD code conversions
3. BCD to Binary code conversions using 8085.
4. Arithmetic logical operations of 16-bit numbers using 8086
5. Programming using arithmetic, logical and bit manipulation instructions of 8051.
6. Program to toggle all the bits of Port P1 of 8051 continuously with 250 ms delay.
7. Program to interface seven segment display unit using 8051
8. Program to transmit/receive a message from Microcontroller to PC serially using RS232 using 8051
9. Program to interface Stepper Motor to rotate the motor in clockwise and anti clockwise directions using 8051
10. Program to interface a relay using 8051.
11. Program to interface LCD data pins to port P1 of 8051 and display a message on it.
12. Program for Traffic Light Controller using 8051

### COURSE OUTCOMES:

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

1. Understand the 8085 processor instructions
2. Develop 8085 programming skills
3. Able to understand 8086 processor instructions
4. Interface different input & output devices to Microcontroller
5. Establish serial communication for interfacing devices

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE</b>	<b>B.Tech. V Semester</b>		
<b>Code:C0H03</b>	<b>ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLSLAB</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:1</b>		-	-	2

**Prerequisites:Nil**

**Course Objectives:**

The learners need to be aware of the characteristics of technical communication in their workplaces; as a result, they are exposed to different channels of technical communication. Hence the acquired skills make the learners effective communicators using persuasive language. Besides the above said, one of the major objectives is to maintain objectivity in writing documents and to produce professional quality documents using different components of the language.

**Methodology:**

Facilitator's role: Since classroom learning augments thinking process, helping them to develop written, spoken and non verbal communication, the facilitator / Faculty would briefly discuss the topics with the students and later on guide them while the students involved in activities, writing work and while making presentations. The facilitator is required to design a lot of practical/industry oriented project works for the students

\*Students are required to participate, perform, write and submit the work in the form of written documents or Power Point Presentations to hone their spoken written and non verbal communication skills. Students are to take up field work and submit the project work.

**MODULE I Oral Presentations 9Periods**

Mechanics of Presentations – Methodology of Presentation, Importance of Non-verbal communication during presentations – Nuances of Presentation.\* This particular module is for internal evaluation purpose(s).

**MODULE II E-Correspondence and Social Media Etiquette 9Periods**

Common web mail services, yahoo, gmail etc, fields to pay attention- To:, Cc:, Bcc:, Reply All, Subject, Salutation, Body, Signature, Font, Caps Lock, Highlight, The 'KISS' strategy (Keep It Simple and Short,) Points to remember while signing off, Introduction to Technical Vocabulary, Cultural Differences

This Module is purely for internal assessment / evaluation

**MODULE III Group Discussion 9Periods**

.Initiators- Contributor-Informer-Team Leader-Motivator-Creative Contributor , Importance of , Nonverbal communication -eyecontact, voice characters, posture, gestures, do's and don'ts, Role play and Simulation-Learners assuming the roles of characters and participating in Group discussion, analysis, or prediction with strictly defined goals.

**MODULE IV Interview Skills & Office Etiquette 9Periods**

Preparing for the interview, types of interviews, interview session, importance of nonverbal communication during the interview, do's and don'ts of interview, follow up and thanking letter. FAQ's. Formal Conversation, office attire - do's and don'ts, greetings and meetings, speaking to Seniors and handshakes, offering and taking visiting cards, Asking questions and Seeking Clarifications.

**MODULE V Career Progression 9Periods**

Job Hunt Process-SWOT analysis, correspondence and browsing the internet to search for

asuitablejob(s), jobapplication-over letter drafting, drafting a winning resume’, types of resume’s - electronic, video and printed resume’s Instruction: Students are required to prepare their video resume which will be assessed by the faculty member.

### References

- 1 Chrissie:**HandbookofPracticalCommunicationSkills**:JaicoPublishinghouse,1999.
- 2 Daniels,Aubrey:**BringingOuttheBestinPeople**:TataMcGraw-Hill:NewYork,2003.
- 3 [Wright](#),Goulstone, Mark: **Just Listen: Discover the Secret to getting through toabsolutelyanything**: AmericanManagement Association, 2010.
- 4 Leslie.T.Giblin:**Skillwithpeople**Publicationdetailsnotknown
- 5 Lewis,Norman:**WordPowerMadeEasy**:GoyalPublications:NewDelhi,2009.
- 6 Murthy,A.G,Krishna,:**TenMuch** :TataMcGraw-Hill:NewDelhi,2010.

### E-Resources

1. [http://www.mindtools.com/pages/article/newTMC\\_05.htm](http://www.mindtools.com/pages/article/newTMC_05.htm)
2. <http://www.kent.ac.uk/careers/intervw.htm>
3. <http://www.wikihow.com/Write-a-Report>

**CourseOutcomes** :At theendofthecourse,students willbeable to

- 1 GiveOralPresentationsConfidently.
- 2 DraftappropriateResumeinaccordancewiththecontext.
- 3 Participateandpresenttheirviewandideaslogicallyand confidently.
- 4 Understandtheimportanceofcommunicationinvarioussettings.
- 5 Utilizethetechnologyforcareer advancement.

### CO-POMAPPING

CO-POMapping (3/2/1indicatesstrength ofcorrelation)3-Strong,2-Medium,1-Weak															
COS	ProgrammeOutcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	1	-	-	-	-	2	-	2	-	-	-
CO2	-	-	-	-	-	-	-	-	-	1	-	2	-	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-
CO4	-	-	-	-	1	1	-	-	1	2	-	2	-	-	-
CO5	-	-	-	1	1	-	-	-	1	2	-	2	-	-	-

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE</b>	<b>B.Tech. V Semester</b>		
<b>Code:C0530</b>	<b>UI DESIGN-FLUTTER</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:1</b>		-	-	2

**Course Objectives:**

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widges and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

**Course Outcomes:**

- Implements Flutter Widgets and Layouts
- Responsive UI Design and with Navigation in Flutter
- Create custom widgets for specific UI elements and also Apply styling using themes and custom styles.
- Design a form with various input fields, along with validation and error handling
- Fetches data and write code for unit Test for UI components and also animation

**List of Experiments:** Students need to implement the following experiments

1. a)Install Flutter and Dart SDK.  
b)Write a simple Dart program to understand the language basics.
2. a)Explore various Flutter widgets (Text,Image,Container,etc.).  
b)Implement different layout structures using Row, Column, and Stack widgets.
3. a)Design a responsive UI that adapts to different screen sizes.  
b)Implement media queries and breakpoints for responsiveness.
4. a)Setup navigation between different screens using Navigator.  
b)Implement navigation with namedroutes.
5. a)Learnaboutstatefulandstatelesswidgets.  
b) Implement state management using set State and Provider.
6. A) Create custom widgets for specific UI elements.  
b)Apply styling using themes and custom styles.
7. a)Design a form with various input fields.  
b)Implement form validation and error handling.
8. a)Add animations to UI elements using Flutter's animation framework.  
b)Experiment with different types of animations (fade,slide,etc.).
9. a)Fetch data from a REST API.  
b)Display the fetched data in a meaningful way in the UI.
10. a)Write unit tests for UI components.  
b)Use Flutter's debugging tools to identify and fix issues.

**TEXTBOOK:**

1. MarcoL.Napoli, Beginning Flutter:AHands-onGuidetoAppDevelopment.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code:C00M5</b>	<b>Constitution of India</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:Nil</b>		<b>3</b>	<b>-</b>	<b>-</b>

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

### **Course Contents**

1. Meaning of the constitution law and constitutionalism.
2. Historical perspective of the Constitution of India.
3. Salient features and characteristics of the Constitution of India.
4. Scheme of the fundamental rights.
5. The scheme of the Fundamental Duties and its legal status.
6. The Directive Principles of State Policy – Its importance and implementation.

7. Federal structure and distribution of legislative and financial powers between the Union and the States.
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India.
9. Amendment of the Constitutional Powers and Procedure.
10. The historical perspectives of the constitutional amendments in India.
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency.
12. Local Self Government – Constitutional Scheme in India.
13. Scheme of the Fundamental Right to Equality.
14. Scheme of the Fundamental Right to certain Freedom under Article 19.
15. Scope of the Right to Life and Personal Liberty under Article 21.



<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE</b>	<b>B.Tech. V Semester</b>		
<b>Code:C00M3</b>	<b>QUANTITATIVE APTITUDE AND VERBAL REASONING – I (CommonforAllBranches)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:Nil</b>		<b>2</b>	<b>-</b>	<b>-</b>

MODULE–I

8PERIODS

**Quants: Percentages, ProfitandLoss.**

Percentages – Percentage Increase / Decrease; Results on Population; Results on Depreciation. Profit & Loss – Cost Price; Selling Price: Profit or Gain; Gain Percentage; Loss Percentage. Verbal: Articles, Para Jumbles Articles- Types of articles, Countable nouns, Uncountable nouns, Usage of articles, Omission of articles. Para Jumbles - Para Jumbles, Types of Para Jumbles, Strategies to answer questions on Jumbled Paragraphs. Logical: Data Arrangements, Blood Relation Data Arrangements- Linear Arrangement, Circular Arrangement, Multi-Dimensional Arrangement. Blood Relations- Classification of blood relations, Pointing a person, Equation related problems.

MODULE–II

6PERIODS

**Quants:Interests**

**Interests**-Types of interest; Simple interest; principle; Rate of interest; compound interest; interest is compounded Annually; interest is compounded Half-yearly; interest is compounded Quarterly; Rates are different for different years, say R1%, R2%, R3% for 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> year respectively; Present worth of Rs.xduen years. Verbal: Sentence Completion, Prepositions **Sentence Completion**- Formats of Question; Strategies to solve sentence completion questions – Proactive and reactive solving, Identifying clues -Signposts,Types of sign posts, Root words, Sentence structure clues. **Prepositions**- Definition, Types of prepositions, Preposition of Place, Preposition ofTime, Preposition of Direction, Compound Prepositions, Prepositional Phrases. Logical: Coding and Decoding **Coding and Decoding**-Number Series, Alphabet Series, Analogy, Odd Man Out, Visual Reasoning.

MODULE–III

6PERIODS

**Quants:RatioandProportion,Averages Ratios & Proportion**-The ratio of two quantities a and b in the same units; Proportion; The equality of two ratios is called proportion; Fourth Proportional; Mean Proportional; Comparison of Ratios; Duplicate Ratios; Variations. **Averages** – Average Speed, Weighted average Verbal:**Vocabulary**-Etymology, Root Words, Prefixes and Suffixes; Synonyms and Antonyms, Tips to solve questions on Synonyms and Antonyms; Word Analogy, Patterns of questions on Word Analogy; Miscellaneous Vocabulary. Logical: Data Interpretation and Data Sufficiency **Data Interpretation**-Tables, Piecharts, Bar Graphs, Line graphs **Data Sufficiency**-Strategies to solve.

MODULE– IV

6PERIODS

**Quants:Timeand Work; Time & Work**-Work from Days: Calculate the one –day work; Days from Work: Shortcut to calculate the work in given time; Verbal: Sentence Correction **Sentence Correction** –Subject –Verb Agreement; Modifiers; Parallelism; Pronoun-Antecedent Agreement; Verb Time Sequence; Comparisons; Determiners; Exercise

Questions. Logical: Clocks and Calendars **Clocks:** Introduction, Derivation of angles, Angles between hands of the clock, Hands together, Hands at angular distance, Gain & Loss problems. **Calendars:**-Leap year –Non leap year, Odd days, Finding the day from date, Repeated years.

MODULE-V:

6PERIODS

**Quants:****Mixtures and Alligations; Alligation**-Mean Price; Rule of Alligation; a container contains x of liquid from which y units are taken out and replaced by water; Verbal: Reading Comprehension, Critical Reasoning **Reading Comprehension** –Speed reading strategies; Reading Comprehension – types of questions, tackling strategies; Critical Reasoning. Logical: Directions, Cubes, Syllogisms **Directions** -Introduction, Direction based questions, Shadow based problems. **Cubes**-Cube & cuboid concepts, 3-2-1-0 faced problems. **Syllogisms**-Statements and Conclusion, Syllogisms using Venn Diagrams.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VI Semester</b>		
<b>Code:C6908</b>	<b>APPLICATIONS OF IoT</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Course Objectives:**

- Explain the definition and usage of the term “The Internet of Things” indifferent contexts.
- Understand where the IoT concept fits within the broader ICT industry and possible future trends
- Appreciate the role of big data, cloud computing and data analytics in a typical IoT system.
- Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack.
- Design a simple IoT system comprising sensors, edge devices, wireless network connections and data analytics capabilities.
- Use the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis.

**MODULE 1: INTRODUCTION TO INTERNET OF THINGS**

The technology of the internet of things, making the internet of things, Elements of an IoT ecosystem, design principles for connected devices, Web thinking for connected devices.

**MODULE 2: IoT Devices**

IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Connecting Raspberry Pi via SSH. Linux on Raspberry Pi, Raspberry Pi Interfaces, Other IoT devices.

**MODULE 3: Python with Raspberry pi**

Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operate the Raspberry Pi in “headless mode”, Bash Command line, operating Raspberry Pi without needing a GUI interface, Basics of the Python programming language, programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow, Programming RaspberryPi with Python,

**MODULE 4: M2M and IoT Technology Fundamentals**

Devices and gateways, Local and wide area networking, Data management, Business processes in IoT security, Steps towards a Secure Platform, Privacy-Preserving sharing

of IOT Data, Secure Authentication and Access Control in Constrained Devices, Smarties Approach.

## MODULE 5: IoT Applications

IoT Applications —IoT applications in home, infrastructures, buildings, Industries, Home appliances, other IoT electronic equipments, Industry 4.0 concepts. Value Creation for Industry, Value Creation and Challenges, The Smart Factory Initiative, Cost-effective Process Integration of IoT Devices, IoT for Retailing Industry.

### TEXT BOOKS

1. Ovidiu Vermesan, Peter Friess, “Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems” River Publishers, 2013.
2. Simon Monk, “Programming the Raspberry Pi: Getting Started with Python”, January 2012, McGraw Hill Professional.
3. Adrian McEwen, Hakim Cassimally “Designing the Internet of Things”, John Wiley & Sons, 2014.
4. Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.

### REFERENCE BOOKS

1. Qusay F. Hassan, “Internet of Things A to Z: Technologies and Applications”, John Wiley & Sons, 2018.
2. Alessandro Bassi, Martin Bauer, “Enabling Things to Talk: Designing IoT solutions with the IoT Architectural Reference Model”, Springer, 2013.
3. Eben Upton and Gareth Halfacree, “Raspberry Pi User Guide”, August 2016, 4th edition, John Wiley & Sons.
4. Joe Biron and Jonathan Follett “Foundational Elements of an IoT Solution: The Edge, The Cloud, and Application Development”, First Edition. Cisco Press, 2017.

### E BOOKS

1. [https://www.worldcat.org/title/internet-of-things/oclc/896359016&referer=brief\\_results](https://www.worldcat.org/title/internet-of-things/oclc/896359016&referer=brief_results)

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VI Semester</b>		
<b>Code:C6909</b>	<b>PROGRAMMING LANGUAGES FOR IOT</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

1. This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi.
2. The course focuses on higher-level operating systems, advanced networking, user interfaces, multimedia and uses more computing intensive IoT applications as examples using Raspberry Pi running Linux as the platform of choice.

### UNIT - I

Getting Started with Raspberry Pi: Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS, Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operates the Raspberry Pi in “headless mode”, Bash Command line, operating Raspberry Pi without needing a GUI interface.

Basics of Python programming language: Programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow.

### UNIT - II

**Introducing Micro Python:** MicroPython Features, MicroPython Limitations, Experimenting with Python on PC, Installing Python 3 on Windows 10, Running the Python Console, Running Python Programs with the Interpreter, The Run, Evaluate, Print Loop (REPL Console), Off and Running with MicroPython, Additional Hardware, Basic Electronics Kit, Breadboard and Jumper Wires and 3 Examples.

### UNIT - III

**IoT Physical Servers and Cloud Offerings:** Introduction to Cloud Storage models and communication APIs. Web Server – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API. Connecting to APIs.

### UNIT - IV

**Baking Pi:** Powering Raspberry Pi, Formatting SD cards, Installing and connecting Raspberry pi, How to tell Raspberry pi is working, Installing Raspbian with NOOBS, Networking Raspberry Pi, Connecting with Ethernet, Connecting Via Local Computer Network, Connecting Via Wireless Network, Updating and

Upgrading, Setting up a Host Name, Connecting Raspberry pi with SSH, Creating Simple Raspberry pi application.

#### **UNIT - V**

**FIRST Project on Java:** Bill of Materials, Getting Started with NetBeans, Downloading and Configuring NetBeans, Revisiting HelloRaspberryPi, Brewing Java, Communicating with a USB Scale, Coffee Calculator, Asynchronous Communication, Coffee Brewing Recipe, Commercial Licensing.

#### **TEXT BOOKS:**

1. Simon Monk, “Programming the Raspberry Pi: Getting Started with Python”, January 2012, McGraw Hill Professional.
2. MicroPython for the Internet of Things, A Beginner’s Guide to Programming with Python on Microcontrollers, Charles Bell, Apress.
3. Raspberry Pi with Java: Programming the Internet of Things (IoT) (Oracle Press) 1st Edition.

#### **REFERENCE BOOKS:**

1. Eben Upton and Gareth Halfacree, “Raspberry Pi User Guide”, August 2016, 4th edition, John Wiley & Sons
2. Alex Bradbury and Ben Everard, “Learning Python with Raspberry Pi”, Feb 2014, John Wiley & Sons
3. Michael Margolis, “Arduino Cookbook”, First Edition, March 2011, O’Reilly Media, Inc
4. The official raspberry Pi Projects Book,  
[https://www.raspberrypi.org/magpiissues/Projects\\_Book\\_v1.pdf](https://www.raspberrypi.org/magpiissues/Projects_Book_v1.pdf)

<b>2022-23 Onwards (MR22)</b>	<b>MALLAREDDYENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VI Semester</b>		
<b>Code:C6620</b>	<b>MachineLearning</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

PREREQUISITES: NIL

**Course Objectives:**

This course provides the students a broad introduction to python programming, machine learning, discuss about various learning algorithms like decision tree learning, Bayesian learning, computational learning, instance based learning, combined inductive and analytical learning methods, analyze genetic algorithms and various learning set of rules.

**MODULE I: PYTHON PROGRAMMING-MACHINE LEARNING (ML) [10 PERIODS]**

**INTRODUCTION TO PYTHON:**

Python, expression, variables, assignment statements, functions, built in function, strings, modules, lists, making choice( Boolean, if, storing conditional statements), repetition(loops, while, counted loops, user input loops, control loops , style notes), File processing( one record per line, records with multiple fields, positional data, multiline records, looking ahead, writing files), sets and dictionaries( sets, dictionaries, inverting a dictionary), Algorithms with suitable example. Construction of functions, methods, Graphical user interfaces, databases and applications.

**Introduction** - Well-posed learning problems, designing a learning system, Perspectives and issues in ML

**Concept Learning**-Introduction, Concept Learning task, Concept learning as search, Find-S: Finding a maximally specific hypothesis, Version spaces and candidate elimination algorithm, Remarks on version spaces and Candidate elimination, Inductive bias.

**Module II: Decision Tree Learning and ANN [09 Periods]**

**Decision Tree learning** - Introduction, Decision Tree representation, Appropriate Problems, Decision Tree learning algorithm, Hypothesis Space Search, Inductive bias, Issues.

**Artificial Neural Networks** - Introduction, Neural network representation, Problems for Neural Network Learning, Perceptions, Multilayer networks and Back Propagation algorithm, Remarks on back propagation algorithm, Evaluation Hypotheses, Motivation, Estimation hypothesis accuracy, Sampling theory, General approach for deriving confidence intervals, Difference in error of two hypotheses,

**Module III: Bayesian learning and Instance based Learning [10 Periods]**

**A: Bayesian learning** - Introduction and concept learning, Maximum Likelihood and Least Squared Error Hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle.

**B: Instance-based Learning** - K -Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Lazy and Eager Learning, Genetic Algorithm: Motivation, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

**Module IV: Rules and Analytical Learning****[09 Periods]**

**Learning Set of Rules** - Introduction, Sequential Covering Algorithms, Learning Rule Sets: Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution.

**Analytical Learning** - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

**Module V: Learning Techniques****[10 Periods]**

**Combining Inductive and Analytical Learning**- Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to initialize Hypothesis, Using Prior Knowledge to alter Search Objective, Using Prior Knowledge to Augment Search Operators. **Reinforcement Learning**- Introduction, Learning Task, QLearning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

## TEXT BOOKS:

1. Jennifer Campbell, Paul Gries, Jason Montojo, Greg Wilson, "Practical Programming" An introduction to Computer Science Using Python
2. Tom M. Mitchell, "**Machine Learning**", MGH, 1<sup>st</sup> Edition, 2013.
3. Stephen Marsland, "**Machine Learning: An Algorithmic Perspective**", Chapman and Hall / CRC, 2<sup>nd</sup> Edition, 2014.

## REFERENCES:

1. Neural Networks, William Hsieh, "**Machine Learning Methods in the Environmental Sciences**"
2. Richard O. Duda, Peter E. Hart and David G. Stork, "**Pattern Classification**", John Wiley & Sons Inc., 2001
3. Chris Bishop, "**Neural Networks for Pattern Recognition**", Oxford University Press, 1995

## E-RESOURCES:

1. <http://www.zuj.edu.jo/download/machine-learning-tom-mitchell-pdf/>
2. <https://goo.gl/FKioSh>
3. <http://www.ntu.edu.sg/home/egbhuang/pdf/ieee-is-elm.pdf>
4. [www.fxpal.com/publications/a-genetic-algorithm-for-video-segmentation-and-summarization.pdf](http://www.fxpal.com/publications/a-genetic-algorithm-for-video-segmentation-and-summarization.pdf)
5. <http://nptel.ac.in/courses/106106139/>
6. <http://nptel.ac.in/courses/106105152/>

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



<b>2022-23 Onwards (MR22)</b>	<b>MALLAREDDYENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VI Semester</b>		
<b>Code:C6620</b>	<b>COMPUTER VISION AND ROBOTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Course Objectives:**

- To understand the Fundamental Concepts Related To sources, shadows and shading
- To understand the The Geometry of Multiple Views

**UNIT-I**

**CAMERAS:** Pinhole Cameras **Radiometry–Measuring Light:** Light in Space, Light Surfaces, Important Special Cases **Sources, Shadows, And Shading:** Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models **Color:** The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

**UNIT-II**

**Linear Filters:** Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates **Edge Detection:** Noise, Estimating Derivatives, Detecting Edges **Texture:** Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

**UNIT-III**

**The Geometry of Multiple Views:** Two Views **Stereopsis:** Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras **Segmentation by Clustering:** Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph – Theoretic Clustering,

**UNIT-IV**

**Segmentation by Fitting a Model:** The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness **Geometric Camera Models:** Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations **Geometric Camera Calibration:** Least –Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization

**UNIT-V**

**Introduction to Robotics:** Social Implications of Robotics, Brief history of Robotics, Attributes of hierarchical paradigm, Closed world assumption and frame problem, Representative Architectures, Attributes of Reactive Paradigm, Subsumption Architecture, Potential fields and Perception **Common sensing techniques for Reactive**

**Robots:** Logical sensors, Behavioural Sensor Fusion, Pro-prioceptive sensors, Proximity Sensors, Topological Planning and Metric Path Planning

**TEXT BOOKS:**

1. David A. Forsyth and Jean Ponce: Computer Vision—A Modern Approach, PHI Learning (Indian Edition), 2009.
2. Robin Murphy, Introduction to AI Robotics, MIT Press.

**REFERENCE BOOKS:**

1. E.R. Davies: Computer and Machine Vision—Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. The Robotics premier, Maja J Matari, MIT Press.
3. Richard Szeliski “Computer Vision: Algorithms and Applications” Springer-Verlag London Limited 2011.

<b>022-23 Onwards (MR22)</b>	<b>MALLAREDDYENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VI Semester</b>		
<b>Code:C1215</b>	<b>REAL TIME SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives

- To provide abroad understanding of the requirements of Real Time Operating Systems.
- To make the student understand, applications of these Real Time features using case studies.

### UNIT-I

**Introduction:** Introduction to UNIX/LINUX, Overview of Commands, File I/O, (open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

### UNIT-II

**Real Time Operating Systems:** Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

### UNIT-III

**Objects, Services and I/O:** Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

### UNIT-IV

**Exceptions, Interrupts and Timers:** Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

### UNIT-V

**Case Studies of RTOS:** RT Linux, Micro C /OS-II, Vx Works, Embedded Linux, and Tiny OS.

### TEXT BOOK:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011
2. Embedded Systems-Architecture, Programming and Design by Rajkamal, 2007, TMH.

### REFERENCE BOOKS:

1. Advanced UNIX Programming, Richard Stevens
2. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

<b>2022-23 Onwards (MR22)</b>	<b>MALLAREDDYENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VI Semester</b>		
<b>Code:Nil</b>	<b>EMBEDDED HARDWARE DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

- Knowledge on fundamental concepts on building hardware, Serial ports, AVR Micro controllers and CAN.

### UNIT-I

**An Introduction to Computer Architecture** - Processors, Basic System Architecture, Interrupts, CISC and RISC, Digital Signal Processors, Memory and its types, Input/Output, DMA, Parallel and Distributed Computers, Embedded Computer Architecture **Forth/Open Firmware** -Introducing Forth, String Word, Stack Manipulation, Creating New Words, Comments, if...else, Loops, Data Structures, Interacting with Hardware and Memory, Forth Programming Guidelines

### UNIT-II

**Building Hardware** - Tools, Soldering, Quick Construction, Printed-Circuit Boards, Building it, JTAG **Adding Peripherals Using SPI** – Serial Peripheral Interface, SPI-Based Clock / Calendar, SPI –Based Digital Potentiometer **Adding Peripherals Using I2C** – Overview of I<sup>2</sup>C, Adding a Real-Time Clock with I<sup>2</sup>C, Adding a Small Display with I2C

### UNIT-III

**Serial Ports** –UARTs, Error Detection, Old Faithful: RS-232C, RS-422, RS-485 **IrDA**– Introduction to IrDA, An IrDA Interface, Other Infrared Devices **USB** –Introduction to USB, USB Packets, Physical Interface, Implementing USB Interface

### UNIT-IV

**Networks**–Controller Area Network (CAN), Ethernet **Analog** – Amplifiers, A to D conversion, Interfacing an External ADC, Temperature Sensor, Light sensor, Accelerometer, Pressure Sensor, Magnetic-Field Sensor, D to A conversion, PWM, Motor Control, **The PIC Microcontrollers** - A Tale of Two Processors, Starting simple, A Bigger PIC, Motor control with a PIC

### UNIT-V

**The AVR Micro controllers** –The AVR Architecture, The ATtiny 15 Processor, Downloading Code, A Bigger AVR, Bus interfacing **68000-Series Computers**– Architecture, A Simple 68000 -Based Computer **DSP – Based Controllers** –The DSP 56800, ADSP56805 - Based Computer, JTAG

### TEXT BOOK:

1. John Catsoulis, Designing Embedded Hardware, 2nd Edition, O'Reilly Media, Inc.

### REFERENCE BOOK:

K. Shibu, Introduction to Embedded Systems, McGraw Hill Education.

<b>2022-23 Onwards (MR22)</b>	<b>MALLAREDDYENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VI Semester</b>		
<b>Code:</b>	<b>ENERGY SOURCES AND POWER MANAGEMENT/Renewable Energy Source</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Course objectives:**

- To facilitate the students to achieve a clear conceptual understanding of technical and commercial aspects of Conventional energy Sources, Power distribution management system.

**Course Outcomes:**

- Understand conventional energy sources and energy management system.
- Understand the significance of intelligent electronic devices
- Knowledge on energy distribution management system
- Understand the importance of smart meters

**UNIT-I**

**Introduction to Energy Sources:** Conventional energy sources---Thermal, Hydel, Nuclear, Gas powerstations (Single linediagrams–qualitativeapproach only)

**UNIT-II**

Renewable energy sources --Solar, wind, Tidal, wave, OTEC, Fuelcells, Geothermal, Energy Storage.

**UNIT-III**

**Energy Management System:** Energy Management System (EMS) – SMART GRID - Smart GridConcept - Definitions and Need for Smart Grid – Functions – Opportunities – Benefits and challenges,Difference between conventional & Smart Grid, Smart substations - Substation Automation - FeederAutomation, SCADA – Remote Terminal Unit – Intelligent Electronic Devices – Protocols, Phasor Measurement Unit–Wide area monitoring protection and control, Smart integration of energy resources

**UNIT-IV**

**Distribution Management System:** Distribution Management System (DMS) – Volt / VAR control –Fault Detection, Isolation and Service Restoration, Network Reconfiguration, Outage managementSystem, Customer Information System, Geographical Information System, Effect of Plug in Hybrid Electric Vehicles

**UNIT-V**

**SmartMeters:** Introduction to Smart Meters –Advanced Metering infrastructure (AMI), AMI protocols – Standards and initiatives, Demand side management and demand response programs, Demand pricing and Time of Use, Real Time Pricing, Peak Time Pricing.

**TEXTBOOKS:**

1. StuartBorlase‘SmartGrid:Infrastructure,TechnologyandSolutions’,CRCPress2012.

2. JanakaEkanayake,NickJenkins,KithsiriLiyanage,JianzhongWu,AkihikoYokoyama, 'SmartGrid:TechnologyandApplications', Wiley,2012
3. Generation,distributionandutilizationofElectricpower,C.L.Wadhwa,NewAgePublications
4. Renewablesourcesandemergingtechnologies,D.P.Kothari,K.C.Singal,RakeshRanjan, PHI2/e.

**REFERENCEBOOKS:**

1. MiniS.Thomas,JohnDMcDonald, 'PowerSystemSCADAandSmartGrids', CRCPress, 2015
2. KennethC.Budka,JayantG.Deshpande,MarinaThottan, 'CommunicationNetworksfor SmartGrids', Springer,2014.

**EBOOKS:**

1. <https://books.google.co.in/books?isbn=1119969093>
2. <https://books.google.co.in/books?isbn=135123093X>

<b>2022-2023 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VI Semester</b>		
<b>Code: C0518</b>	<b>SOFTWARE ENGINEERING AND MODELING (Common for CSE and IT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

PREREQUISITES: NIL

**Course Objectives:**

This course enables students to learn fundamental aspects of Software Engineering, analyze various process models, identify various types of requirements and the process for Requirements Engineering, make use of various System Models to conceptualize and construct a system, demonstrate different testing tactics and define metrics for software measurement, classify and mitigate the Software Risks, learn to achieve quality standards, understand the Unified Modeling Language Principles and learns fundamental process pattern for object-oriented analysis and design.

**MODULE I: Introduction to Software Engineering [09 Periods]**

**Basic terms of Software Engineering-** The evolving role of software, Changing Nature of Software, Software Myths, Software engineering-A layered technology, A Process Framework, The Capability Maturity Model Integration (CMMI). **Process Models-** The water fall model, Incremental process models, evolutionary process models, unified process.

**MODULE II: Requirements of Software Engineering [09 Periods]**

**Software Requirements-** Functional and non-functional requirements, User requirements, System requirements, Interface specification, software requirements document. **Requirements Engineering Process** - Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

**MODULE III: Phases of Software Engineering [10 Periods]**

**A: System Models** -Context models, Behavioral models, Data models, Object models, structured methods. **B: Design Engineering and creating an Architectural Design-** Design process and Design quality, Design concepts, the design model, Software architecture, Data design, Architectural styles and patterns, Architectural Design.

**MODULE IV: Testing Methodology [09 Periods]**

**Testing Strategies-** A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box Testing, Validation Testing, System Testing. **Risk Management** - Reactive vs proactive risk strategies, RMMM and plan. Quality concepts, Software quality assurance, Software reviews, Statistical Software Quality Assurance, Software Reliability, ISO 9000 Quality standards

**MODULE V: Introduction to UML and Modeling [11 Periods]**

**Introduction and Architecture-** Introduction to UML, Importance of modeling, principles of modeling, object oriented modeling. Conceptual model of the UML, Architecture, Use cases **Basic Behavioral and Structural-** Use case Diagrams, Activity Diagrams, Classes, Relationships, common Mechanisms and diagrams. Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Terms, concepts, modeling techniques for Class and Object Diagrams, Interactions, Interaction diagrams.

**TEXTBOOKS:**

1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, McGraw-Hill International Edition, 6<sup>th</sup> edition.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, – The Unified Modeling Language User Guide, Pearson Education.

**REFERENCES:**

1. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Springer Verlag, 1997.
2. Meilir Page-Jones, – Fundamentals of Object Oriented Design in UML, Pearson Education.

**E – RESOURCES:**

1. <http://freequestionpaper.in/questionpaper/2014/08/Software-Engineering-Roger-S-Pressman-5th-edition-IDM.pdf>
2. [https://books.google.co.in/books?id=PqsWaBkFh1wC&printsec=frontcover&dq=software+engineering+by+ian+sommerville+FREE+download&hl=en&andsa=X&ved=0ahUKEwjv5fhpB\\_TAhUHOo8KH50AC4Q6AEIKjAB#v=onepage&q=software%20engineering%20by%20ian%20sommerville%20FREE%20download&df=false](https://books.google.co.in/books?id=PqsWaBkFh1wC&printsec=frontcover&dq=software+engineering+by+ian+sommerville+FREE+download&hl=en&andsa=X&ved=0ahUKEwjv5fhpB_TAhUHOo8KH50AC4Q6AEIKjAB#v=onepage&q=software%20engineering%20by%20ian%20sommerville%20FREE%20download&df=false)
3. <http://ieeexplore.ieee.org/document/4807670/>
4. <https://link.springer.com/search?facet-journal-id=40411&package=openaccessarticles&query=&facet-sub-discipline=%22Software+Engineering%22>
5. <http://freevideolectures.com/Course/2318/Software-Engineering>

**COURSE OUTCOMES:**

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

1. **Analyze** the customer business requirements and choose the appropriate Process model for the given project
2. **Elicit** functional and non-functional requirements using rigorous engineering methodology
3. **Conceptualize** and achieve requirements defined for the system using Architectural styles and Design patterns
4. **Design** Test cases and define metrics for standardization, mitigate and monitor the risks and assure quality standards.
5. **Understand** the basic concepts of UML and Implement the real time application using UML concepts

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



<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. V Semester</b>		
<b>Code: C6910</b>	<b>Application of IOT Lab CSE (IOT)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		<b>-</b>	<b>-</b>	<b>2</b>

#### COURSE OBJECTIVES:

Develop ability to

1. Assess the vision and introduction of IoT and understanding how M2M is connected to internet of things
2. Identify the appropriate Hardware and software components of IoT for communication
3. Gain knowledge on Cloud Storage models, web servers and how to integrate device, data and cloud management framework for IoT.
4. Learn the concepts of various data analytics and operational technology security with IoT.
5. Understand advanced and emerging concepts fog computing and Edge computing-IoT

#### LIST OF EXPERIMENTS

1. Getting Started with IoT (Arduino).
2. Write an Arduino sketch to blink an LED Light for a particular interval of time.
3. Write an Arduino sketch to measure the distance (in cms) of a certain object.
4. Write an Arduino sketch to
  - i. Blink an LED and a buzzer if the distance measured is less than a threshold value
  - ii. Illustrate the working of PIR Sensor with an example.
  - iii. Illustrate the IR and DHT Sensor.
5. Write an Program to send the humidity and temperature data to Cloud(ThingSpeak)
6. Write a program to alert the user through SMS and Email notification if humidity is greater than a threshold value using IFTTT and Thingspeak cloud.
7. Write a Python program that blinks an LED at a rate of 3 second ON, 1 second OFF
8. Connect a PIR sensor to the GPIO pins of the Raspberry Pi. Perform measurements to determine the range of the sensor, i.e., start with a small distance (e.g., a few inches) and see if the motion sensor responds. Repeat these for increasing distances until the sensor stops responding. Report the measured distance.
9. Select at least 1 input sensor (not PIR) and 1 output device and make the RPi control the chosen output device in response to activity by the input device (e.g., a temperature sensor as input and two or more LEDs indicating the current temperature in binary code).
10. Write a python program for client-server-based intruder detection system using mqtt application layer protocol
11. Write an Arduino sketch to blink an LED Light for a particular interval of time using wireless communication protocol(LoRa)

#### CASE STUDY:

1. Assume that you are in a college, design and implement a IoT prototype to measure the amount of usage of water at a given location (take the location from user) on a day-to-day basis and send the information to Cloud.

1. Receive the above information from the sensors/ cloud and apply necessary algorithms to predict the amount of water being wasted at a particular location and also send a notification to the user.

CO-PO,PSOMapping (3/2/1indicates strengthofcorrelation)3-Strong,2-Medium,1-Weak															
COs	ProgrammeOutcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1								1	1	1		
CO2	3	2										1	2		
CO3	2	1										1	1		

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VI Semester</b>		
<b>Code:C6621</b>	<b>Machine Learning Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:1</b>		-	-	<b>2</b>

**Prerequisites:** Computer Programming, Python

**CourseObjective:**

The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.

**Course Outcomes:**

After the completion of the course the student can able to:

- Understand complexity of Machine Learning algorithms and their limitations;
- Understand modern notions in data analysis - oriented computing;
- Be capable of confidently applying common Machine Learning algorithms inpractice and implementing their own;
- Be capable of performing experiments in MachineLearning using real-world data

**SOFTWARE REQUIREMENT:**

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

**REFERENCES:**

1. WilliRichert,LuisPedroCoelho,—BuildingMachineLearningwithPythonl,Packt Publishing, 2013.

**COURSE OUTCOMES:**

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

1. Underst and the implementation procedures for the machine learning algorithms.
2. Design Java /Python programs for various Learning algorithms.
3. Apply appropriate datasets to the Machine Learning algorithms.
4. Identify and apply Machine Learning algorithms to solve real world problems.

<b>CO-PO, PSOMapping</b>															
<b>(3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak</b>															
<b>COs</b>	<b>ProgrammeOutcomes(POs)</b>												<b>PSOs</b>		
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	1	1		1		1						1	1	2	
<b>CO2</b>	1	1	2	1	1	1						1	1	1	1
<b>CO3</b>	1	1	2	2	2	1		1	1		1	3	1	3	1

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VI Semester</b>		
<b>Code:C00P1</b>	<b>Industrial Oriented MiniProject/Internship/Skill Development Course(Big Data -Spark)</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:2</b>		-	-	<b>4</b>

### Course Objectives:

- The main objective of the course is to process Big Data with advance architecture like spark and streaming data in Spark

### List of Experiments:

- To Study of Big Data Analytics and Hadoop Architecture
  - Know the concept of bigdata architecture
  - Know the concept of Hadoop architecture
- Loading Data Set into HDFS for Spark Analysis Installation of Hadoop and cluster management
  - Installing Hadoop single node cluster in ubuntu environment
  - Knowing the differencing between single node clusters and multi-node clusters
  - Accessing WEB – UI and the port number
  - Installing and accessing the environments such ashive and sqoop
- File management tasks & Basic linux commands
  - Creating a directory in HDFS
  - Moving forth and back to directories
  - Listing directory contents
  - Uploading and downloading a file in HDFS
  - Checking the contents of the file
  - Copying and moving files
  - Copying and moving files between local to HDFS environment
  - Removing files and paths
  - Displaying few lines of a file
  - Display the aggregate length of a file
  - Checking the permissions of a file
  - Zippping and unzipping the files with & without permission pasting it to a location
  - Copy, Paste commands
- Map-reducing
  - Definition of Map-reduce
  - Its stages and terminologies
  - Word –count program to understand map –reduce (Map perphase, Reducer phase, Driver code)
- Implementing Matrix – Multiplication with Hadoop Map - reduce
- Compute Average Salary and Total Salary by Gender for an Enterprise.
- Creating hive tables (External and internal)
  - Loading data to external hive tables from sql tables (or) Structure dc. s. vusing scoop
  - Performing operations like filterations and updations
  - Performing Join (inner, outeretc)

- (v) Writing User defined function on hive tables
- 8. Create a sql table of employees Employee table with id,designation Salary table (salary ,deptid) Create external table in hive with similar schema of above tables,Move data to hive usingscoop and load the contents into tables,filter a new table and write a UDF to encrypt the table with AES -algorithm, Decrypt it with key to show contents
- 9. (i)Pyspark Definition (Apache Pyspark) and difference between Pyspark, Scala, pandas
  - (ii) Pyspark files and class methods
  - (iii) Get (filename)
  - (iv) Get root directory()
- 10. Pyspark-RDD'S
  - (i) What is RDD's?
  - (ii) Ways to Create RDD
  - (iii) Parallelized collections
  - (iv) External dataset
  - (v) Existing RDD's
  - (vi) Spark RDD's operations (Count,foreach(), Collect, join, Cache())
- 11. Perform pyspark transformations
  - (i) Map and flat Map
  - (ii) To remove the words, which are not necessary to analyze this text.
  - (iii) Group By
  - (iv) What if we want to calculate how many times each word is coming in corpus?
  - (v) How do I perform a task (say count the words 'spark' and 'apache' in rdd3) separately on each partition and get the output of the task performed in the separation?
  - (vi) Unions of RDD
  - (vii) Joint two pairs of RDD Base dup on their key
- 12. Pyspark spark conf - Attributes and applications
  - (i) What is Pyspark spark conf()
  - (ii) Using spark conf create a spark session to write a data frame to read details in a c.s.v and later move that c.s.v to another location

**TEXT BOOKS:**

1. Spark in Action, Marko Bonaci and Petar Zecevic, Manning.
2. PySpark SQL Recipes: With HiveQL, Dataframe and Graphframes, Raju Kumar Mishra and Sundar Rajan Raman, Apress Media.

**WEBLINKS:**

1. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_0133015058445189122\\_5182\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0133015058445189122_5182_shared/overview)
2. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01258388119638835242\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01258388119638835242_shared/overview)
3. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_0126052684230082561\\_692\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126052684230082561_692_shared/overview)

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE</b>	<b>B.Tech. VISEmester</b>		
<b>Code:C00M6</b>	<b>INTELLECTUAL PROPERTY RIGHTS</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:Nil</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Course Objectives:**

- Significance of intellectual property and its protection
- Introduce various forms of intellectual property

**UNIT-I**

**Introduction to Intellectual property:** Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT-II**

**TradeMarks:** Purpose and function of trademarks, acquisition of trademark rights, protectable matter, selecting, and evaluating trademark, trade mark registration processes.

**UNIT-III**

**Law of copyrights:** Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law. **Law of patents:** Foundation of patent law, patent searching process, ownership rights and transfer.

**UNIT-IV**

**Trade Secrets:** Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation. Unfair competition: Misappropriation right of publicity, false advertising.

**UNIT-V**

New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits. International overview on intellectual property, international — trade mark law, copyright law, international patent law, and international development in trade secrets law.

**TEXT BOOK:**

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

**REFERENCE BOOK:**

1. Intellectual property right—Unleashing the knowledge economy, Prabuddhaganguli, TataMcGrawHillPublishingcompanyltd.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLAREDDYENGINEERINGCOLLEGE</b>	<b>B.Tech.VI Semester</b>		
<b>Code:C00M4</b>	<b>QUANTITATIVEAPTITUDEANDVERBALR EASONING – II</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits:Nil</b>	<b>(CommonforAllBranches)</b>	<b>3</b>	<b>-</b>	<b>-</b>

### Module– I

**8Periods**

**QUANTS:** NUMBER SYSTEM (NS) **NUMBER SYSTEMS**-FACTORS AND MULTIPLES: THE H.C.F. OF TWO OR MORE THAN TWO NUMBERS; FACTORIZATION METHOD DIVISION METHOD; FINDING THE H.C.F. OF MORE THAN TWO NUMBERS; PRODUCT OF TWO NUMBERS = PRODUCT OF THEIR H.C.F. AND L.C.M.; CO-PRIMES; H.C.F.AND L.C.M. OF FRACTIONS: COMPARISON OF FRACTIONS. **VERBAL:** ARTICLES, PARA JUMBLES

**Articles-** Types of articles, Countable nouns, Uncountable nouns, Usage of articles, Omission of articles. **Para Jumbles-** Para Jumbles, Types of Para Jumbles, Strategies to answer questions on Jumbled Paragraphs. **Logical:** Data Arrangements, Blood Relation **Data Arrangements-** Linear Arrangement, Circular Arrangement, Multi- Dimensional Arrangement. **Blood Relations-** Classification of blood relations, Pointing a person, Equation related problems.

### MODULE–II

**6PERIODS**

**Quants: Time and Distance, Pipes Time & Distance -;** Km / hr to m / sec conversion; m/ sec to km /hr conversion; man covers a certain distance at x km/hr and an equal distance at y km/hr **Verbal:** Sentence Completion, Prepositions **Sentence Completion-** Formats of Question; Strategies to solve sentence completion questions – Proactive and reactive solving, Identifying clues - Signposts, Types of sign posts, Root words, Sentence structure clues. **Prepositions-** Definition, Types of prepositions, Preposition of Place, Preposition of Time, Preposition of Direction, Compound Prepositions, Prepositional Phrases. **Logical:** Coding and Decoding **Coding and Decoding-** Number Series, Alphabet Series, Analogy, Odd Man Out, Visual Reasoning.

### MODULE–III

**6PERIODS**

**Quants: Ages, Progression, Logarithms** **Ages, Progression** –Arithmetic progression; Arithmetic mean; Geometric progression and mean **Logarithms-** Why logarithms: Properties of Logarithms: Laws of logarithm: Characteristic of logarithm: **Verbal:** Vocabulary **Vocabulary-** Etymology, Root Words, Prefixes and Suffixes; Synonyms and Antonyms, Tips to solve questions on Synonyms and Antonyms; Word Analogy, Patterns of questions on Word Analogy; Miscellaneous Vocabulary. **Logical:** Data Interpretation and Data Sufficiency **Data Interpretation-** Tables, Pie charts, Bar Graphs, Line graphs **Data Sufficiency** –Strategies to solve.

### MODULE–IV

**6PERIODS**

**Quants: Permutations and Combinations, Probability** **Permutations-** Factorial Notation: The different arrangements; Number of Permutations: number of all permutations of n things, take n all at a time; n subjects of which p1 are like of one kind; p2 are like of another kind; p3 are like of third kind; Number of Combinations: The number of all combinations of n things, take n r at a time. **Verbal:** Sentence Correction **Sentence Correction** –Subject –Verb Agreement; Modifiers; Parallelism; Pronoun-Antecedent Agreement; Verb Time Sequence; Comparisons; Determiners; Exercise Questions. **Logical:** Clocks and Calendars **Clocks:** Introduction, Derivation of angles, Angles between hands of the clock, Hands together, Hands at angular distance, Gain & Loss



problems.**Calendars**:-Leap year-Non leap year, Odd days, Finding the day from date, Repeated years.

**MODULE-V:**

**6PERIODS**

**Quants: Areas and Volumes (Mensuration) Areas&Volumes**-Pythagoras Theorem Results on Quadrilaterals Perimeter; Area of a circle Circumference Length of an arc Area of a sector; Area of a triangle. Verbal: Reading Comprehension, Critical Reasoning **Reading Comprehension**-Speed reading strategies; Reading Comprehension – types of questions, tackling strategies; Critical Reasoning. Logical: Directions, Cubes, Syllogisms **Directions** -Introduction, Direction based questions, Shadow based problems. **Cubes** –Cube & cuboid concepts, 3-2-1-0 faced problems. **Syllogisms** – Statements and Conclusion, Syllogisms using Venn Diagrams.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>		
<b>Code: C6911</b>	<b>IOT CLOUD AND DATA ANALYTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:**Basic Network Concepts

**Course Objectives:**

The objective the course is to get familiar with knowledge of IoT, Cloud computing for IoT, application of various data visualizing, processing methodologies and machine learning algorithms for IoT data. To get hands on various data visualization tools to visualize IoT cloud data.

**MODULE I: INTRODUCTION TO IoT**

Introduction to Internet of Things (IoT)- Concepts and definitions of IoT-History of IoT – IoT data vs big data- IoT Analytics lifecycle and Techniques-IoT complete Technology chain- Applications of IoT- Opportunities and challenges in IoT.

**MODULE II: IoT and CLOUD**

Cloud computing – Cloud service models – Cloud Deployment models – Need of cloud computing for IoT-Fog computing Vs Cloud Computing for IoT-IoT Cloud Platforms – Microsoft Azure IoT-Amazon Web Services IoT-IBM WATSON IoT-Google’s cloud IoT.

**MODULE III: IOT AND MACHINE LEARNING**

Principles and foundation of Artificial intelligence and IoT – Machine Learning Paradigms for IoT – Supervised learning for IoT-Linear regression-Logistic regression-SVM – Decision Tree -Naïve’sbayes- Deep Learning for IoT-Neural Network.

Defining IoT Analytics - IoT Analytics challenges – IoT analytics for the cloud-Microsoft Azure overview– Designing data processing for analytics – Designing visual analysis for IoT data-Data science for IoT-Feature engineering with IoT data.

**MODULE V :IoT SECURITY**

Overview of IoT Security- security Threats in IoT- APIs in IoT-Authentication in IoT-Strategies for securing IoT-Public Key Cryptography.

**TEXT BOOKS**

1. Rajkumar Buyya, Amir Vahid Dastjerdi,” Internet of Things: Principles and Paradigms”,Elsevier,2016.
2. R. Chandrasekaran,” Essentials of Cloud computing”, 2nd Edition, Chapman and Hall/CRC, 2015.
3. Amita Kapoor, “Hands on Artificial intelligence for IoT”, 1st Edition, Packt Publishing, 2019.
4. David Etter,” IoT Security: Practical Guide Book”, CreateSpace Independent Publishing Platform, 2016.

**REFERENCE BOOKS**

1. John Soldatos, “Building Blocks for IoT Analytics”, River Publishers,2016.

2. John E. Rossman, “The Amazon way on IoT”, Volume 2, John E. Rossman publication, 2016.

3.

### **E-BOOKS**

1. [http://index-of.co.uk/Cloud-Computing-](http://index-of.co.uk/Cloud-Computing-books/Essentials%20of%20cloud%20computing%20(2015).pdf)

[books/Essentials%20of%20cloud%20computing%20\(2015\).pdf](http://index-of.co.uk/Cloud-Computing-books/Essentials%20of%20cloud%20computing%20(2015).pdf)

2. <https://www.iottechexpo.com/2018/11/iot/the-iot-analytics-lifecycle-from-generating-data-to-predicting-the-future-losant/>

### **Online Resources**

1. <https://www.coursera.org/learn/cloud-iot-platform>

2. <https://www.udemy.com/course/i0thacking1/>

### **COURSE OUTCOMES**

1. Demonstrate the working of IoT

2. Identify the need of cloud computing for IoT

3. Apply Machine Learning Algorithms for IoT data

4. Predict and visualize output using Data Analytic tools

5. Identify the Vulnerability in connected networks

2020-21 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code: C1215	DATA MINING	L	T	P
Credits: 3		3	-	-

### PREREQUISITES: NIL

#### Course Objectives:

This course provides the students to understand stages in building a Data Warehouse, identify the need and importance of preprocessing techniques, implement similarity and dissimilarity techniques, analyze and evaluate performance of algorithms for Association Rules, analyze Classification and Clustering algorithms.

#### MODULE I: Introduction and Mining Issues & Data [09 Periods]

**Introduction** - Why Data Mining? What Is Data Mining? What Kinds of Data Can Be mined? What Kinds of Patterns Can Be Mined? Which Technologies Are Used? Which Kinds of Applications Are Targeted?

**Mining Issues and Data** - Major Issues in Data Mining, Types of Data, Data Quality

#### MODULE II: Data, Measuring Data Similarity and Dissimilarity [10 Periods]

**Data** - Data Pre-processing, Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature Creation, Data Discretization and Binarization, Variable transformation.

**Measuring Data Similarity and Dissimilarity** - Similarity and Dissimilarity between simple attributes, Dissimilarities and similarities between data objects, Examples of Proximity measures, Issues in Proximity Calculation, Selection of right proximity measure.

#### MODULE III: Classification and Techniques [09 Periods]

**A: Classification** - Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree. **B: Techniques** -Methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.

#### MODULE IV: Classifier and Association Analysis [10 Periods]

**Classifiers** - Alternative Techniques, Bayes' Theorem, Naïve Bayesian Classification, Bayesian Belief Networks

**Association Analysis** - Basic Concepts and Algorithms: Problem Definition, Frequent Item Set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithm.

#### MODULE V: Cluster Analysis and DBSCAN [10 Periods]

**Cluster Analysis** - Basic Concepts and Algorithms: Overview: What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm **DBSCAN** - Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses.

**TEXT BOOKS:**

1. Pang-Ning Tan & Michael Steinbach, “**Introduction to Data Mining**”, Vipin Kumar, Pearson.
2. Jiawei Han, Michel Kamber,”**Data Mining concepts and Techniques**”, 3/e, Elsevier.

**REFERENCES:**

1. Hongbo Du, “**Data Mining Techniques and Applications: An Introduction**”, Cengage Learning.
2. Vikram Pudi and P. Radha Krishna, “**Data Mining**”, Oxford.
3. Mohammed J. Zaki, Wagner Meira, Jr ,”**Data Mining and Analysis -fundamental Concepts and Algorithms**”, Oxford
4. Alex Berson, Stephen Smith ,”**Data Warehousing Data Mining & OLAP**” , TMH.

**E-RESOURCES:**

1. <http://www-users.cs.umn.edu/~kumar/dmbook/index.php>
2. <http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf>
3. [http://www.ijctee.org/files/Issuethree/IJCTEE\\_1111\\_20.pdf](http://www.ijctee.org/files/Issuethree/IJCTEE_1111_20.pdf)
4. <http://www.cscs.org/southcentral/E-Journal/2010/Papers/Yihao%20final%20paper%20CCSC%20for%20submission.pdf>
5. <https://gunjesh.wordpress.com/>

**Course Outcomes:**

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

- 1.**Acquire** knowledge in building a Data Warehouse
- 2.**Understand** the need and importance of preprocessing techniques
- 3.**Implement** Similarity and dissimilarity techniques
- 4.**Analyze** and evaluate performance of algorithms for Association Rules.
- 5.**Deploy** Classification and Clustering algorithms

CO- PO, PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
CO	ProgrammeOutcomes(POs)									PSOs					
	P O	P O	P O	P O	PO	PO	P O	P O	P O	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	1	1	1	1									1	1	1
CO2	1	2	2	2	1						1		1		2
CO3	1	1	1	2	1						1		1		1
CO4	1	1	1	1	1						1		1	1	1
CO5	1	2	2	2	2						2		2	1	3

<b>2020-21 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>			
<b>Code: C6912</b>	<b>Mobile Application Development [Professional Elective - I] (Common for CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT) and IT)</b>	<b>L</b>	<b>T</b>		<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>		<b>-</b>

### PREREQUISITES

1. Acquaintance with JAVA programming
2. A Course on “Database Management Systems”

### Objectives

1. To demonstrate their understanding of the fundamentals of Android operating systems
2. To improves their skills of using Android software development tools
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform
4. To demonstrate their ability to deploy software to mobile devices
5. To demonstrate their ability to debug programs running on mobile devices

### OUTCOMES

1. Student understands the working of Android OS Practically.
2. Student will be able to develop Android user interfaces
3. Student will be able to develop, deploy and maintain the Android Applications.

### MODULE – I

[9 PERIODS]

**Introduction to Android Operating System:** Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

**Android application components** – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes

**Android Application Lifecycle** – Activities, Activity lifecycle, activity states, monitoring state changes

### MODULE – II

[10 PERIODS]

**Android User Interface:** Measurements – Device and pixel density independent measuring UNIT – s.

**Layouts** – Linear, Relative, Grid and Table Layouts

**User Interface (UI) Components** – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

**Event Handling** – Handling clicks or changes of various UI components

**Fragments** – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

**MODULE – III**

**[10 PERIODS]**

**Intents and Broadcasts:** Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

**Broadcast Receivers** – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

**Notifications** – Creating and Displaying notifications, Displaying Toasts

**MODULE – IV**

**[10 PERIODS]**

**Persistent Storage:** Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory

**Shared Preferences** – Creating shared preferences, saving and retrieving data using Shared Preference

**MODULE – V**

**[09 PERIODS]**

**Database** – Introduction to SQLite database, creating and opening a database, creating tables, inserting, retrieving and editing data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

**Textbooks:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning,2013

**Reference:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

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

<b>2020-21 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>			
<b>Code: C0536</b>	<b>SOFTWARE TESTING METHODOLOGIES</b>	<b>L</b>	<b>T</b>		<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>		<b>-</b>

### Prerequisites

A basic knowledge of programming.

### Course Objectives

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using the latest tools.

### Course Outcomes:

- Understand purpose of testing and path testing
- Understand strategies in data flow testing and domain testing
- Develop logic – based test strategies
- Understand graph matrices and its applications
- Implement test cases using any testing automation tool

### UNIT-I

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

### UNIT-II

Transaction Flow Testing: transaction flows, transaction flow testing techniques. Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing. Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

### UNIT-III

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

### UNIT-IV

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Test ability tips.

### UNIT-V

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like Jmeter /selenium /soap UI /Catalon).



**TEXT BOOKS:**

1. Software Testing techniques-BarisBeizer,Dreamtech,secondedition.
2. Software Testing Tools–Dr. K.V.K. K.Prasad,Dreamtech.

**REFERENCE BOOKS:**

1. Thecraftofsoftwaretesting-BrianMarick,PearsonEducation.
2. SoftwareTestingTechniques–SPD(Oreille)
3. SoftwareTestingintheRealWorld–EdwardKit,Pearson.
4. EffectivemethodsofSoftwareTesting,Perry,JohnWiley.
5. ArtofSoftwareTesting–Meyers,JohnWiley.

<b>2020-21 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>		
<b>Code: C0546</b>	<b>CLOUD COMPUTING [Professional Elective - VI]</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:** Computer Networks

### **Course Objectives:**

This course provides the students to gain knowledge in the cloud computing environment, security architecture and development of cloud services. Students will also examine the collaboration of real time cloud services and analyze the case studies from various cloud development tools.

#### **MODULE I: Introduction to Cloud Computing [8 Periods]**

Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

#### **MODULE II: Virtualization [12 Periods]**

**Virtual Machines and Virtualization of Clusters and Data Centers :** Levels of Virtualization, Virtualization Structures//Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation.

**Case studies:** Xen Virtual machine monitors- Xen API. VMware - VMware products- VMware Features. Microsoft Virtual Server - Features of Microsoft Virtual Server.

#### **MODULE III: CLOUD COMPUTING ARCHITECTURE OVER VIRTUALIZED DATA CENTERS**

**[8 Periods]**

**A:** Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds.

**B:** Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

#### **MODULE IV: Cloud Security [8 Periods]**

**Cloud Security and Trust Management, Data Security in the Cloud :** An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, Crypt Db:Onion Encryption layers -DET, RND, OPE, JOIN, SEARCH, HOM, and Homomorphic Encryption, FPE. Trust, Reputation and Security Management.

#### **MODULE V: Cloud Programming and Standards [12 Periods]**

**Cloud Programming and Software Environments:** Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

**Common Standards in Cloud Computing:** The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

**TEXT BOOKS:**

1. John W. Rittinghouse, "Cloud Computing: Implementation, Management, and Security ". James F. Ransome, CRC Press 2009.
2. Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, “ Distributed and Cloud Computing From Parallel Processing to the Internet of Things”, Elsevier, 2012.
3. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski,” Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing ©2011

**REFERENCES:**

1. Raluca Ada Popa, Catherine M.S. Redfield, NikolaiZeldovich, and Hari Balakrishnan, “CryptDB: Protecting Confidentiality with encrypted Query Processing”23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
2. Craig Gentry,”A Fully Homomorphic Encryption Scheme”, September 2009.
3. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

**E-RESOURCES:**

- 1 [http://www.motc.gov.qa/sites/default/files/cloud\\_computing\\_ebook.pdf](http://www.motc.gov.qa/sites/default/files/cloud_computing_ebook.pdf)
- 2 <https://www.thesis scientist.com/docs/Study%20Notes/8ad50655-64f5-46d4-bc89-0c02feaf132f>
- 3 [http://ndl.iitkgp.ac.in/document/zyMnqgZQXCJME6wgSqrU87VCGcelOw5mZ-5ybmrhKBj79VQPP0\\_ZQHLqcOopPDoaFWWhZybCrPg\\_joTbBU8ZpGA](http://ndl.iitkgp.ac.in/document/zyMnqgZQXCJME6wgSqrU87VCGcelOw5mZ-5ybmrhKBj79VQPP0_ZQHLqcOopPDoaFWWhZybCrPg_joTbBU8ZpGA)
- 4 <http://www.springer.com/computer/communication+networks/journal/13677>
- 5 <http://nptel.ac.in/courses/106106129/28>

**Course Outcomes:**

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

1. Understand the cloud enabling technologies and the Cloud service models.
2. Choose the levels of virtualization and tools for resource provisioning.
3. Compare the cloud platform architectures of virtualized data centers and Inter- cloud Resource Management.
4. Analyze the principles of Security and Trust management to protect confidentiality of data in the Cloud.
5. Propose the standards of Parallel and Distributed Programming Paradigms for improving user Access to Cloud Computing.

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

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>		
<b>Code: C6618</b>	<b>ARTIFICIAL INTELLIGENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:**

1. Programming for problem solving, Data Structures.

**Course Objectives:**

- To learn the distinction between optimal reasoning Vs human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Course Outcomes:**

- Understand search strategies and intelligent agents
- Understand different adversarial search techniques
- Apply propositional logic, predicate logic for knowledge representation
- Apply AI techniques to solve problems of game playing, and machine learning.

**UNIT-I**

Introduction to AI, Intelligent Agents, problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A\* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

**UNIT-II**

**Problem Solving by Search-II and Propositional Logic**

**Adversarial Search:** Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems. Propositional Logic: Knowledge-

Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

### **UNIT-III**

#### **Logic and Knowledge Representation**

**First-Order Logic:** Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

**Inference in First-Order Logic:** Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

### **UNIT-IV**

**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

**Classical Planning:** Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

### **UNIT-V**

**Uncertain knowledge and Learning Uncertainty:** Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its

Use **Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-

Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

#### **TEXT BOOK:**

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

#### **REFERENCE BOOKS:**

1. Artificial Intelligence, 3rd Edn, E. Richard K. Knight (TMH).
2. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>		
<b>Code: C6203</b>	<b>CRYPTOGRAPHY AND NETWORK SECURITY</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:**

- Undergraduate-level knowledge of Network Security.

**Course Objectives:**

- Acquire a comprehensive understanding of Light weight Cryptography and its implications for enhancing security in RFID tags.
- Implement both proactive and defensive strategies to mitigate potential threats, attacks, and intrusions effectively.

**Course Outcomes:**

- Learn cryptographic – based solutions as well as methods for detecting and preventing attacks and intrusions.
- Comprehend the security and privacy challenges associated with radio frequency identification (RFID) systems.
- Gain insight into various approaches for both attacking and defending industrial systems.

**UNIT-I**

**New Trends in Cryptography**

Security requirements, mechanisms, Modern Cryptography, symmetric key algorithms, asymmetric key algorithms, hash function, light weight cryptography, light weight algorithms -SIMON, SPECK, PRESENT, HIGHT, CAMELLA, TEA.

**UNIT-II**

**RFID Technology:** RFID basics, Coupling techniques Tags & smart labels Readers, writers & printers, RFID antennas Frequency bands & spectrum Security Standards.

**Anti-counterfeiting and RFID:**

Anti-Counter feiting and Supply Chain Security, Networked RFID Systems, PC Network Architecture, A Security Primer.

**UNIT-III**

**Security and Privacy Current Status:** Addressing Insecurities and Violations of Privacy, RFID Tag, Vulnerabilities in RFID Systems, From Identification to Authentication, A Review of RFID Product Authentication Techniques.

**Network-Based Solutions:** EPC System for a Safe & Secure Supply Chain and How it is Applied, The Potential of RFID and NFC in Anti-Counter feiting, Improving the Safety and Security of the Pharmaceutical Supply Chain.

**UNIT-IV**

**Cryptographic Solutions:** Product Specific Security Based on RFID Technology, Strengthening

the Security of Machine, Readable Documents, Enhancing Security of Class I Generation 2 RFID against Traceability and Cloning.

#### **UNIT-V**

**Low-cost Cryptographic Solutions:** A Random Number Generator for Application in RFID Tags, A Low-Cost Solution to Cloning and Authentication Based on a Light weight Primitive, Light weight Cryptography for Low – Cost RFID.

#### **TEXT BOOK:**

1. Networked RFID Systems and Lightweight Cryptography by Peter H. Cole, Damith C. Ranasinghe 3rd edition, Springer Publication 2010.
2. New Frontiers in Cryptography Quantum, Blockchain, Lightweight, Chaotic and DNA By Khalid Salah Mohamed, 2020.

#### **REFERENCE BOOKS:**

1. RFID Security and Privacy by Yingjiu Li, Robert H. Deng.
2. RFID HANDBOOK by Klaus Finkenzeller, Third edition Wiley Publications.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>		
<b>Code: C0523</b>	<b>QUANTUM COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

- To introduce the fundamentals of quantum computing.
- The problem – solving approach using finited imensional mathematics.

### Course Outcomes:

- Understand basics of quantum computing.
- Understand physical implementation of Qubit.
- Understand Quantum algorithms and their implementation.
- Understand The Impact of Quantum Computing on Cryptography.

### UNIT-I

**History of Quantum Computing:** Importance of Mathematics, Physics and Biology.  
Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

### UNIT-II

**BackgroundMathematics:** Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other thancomputational basis. Background Biology: Basic concepts of Genomics and Proteomics (CentralDogma)

### UNIT-III

**Qubit:** Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphereQuantumCircuits: single qu bit gates, multiple qubitgates, designing the quantum circuits. Bellstates.

### UNIT-IV

**Quantum Algorithms:** Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

### UNIT-V

**Noise and error correction:** Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantuminformationtheory.QuantumCryptography, Quantum teleportation



**TEXT BOOK:**

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge.

**REFERENCE BOOKS:**

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol. II.
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VII Semester		
Code:	WIRELESS NETWORKS	L	T	P
Credits: 3		3	-	-

**Prerequisite:** Computer Networks

**Course Objectives:**

- To study the fundamentals of wireless Ad-Hoc Networks.
- To study the operation and performance of various Ad Hoc wireless network protocols.
- To study the architecture and protocols of Wireless sensor networks.

**Course Outcomes:**

- Understand the basics of wireless Ad-hoc networks.
- Understand design, operation and the performance of MAC layer protocol of wireless Ad Hoc networks.
- Understand design, operation and the performance of routing protocol of wireless AdHoc network.
- Understand design, operation and the performance of transport layer protocol of wireless AdHoc networks.
- Understand sensor network Architecture, and to distinguish between protocol used in Adhoc wireless networks and wireless sensor networks.

**UNIT-I**

**Wireless LANs and PANs:** Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPER LAN Standard, Bluetooth, Home RF.

**AD-Hoc Wireless Networks:** Introduction, Issues in AdHoc Wireless Networks.

**UNIT-II**

**MAC Protocols:** Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention – Based Protocols, Contention-Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

**UNIT-III**

**Routing Protocols:** Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power– Aware Routing Protocols.

**UNIT-IV**

**Transport Layer Protocols:** Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for AdHoc Wireless Networks.

## **UNIT-V**

**Wireless Sensor Networks:** Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

### **TEXT BOOKS:**

1. AdHocWirelessNetworks: Architectures and Protocols- C.SivaRamMurthyandB.S.Manoj,2004,PHI.
2. WirelessAd-hocandSensorNetworks:Protocols,PerformanceandControl- JagannathanSarangapani,CRCPress.

### **REFERENCE BOOKS:**

1. Ad-HocMobileWirelessNetworks:Protocols&Systems,C.K.Toh,1<sup>st</sup>Ed.PearsonEducation.
2. WirelessSensorNetworks-C.S.Raghavendra,KrishnaM.Sivalingam,2004,Springer.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>		
<b>Code: C1220</b>	<b>AUGMENTED REALITY &amp; VIRTUAL REALITY</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Course Objectives:**

- Provide a foundation to the fast-growing field of AR and make the students aware of the various AR concepts.
- To give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

**Course Outcomes:**

- Describe how AR systems work and list the applications of AR.
- Understand the software architectures of AR.
- Understand the Visual perception and rendering in VR
- Understand the interaction, auditory perception and rendering in VR

**UNIT-I**

**Introduction to Augmented Reality:** Augmented Reality –Defining augmented reality, history of augmented reality, Examples, Related fields

**Displays:** Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model, Visual Displays

**Tracking:** Tracking, Calibration, and Registration, Coordinate Systems, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors

**UNIT-II**

**Computer Vision for Augmented Reality:** Marker Tracking, Multiple –Camera Infrared Tracking, Natural Feature Tracking by Detection, Outdoor Tracking.

**Interaction:** Output Modalities, Input Modalities, Tangible Interfaces, Virtual User Interfaces on Real Surfaces, Augmented Paper, Multi-view Interfaces, Haptic Interaction

**Software Architectures:** AR Application Requirements, Software Engineering Requirements, Distributed Object Systems, Data flow, Scene Graphs

**UNIT-III**

**Introduction to Virtual Reality:** Defining Virtual Reality, History of VR, Human Physiology and Perception

**The Geometry of Virtual Worlds:** Geometric Models, Axis-Angle Representations of Rotation, Viewing Transformations

**Light and Optics:** Basic Behavior of Light, Lenses, Optical Aberrations, The Human Eye, Cameras, Displays

## **UNIT-IV**

The Visual Cortex, Eye Movements, Implications for VR

**Visual Perception:** Visual Perception-Perception of Depth, Perception of Motion, Perception of Color  
**Visual Rendering:** Visual Rendering –Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates, Immersive Photos and Videos

## **UNIT-V**

**Motion in Real and Virtual Worlds:** Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion andvection

**Interaction:** Motor Programs and Remapping, Locomotion, Social Interaction

**Audio:** The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering

## **TEXT BOOKS:**

1. Augmented Reality: Principles & Practice by Schmalstieg/Hollerer, Pearson Education India, First Edition (12 October 2016), ISBN-10: 9332578494.
2. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016.

## **REFERENCE BOOKS:**

1. Allan Fowler-AR Game Development II, 1st Edition, Apress Publications, 2018, ISBN 978-1484236178
2. Understanding Virtual Reality: Interface, Application and Design, William R. Sherman and Alan B. Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B. Craig, William R. Sherman and Jeffrey D. Will, Morgan Kaufmann, 2009
4. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381
5. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija—Utgivare Publisher. 2012. ISBN 978-951-38-7449-0
6. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>		
<b>Code: C6913</b>	<b>IOT AUTOMATION</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

- While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choices to security concerns.
- Students acquire the upcoming Industrial IoT: Road map to the Connected World Course offers important insights on overcoming the challenges and thrive in this exciting space.

### Course Outcomes:

- Discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security.
- Explore IoT technologies, architectures, standards, and regulation.
- Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices.
- Examine technological developments that will likely shape the industrial landscape in the future.
- Understand how to develop and implement IIoT technologies, solutions, and applications.

### UNIT-I

**Introduction & Architecture:** Introduction of IIoT and the connected, The difference between IoT and IIoT, Architecture IIoT, IOT node, Challenges of IIoT, Fundamentals of Control System, introductions, components, closed loop & open loop system.

### UNIT-II

**IIoT Components:** Introduction to Sensors, Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11). Digital switch, Electro Mechanical switches.

### UNIT-III

**Communication Technologies of IIoT:** Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus technology, wireless network communication.

### UNIT-IV

**Visualization and Data Types of IIoT:** Front-end EDGE devices, Enterprise data for IIoT, Emerging descriptive data standards for IIoT, Cloud database, Cloud computing, Fog or Edge computing.

Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT.

## UNIT-V

**Retrieving Data:** Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction (M2M).

**Control & Supervisory Level of Automation:** Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA). HMI in an automation process, ERP & MES.

### TEXT BOOKS:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication).
3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor).

### REFERENCE BOOK:

1. Jerker Delsing, IoT Automation: Arrow head Framework, CRC Press.

<b>2022-23 Onwards (MR22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>		
<b>Code: C0560</b>	<b>Human Computer Interaction [Professional Elective - II]</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives

To gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface design in general, and alternatives to traditional-keyboard and mouse computing; become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans; be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation; appreciate the importance of a design and evaluation methodology that begins with and maintains a focus on the user; be familiar with a variety of both conventional and non-traditional user interface paradigms, the latter including virtual and augmented reality, mobile and wearable computing, and ubiquitous computing; and understand the social implications of technology and their ethical responsibilities as engineers in the design of technological systems. Finally, working in small groups on a product design from start to finish will provide you with valuable team-work experience.

### MODULE-I

[10 PERIODS]

Introduction: Importance of user Interface- definition, importance of good design. Benefits of good design. A brief history of Screen design.

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

### MODULE-II

[10 PERIODS]

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business Functions. Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content– screen navigation and flow– information retrieval on web – statistical graphics – Technological consideration in interface design.

### MODULE-III

[10 PERIODS]

Windows – New and Navigation schemes selection of window, selection of devices based and screen-based controls. Components–text and messages, Icons and increases–Multimedia, colors, uses problems, choosing colors.

### MODULE-IV

[10 PERIODS]

HCI in the software process: The software life cycle, Usability engineering, Iterative design and prototyping, Design Focus: Design rationale, Design rules, Principles to support usability Standards, Golden rules (Shneiderman's Eight Golden Rules of Interface Design) and heuristics, Universal design.



**MODULE-V****[10 PERIODS]**

Cognitive models - Socio-Organizational issues and stake holder requirements –Goal and task hierarchies Design Focus: GOMS saves money, Linguistic models, Cognitive architectures, Ubiquitous computing and augmented realities, Information and data visualization–Communication and collaboration models-Hypertext.

**COURSE OUTCOMES**

- Ability to apply HCI and principles to interaction design.
- Ability to design certain tools for blind or PH people.

**TEXT BOOKS**

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech. Modules 1, 2, 3
2. Human – Computer Interaction. Alan Dix, Janet Finckay, Greg Goryd, Abowd, Russell Beal, Pearson Education Modules 4,5

**REFERENCE BOOKS**

1. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
3. User Interface Design, Soren Lauesen , Pearson Education.
4. Human –Computer Interaction, D. R. Olsen, Cengage Learning.
5. Human –Computer Interaction, Smith – Atakan, Cengage Learning.

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

<b>2022-23 Onwards (MR22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>			<b>B.Tech VII Sem</b>		
<b>Code:</b>	<b>Open Elective-II</b>			<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>				<b>3</b>	<b>-</b>	<b>-</b>

<b>2022-23 Onwards (MR22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>		
<b>Code: C0562</b>	<b>Cloud Computing Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>			<b>-</b>	<b>2</b>

### Course Objective:

1. To learn about how to integrate the security aspect into their IoT design taking into consideration all the threats that can possibly happen.
2. To develop web applications in cloud.
3. To learn the design and development process involved in creating a cloud-based application.

### LIST OF EXPERIMENTS:(CLOUD COMPUTING LAB)

1. Install Virtualbox/Vmware Workstation with different flavors of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install GoogleApp Engine. Create a hello world app and other simple web applications using python/java.
4. Find a procedure to transfer the files from one virtual machine to another virtual machine.
5. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)
6. Install Hadoop on lenodecluster and run simple applications like word count.

### E-RESOURCES:

1. <https://www.iitk.ac.in/nt/faq/vbox.htm>
2. <https://www.google.com/urlsa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjqrNG0za73AhXZt1YBHZ21DWEQFnoECAMQAQ&url=http%3A%2F%2Fwww.cs.columbia.edu%2F~sedwards%2Fclasses%2F2015%2F1102-fall%2Flinuxvm.pdf&usg=AOvVaw3xZPuF5xVgk-AQnBRsTtHz>
3. <https://www.cloudsimtutorials.online/cloudsim/>
4. <https://edwardsamuel.wordpress.com/2014/10/25/tutorial-creating-openstack-instance-in-trystack/>
5. <https://www.edureka.co/blog/install-hadoop-single-node-hadoop-cluster>

<b>2020-21 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>		
<b>Code: C6915</b>	<b>IOT Cloud and Data Analytics Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 1</b>		<b>-</b>	<b>-</b>	<b>3</b>

### Course Objectives:

- Demonstrate the working of IoT
- Identify the need of cloud computing for IoT
- Apply Machine Learning Algorithms for IoT data
- Predict and visualize output using Data Analytic tools

### List of Programs:

1. Study of IoT simulators.
2. Simulate data collection using IoT simulators (IOTIFY/NETSIM)
3. Study of Hardware platforms Arduino / Raspberrypi /Node MCU
4. Implement sensor data collection using IoT gateways (Arduino/Raspberrypi/NodeMCU)
5. Develop your own Application that stores IoT data in open source IoT cloud platformanalytic tools.
6. Study of Streaming IoT data into Google cloud platform using Qwik lab environment.
7. Write a program to implement the Line arregression for a sample training data set stored as a .CSVfile. Compute the accuracy of the classifier, considering few test datasets.
8. Build a decision tree classifier for weather prediction dataset. Compute the accuracy of the classifier, considering few test datasets.
9. Develop application for Smart Traffic that analyze the IoT data and predict the Traffic Jam.
10. Visualize the predicted output using Data Analytics tool.

### TEXT BOOKS

- 1 RajkumarBuyya, AmirVahidDastjerdi, "InternetofThings:PrinciplesandParadigms", Elsevier, 2016.
- 2 R.Chandrasekaran, "EssentialsofCloudcomputing", 2<sup>nd</sup>Edition, ChapmanandHall/CRC, 2015.
- 3 AmitaKapoor, "HandsonArtificialintelligenceforIoT", 1<sup>st</sup>Edition, PacktPublishing, 2019.
- 4 DavidEtter, "IoTSecurity:PracticalGuideBook", CreateSpaceIndependentPublishing Platform, 2016.

### REFERENCE BOOKS

- 1 JohnSoldatos, "BuildingBlocksforIoTAnalytics", RiverPublishers, 2016.
- 2 JohnE.Rossmann, "TheAmazonwayonIoT", Volume2, JohnE.Rossmannpublication, 2016.

## E-BOOKS

- 1 [http://index-of.co.uk/Cloud-Computing-books/Essentials%20of%20cloud%20computing%20\(2015\).pdf](http://index-of.co.uk/Cloud-Computing-books/Essentials%20of%20cloud%20computing%20(2015).pdf)
- 2 <https://www.iottechexpo.com/2018/11/iot/the-iot-analytics-lifecycle-from-generating-data-to-predicting-the-future-losant/>

## E- Resources

- 1 <https://www.coursera.org/learn/cloud-iot-platform>
- 2 <https://www.udemy.com/course/ioteching1/>

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2-Medium,1-Weak															
Cos	ProgrammeOutcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1								2	2		
CO2	1	2	2	2	2							1	1		
CO3	1	2	3	2	1							2	2		

<b>2021-22 Onwards (MR22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech VII Sem</b>		
<b>Code: C00P2</b>	<b>Project stage-I</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>-</b>	<b>-</b>	<b>6</b>

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VIII Semester</b>		
<b>Code:</b>	<b>EMBEDDED SOFTWARE DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

- Knowledge on fundamental concepts of real time embedded systems and applications

### Course Outcomes:

- Understand requirements for realtime software design method for embedded systems
- Understand and analyze overview of Real –Time Software Design Method for Embedded Systems
- Discussion on State Machines for Real – Time Embedded Systems with examples
- Understand the importance of software architectural Patterns for Real – Time Embedded Systems

### UNIT-I

Introduction - The Challenge, Real-Time Embedded Systems and Applications, Characteristics of Real-Time Embedded Systems, Distributed Real – Time Embedded Systems, Cyber-Physical Systems, Requirements for Real - Time Software Design Method for Embedded Systems, COMET / RTE: A Real-Time Software Design Method for Embedded Systems, Visual Modeling Languages: UML, SysML, and MARTE.

Real-Time Software Design and Architecture Concepts - Object-Oriented Concepts, Information Hiding, Inheritance, Active and Passive Objects, Concurrent Processing, Cooperation between Concurrent Tasks, Information Hiding Applied to Access Synchronization, Runtime Support for Real-Time Concurrent Processing, Task Scheduling, Software Architecture and Components.

### UNIT-II

Overview of Real-Time Software Design Method for Embedded Systems - COMET/RTE System and Software Life Cycle model, Phases in COMET/RTE Life Cycle model.

Structural Modeling for Real – Time Embedded Systems with SysML and UML-Static Modeling Concepts, Categorization of Blocks and Classes using Stereotypes, Structural Modeling of the Problem Domain with SysML, Structural Modeling of the System Context, Hardware / Software Boundary Modeling, Structural Modeling of the Software System Context, Defining

Hardware/Software Interfaces, System Deployment Modeling. UseCase Modeling for Real-Time Embedded Systems.

### **UNIT-III**

State Machines for Real-Time Embedded Systems-State Machines and examples, Events and Guard Conditions, Actions, Hierarchical State Machines, Cooperating State Machines, Inherited State Machines, Developing State Machines from Use Cases.

Object and Class Structuring for Real-Time Embedded Software- Object and Class Structuring Criteria, Object and Class Structuring Categories, ObjectBehavior and Patterns, Boundary ClassesandObjects, Entity Classes and Objects, Control Classes and Objects, Application Logic Classes and Objects.

Dynamic Interaction Modeling for Real-Time Embedded Software-Object Interaction Modeling, Message Sequence Description, Approach for Dynamic Interaction Modeling, Stateless Dynamic Interaction Modeling, State Dependent Dynamic Interaction Modeling.

Modeling: Microwave Oven System.

### **UNIT-IV**

Software Architectures for Real-Time Embedded Systems-Overview of Software Architectures, Multiple Views of a Software Architecture, Transition from Analysis to Design, Separation of Concerns in Subsystem Design, Subsystem Structuring Criteria, Decisions about Message Communication between Subsystems.

Software Architectural Patterns for Real-Time Embedded Systems - Software Design Patterns, Layered Software Architectural Patterns, Control Patterns for Real-Time Software Architectures, Client/Service Software Architectural Patterns, Basic Software Architectural Communication Patterns, Software Architectural Broker Patterns, Group Message Communication Patterns.

### **UNIT-V**

Component-Based Software Architectures for Real-Time Embedded Systems-Concepts for Component-Based Software Architectures, Designing Distributed Component-Based Software Architectures, Component Interface Design, Designing Composite Components, Component Structuring Criteria, Design of Service Components, Distribution of Data, Software Deployment, Design of Software Connectors.

Concurrent Real-Time Software Task Design - Concurrent Task Structuring Issues, CategorizingConcurrent Tasks, I/O Task Structuring Criteria, Internal Task Structuring Criteria, Task Priority Criteria, Task Clustering Criteria, Design Restructuring by Using Task Inversion, Developing the Task Architecture, Task Communication and Synchronization, Task Interface and Task Behavior Specifications.

### **TEXTBOOK:**

1. Real-TimeSoftwareDesignforEmbeddedSystemsby HassanGomaa.

### **REFERENCEBOOK:**

1. K.Shibu, Introduction to Embedded Systems, McGrawHillEducation.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VII Semester</b>		
<b>Code: C6916</b>	<b>5G &amp; IOT TECHNOLOGIES</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

- Students will be explored to the interconnection and integration of the physical world and the cyberspace. They are also able to design & develop IOT Devices.

### Course Outcomes:

- Understand 5G and 5G Broadband Wireless Communications
- Understand 5G wireless Propagation Channels
- Understand the application areas of IOT
- Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- Understand building blocks of Internet of Things and characteristics

### UNIT-I

Overview of 5G Broadband Wireless Communications: Mobile communications generations: from 1G to 4G, Rationale of 5G-requirements, Standardization activities.

### UNIT-II

The 5G wireless Propagation Channels: Channel model requirements, Propagation scenarios and challenges in the 5G modeling, Channel Models for mm Wave, MIMO Systems.

### UNIT-III

Introduction to Internet of Things–Definition and Characteristics of IoT, Physical Design of IoT–IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

### UNIT-IV

IoT and M2M–Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCONF, YANG, NETCONF, YANG, SNMP, NETCONF

## **UNIT-V**

IoT Physical Devices and Endpoints - Introduction to Raspberry PI - Interfaces (serial, SPI, I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

### **TEXTBOOKS:**

1. AfifOsseiran,Jose.F.Monserrat,PatrickMarsch,“Fundamentalsof5GMobileNetworks”,CambridgeUniversityPress.
2. ArshdeepBahgaandVijayMadiseti,“InternetofThings-AHands-onApproach”,UniversitiesPress,2015,ISBN: 9788173719547

### **REFERENCE BOOKS:**

1. JonathanRodriguez,“Fundamentalsof5GMobileNetworks”,JohnWiley&Sons.
2. AmitabhaGhoshandRapeepatRatasuk“EssentialsofLTEandLTE-A”,CambridgeUniversityPress
3. AthanasiosG.Kanatos,KonstantinaS.Nikita,PanagiotisMathiopoulos,“NewDirectionsinWirelessCommunicationSystems fromMobileto5G”, CRCPress.
4. GettingStartedwithRaspberryPi,MattRichardson&ShawnWallace,O'Reilly(SPD),2014,ISBN:9789350239759.



<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VIII Semester</b>		
<b>Code: C7328</b>	<b>COGNITIVE COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:**Probability Theory.

Course Objectives:

- To provide an understanding of the central challenges in realizing aspects of human cognition.
- To provide a basic exposition to the goals and methods of humancognition.
- To develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions.
- To support human reasoning by evaluating data incontext and presenting relevant findings along with the evidence that justifies the answers.

**Course Outcomes:**

- Understand cognitive computing
- Plan and use the primary tools associated with cognitive computing.
- Plan and execute a project that leverages cognitive computing.
- Understand and develop the business implications of cognitive computing.

#### **UNIT-I**

**Introduction to Cognitive Science:** Understanding Cognition, IBM’s Watson, Design for Human Cognition, Augmented Intelligence, Cognition Modeling Paradigms: Declarative / logic –based computational cognitive modeling, connection ist models of cognition, Bayesian models of cognition, a dynamical systems approach to cognition.

#### **UNIT-II**

Cognitive Models of memory and language, computational models of episodic and semantic memory, modeling psycho linguistics.

#### **UNIT-III**

Cognitive Modeling: modeling the interaction of language, memory and learning, Modeling select aspects of cognition classical models of rationality, symbolic reasoning and decision making.

#### **UNIT-IV**

Formal models of inductive generalization, causality, categorization and similarity, the role of

analogy in problem solving, Cognitive Development Child concept acquisition. Cognition and Artificial cognitive architectures such as ACT-R, SOAR, Open Cog, Copy Cat, Memory Networks.

#### **UNIT-V**

Deep QA Architecture, Unstructured Information Management Architecture (UIMA), Structured Knowledge, Business Implications, Building Cognitive Applications, Application of Cognitive Computing and Systems.

#### **TEXT BOOK:**

1. The Cambridge Hand book of Computational Psychology by Ron Sun (ed.), Cambridge University Press.

#### **REFERENCE BOOKS:**

1. Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles Cognitive Computing and Big Data Analytics, Wiley
2. Vijay V Raghavan, Venkat N. Gudivada, Venu Govindaraju, Cognitive Computing: Theory and Applications: Volume 35 (Handbook of Statistics), North Hollan.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VIII Semester</b>		
<b>Code: C0559</b>	<b>DISTRIBUTEDS SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:**

1. A course on "Operating Systems".
2. A course on "Computer Organization & Architecture".

**Course Objectives:**

- To provide an insight into Distributed systems.
- To introduce concepts related to Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory.

**Course Outcomes:**

- Understand Transactions and Concurrency control.
- Understand distributed shared memory.
- Design a protocol for a given distributed application.

**UNIT-I**

**Characterization of Distributed Systems:** Examples of Distributed systems, Resource sharing and web, challenges

**System models:** Architectural and Fundamental models, Networking and Internet working, Interprocess Communication

**Distributed objects and Remote Invocation:** Communication between distributed objects, RPC, Events and notifications, Case study – Java RMI.

**UNIT-II**

**Operating System Support-OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture.**

**UNIT-III**

**Peer to Peer Systems** – Napster and its legacy, Peer to Peer middle ware

**Time and Global States**-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

**Coordination and Agreement**-Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

**UNIT-IV**

**Transactions and Concurrency Control**-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Time stamp ordering.

**Distributed Transactions** - Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions  
**Distributed deadlocks:** Transaction recovery.

#### **UNIT-V**

**Replication:** Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

**Distributed shared memory:** Design and Implementation issues, Consistency models.

#### **TEXTBOOKS:**

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman&Hall/CRC, Taylor&FrancisGroup,2010.

#### **REFERENCE BOOKS:**

1. Distributed Systems – Principles and Paradigms, A.S.Tanenbaum and M.V.Steen, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D.Kshemakalyani and Mukesh Singhal, Cambridge, 2010.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VIII Semester</b>		
<b>Code: C6919</b>	<b>EDGE COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

Knowledge on how edge computing and Internet of Things (IoT) can be used as away to meet application demands in intelligent IoT systems

### Course Outcomes:

- Understand use of the IoT architecture with it sentities and protocols, from the IoT devices
- Security and privacy issues related to the area of edge computing and IoT
- Understand the Raspberry Pi architecture and its components
- Work with Raspberry Pi components and evaluate its performance.

### UNIT-I

IoT and Edge Computing Definition and Use Cases

Introduction to Edge Computing Scenario's and Use cases - Edge computing purpose and definition, Edge computing usecases, Edge computing hardware architectures,

### UNIT-II

Edge platforms, Edge vs Fog Computing, Communication Models -Edge, Fog and M2M, IoT Architecture and Core IoT Modules-A connected ecosystem, IoT versus machine-to-machine versus, SCADA, The value of a network and Metcalfe's and Beck strom's laws

### UNIT-III

IoT and edge architecture, Role of an architect, Understanding Implementations with examples- Example use case and deployment, Case study — Telemedicine palliative care, Requirements, Implementation, Use case retrospective.

### UNIT-IV

Implementation of Microcomputer RaspberryPi anddeviceInterfacing, Edge to Cloud Protocols- Protocols, MQTT, MQTT publish-subscribe, MQTT architecture details, MQTT state transitions, MQTT packet structure,MQTT data types, MQTT communication formats

### UNIT-V

Edge computing with RaspberryPi, Industrial and Commercial IoT and Edge, Edge computing and solutions.

**TEXT BOOKS:**

1. IoTandEdgeComputingforArchitects-  
SecondEdition,byPerryLea,Publisher:PacktPublishing,2020,ISBN:9781839214806
2. RaspberryPiCookbook,3rdEdition,bySimonMonk,Publisher:O'ReillyMedia,Inc.,2019,ISBN:978149204322.

**REFERENCE BOOKS:**

1. FogandEdgeComputing:PrinciplesandParadigmsbyRajkumarBuyya,SatishNarayanaSrirama, wileypublication,2019, ISBN:9781119524984.
2. DavidJensen,“Beginning Azure IoT**Edge Computing**: Extendingthe Cloudtothe Intelligent Edge,MICROSOFTAZURE

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VIII Semester</b>		
<b>Code: C6920</b>	<b>INDUSTRIAL IOT</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

To provide students with a good depth of knowledge of Designing Industrial IOT Systems for various applications.

### Course Outcomes:

- Identify the Key opportunities and benefits in Industrial IoT
- Apply virtual network to demonstrate the use of Cloud in Industrial IoT
- Analyze industrial IoT Three tier topology and data management system
- Summarize Legacy Industrial and Modern Communication Protocols
- Describe Middleware Architecture, Lo Ra WAN- and Augmented reality

### UNIT-I

**Introduction To Industrial Internet And Use-Cases:** Industrial Internet- Key IIoT Technologies-Innovation and the IIoT-Key Opportunities and Benefits-The Digital and Human Workforce-Logistics and the Industrial Internet-IOT Innovations in Retail.

### UNIT-II

**The Technical And Business Innovators Of The Industrial Internet:** Cyber Physical Systems (CPS) –IP Mobility– Network Virtualization – SDN (Software Defined Networks) –The Cloud and Fog– Role of Big Data in IIOT- Role of Machine learning and AI in IIOT

### UNIT-III

**IIOT Reference Architecture:** Industrial Internet Architecture Framework (IIAF) -Industrial Internet Viewpoints -. Architectural Topology: The Three-Tier Topology- Key System Characteristics- Data Management- Advanced data analytics.

### UNIT-IV

**Protocols for Industrial Internet Systems:** Legacy Industrial Protocols - Modern Communication Protocols – Proximity Network Communication Protocols-Wireless Communication Technologies - Gateways: industrial gateways – CoAP (Constrained Application Protocol) - NFC.

### UNIT-V

**Middleware Software Patterns and IIOT Platforms:** Publish/ Subscribe Pattern: MQTT, XMPP, AMQP, DDS - Middleware Architecture- SigFox- LoRaWAN Augmented reality- Real-World Smart Factories

**Application of IIOT:** Case study: Health monitoring, Iot smart city, Smart irrigation, Robot surveillance.

### TEXTBOOKS:

1. Gilchrist, Alasdair, "Industry 4.0 The Industrial Internet of Things", Apress, 2017.
2. Zaigham Mahmood, "The Internet of Things in the Industrial Sector: Security and Device Connectivity, smart environments and Industry 4.0 (Springer), 2019.

#### **REFERENCE BOOKS:**

1. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat "Industrial Internet of Things: Cybermanufacturing Systems" (Springer), 2017.
2. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)
3. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
4. Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
5. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013 Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493-9357-1

#### **BOOKS**

1. <https://www.apress.com/gp/book/9781484220467>



<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VIII Semester</b>		
<b>Code:</b>	<b>FOG COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

- Overview of Fog Computing and its architecture, challenges and applications in different contexts.

### Course Outcomes:

- Familiar with the concepts of Fog.
- Understand the architecture and its components and working of components and its performance.
- Explore Fogon security, multimedia and smart data.
- Model the fog computing scenario.

### UNIT-I

**Introduction to Fog Computing:** Fog Computing, Characteristics, Application Scenarios, Issues and challenges.

**Fog Computing Architecture:** Communication and Network Model, Programming Models, Fog Architecture for smart cities, health care and vehicles.

**Fog Computing Communication Technologies:** Introduction, IEEE 802.11, 4G, 5G standards, WPAN, Short – Range Technologies, LPWAN and other medium and Long – Range Technologies.

### UNIT-II

**Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds:** Introduction, Background, Network Slicing in 5G, Network Slicing in Software-Defined Clouds, Network Slicing Management in Edge and Fog, Middleware for Fog and Edge Computing, Need for Fog and Edge Computing Middleware, Clusters for Lightweight Edge Clouds, IoT Integration, Security Management for Edge Cloud Architectures.

**Fog Computing Realization for Big Data Analytics:** Introduction to Big Data Analytics, Data Analytics in the Fog, Prototypes and Evaluation.

### UNIT-III

**Fog computing requirements when applied to IoT:** Scalability, Interoperability, Fog-IoT architectural model, Challenges on IoT Stack Model via TCP/IP Architecture, Data Management, filtering, Event Management, Device Management, cloudification, virtualization, security and privacy issues. Integrating IoT, Fog, Cloud Infrastructures: Methodology, Integrated C2F2T Literature by Modeling Technique by Use – Case Scenarios, Integrated C2F2T Literature by

Metrics.

#### **UNIT-IV**

**Exploiting Fog Computing in Health Monitoring:** An Architecture of a Health Monitoring IoT Based System with Fog Computing, Fog Computing Services in Smart E-Health Gateways, Discussion of Connected Components.

Fog Computing Model for Evolving Smart Transportation Applications:

Introduction, Data-Driven Intelligent Transportation Systems, Fog Computing for Smart Transportation Applications Case Study: Intelligent Traffic Lights Management (ITLM) System

#### **UNIT-V**

**Software Defined Networking and application in Fog Computing:** Open Flow Protocol, Open Flow Switch, SDN in Fog Computing, Home Network using SDN.

**Security and Privacy issues:** Trust and privacy issues in IoT Network, web Semantics and trust Management for Fog Computing, Machine Learning based security in Fog Computing, Cyber – Physical Energy Systems over Fog Computing.

#### **TEXT BOOKS:**

1. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya
2. Fog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing) by Rajkumar Buyya and Satish Narayana Srirama
3. Amir Vahid Dastjerdi and Rajkumar Buyya, —Fog Computing: Helping the Internet of Things Realize its Potential, University of Melbourne.

#### **REFERENCE BOOKS:**

1. Flavio Bonomi, Rodolfo Milito, Jiang Zhu, Sateesh Addepalli, —Fog Computing and Its Role in the Internet of Things, MCC'12, August 17, 2012, Helsinki, Finland. Copy right 2012 ACM 978-1-4503-1519-7/12/08...\$15.00.
2. Shanhe Yi, Cheng Li, Qun Li, —A Survey of Fog Computing: Concepts, Applications and Issues, Mobidata' 15, ACM 978 – 1 – 4503 – 3524 – 9 / 15 / 06, DOI: 10.1145/2757384.2757397, June 21, 2015, Hangzhou, China.
3. Amir M. Rahmani, Pasi Liljeberg, Preden, Axel Jantsch, —Fog Computing in the Internet of Things - Intelligence at the Edge, Springer International Publishing, 2018.
4. Ivan Stojmenovic, Sheng Wen, “The Fog Computing Paradigm: Scenarios and Security Issues”, Proceedings, Federated Conference on Computer Science and Information Systems, pp.1–8, 2014.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VIII Semester		
Code:	SMART SENSOR TECHNOLOGIES	L	T	P
Credits: 3		3	-	-

### Course Objectives:

- Obtain knowledge on sensors, sensors with micro controllers and their applications

### Course Outcomes:

- Analyze the sensors available in IoT based on application requirements and the Sensing methods
- Create a Real – time application by choosing appropriate sensors for temperature monitoring.
- Interfacing different types of Sensors with MCU
- Infer Wireless Sensing, RF Sensing and RFMEMS
- Design a real – time application for land slide monitoring and hazard mitigation

### UNIT-I

**Basics of Sensors:** Introduction – Sensor Vs Transducer, Nature of Sensors, Sensor Output Characteristics, Sensing Technologies, Digital Output Sensors.

### UNIT-II

**Application Specific Sensors:** Occupancy and motion detectors: ultrasonic – microwave – capacitive detectors - optical presence sensor, Light Detectors: Photo diodes – photo transistor – photoresistor-CCD and CMOS image sensors, Temperature Sensors: thermos-resistive sensors – thermo electric contact sensor

### UNIT-III

**Sensor With Microcontroller:** Introduction, Amplification and Signal Conditioning, Integrated Signal Conditioning, Digital Conversion, MCU Control, MCUs for Sensor Interface, Techniques and Systems Considerations, Sensor Integration

### UNIT-IV

**Wireless Sensing:** Wireless Data and Communications, Wireless Sensing Networks, Industrial Wireless Sensing Networks, RF Sensing, Telemetry, RFMEMS, Complete System Consideration.

### UNIT-V

**Smart Applications and System Requirements:** Automotive Applications, Industrial (Robotic) Applications, Consumer Applications, Future Sensor Plus Semiconductor Capabilities, Future System Requirements.

### TEXT BOOKS:

1. Frank, Randy, “ Understanding smart sensors”, Artech House integrated micro systems series, 3<sup>rd</sup> Edition, 2013.
2. Jacob Fraden, “ Handbook of Modern Sensors: Physics, Designs, and Applications”, 5<sup>th</sup> Edition, Springer, 2016

**REFERENCEBOOKS:**

1. VlasiosTsiatsis, Stamatias Karnouskos, Jan Holler, David Boyle, Catherine Mulligan, "InternetofThings:TechnologiesandApplicationsforaNewAgeofIntelligence",AcademicPre ss,16-Nov-2018.
2. HenryLeung,SubhasChandraMukhopadhyay,"IntelligentEnvironmentalSensing",S pringer,22-Jan-2015.

**EBOOKS**

1. <https://www.sciencedirect.com/topics/engineering/smart-sensors>
1. <https://www.azosensors.com/article.aspx?ArticleID=1289>

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VIII Semester</b>		
<b>Code: C6215</b>	<b>DIGITAL FORENSICS</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

- Understanding the history and evolution of digital forensics.
- Describe various types of cyber crimes.
- Prepare students for forensics readiness plan.

### Course Outcomes:

- Interpret and appropriately apply the laws and procedures associated with identifying, acquiring, examining, and presenting digital evidence.
- Create a method for gathering, assessing, and applying new and existing legislation and industry trends specific to the practice of digital forensics.

### UNIT-I

**Computer Forensics Fundamentals:** Introduction to Computer Forensics: Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources / Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Stepstaken by Computer Forensics Specialists.

Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement, Computer Forensic Technology, Types of Business Computer Forensic Technology.

**Computer Forensics Evidence and Capture:** Data Recovery Defined, Data Back-up and Recovery, The Role of Back – up in Data Recovery, The Data - Recovery Solution.

### UNIT-II

**Evidence Collection and Data Seizure:** Why Collect Evidence? Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody.

**Duplication and Preservation of Digital Evidence:** Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collecting and Preserving Computer Forensic Evidence. **Computer Image Verification and Authentication:**

Special Needs of Evidential Authentication, Practical Consideration, Practical Implementation.

### UNIT-III

**Computer Forensics analysis and validation:** Determining what data to collect and analyze, validating forensic data, addressing data – hiding techniques, and performing remote acquisitions.

**Network Forensics:** Network forensics overview, Performing live acquisitions, Developing standard

procedures for network forensics, using network tools, Examining the honey net project.

**Processing Crime and Incident Scenes:** Identifying digital evidence, Collecting evidence in private - sector incident scenes, Processing law enforcement crime scenes, Preparing for a search, Securing a computer incident or crime scene, Seizing digital evidence at the scene, Storing digital evidence, Obtaining a digital hash, reviewing a case.

#### **UNIT-IV**

**Current Computer Forensic Tools:** Evaluating computer forensic tool needs, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software.

**E-Mail Investigations:** Exploring the role of e-mail in the investigation, Exploring the roles of the client and server in email, Investigating e-mail crimes and violations, Understanding e-mail servers, Using specialized e-mail forensic tools. Cell phone and mobile device forensics: Understanding mobile device forensics, Understanding acquisition procedures for cell phones and mobile devices.

#### **UNIT-V**

**Working with Windows and DOS Systems:** Understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, Virtual Machines.

#### **TEXTBOOKS:**

1. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
2. Computer Forensics and Investigations by Nelson, Phillips, Enfinger, Steuart, CENGAGE Learning

#### **REFERENCE BOOKS:**

1. Real Digital Forensics by Keith J. Jones, Richard Bejtich, Curtis W. Rose, Addison-Wesley Pearson Education
2. Forensic Compiling, A Practitioners Guide by Tony Sammes and Brian Jenkinson, Springer International edition.
3. Computer Evidence Collection & Presentation by Christopher L. T. Brown, Firewall Media.
4. Homeland Security, Techniques & Technologies by Jesus Mena, Firewall Media.
5. Software Forensics Collecting Evidence from the Scene of a Digital Crime by Robert M. Slade, TMH 2005
6. Windows Forensics by Chad Steel, Wiley India Edition.

<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VIII Semester</b>		
<b>Code: C0550</b>	<b>BLOCKCHAIN TECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

**Prerequisites:**

1. Knowledge in information security and applied cryptography.
2. Knowledge in Computer Networks

**Course Objectives:**

- To learn the fundamentals of Block chain and various types of block chain and consensus mechanisms.
- To understand the public block chain system, Private block chain system and consortium block chain.
- Able to know the security issues of block chain technology.

**Course Outcomes:**

- Understanding concepts behind crypto currency
- Applications of smart contracts in decentralized application development
- Understand frame works related to public, private and hybrid block chain
- Create block chain for different application case studies

**UNIT-I**

**Fundamentals of Block chain:** Introduction, Origin of Block chain, Block chain Solution, Components of Block chain, Block in a Block chain, The Technology and the Future.

**Block chain Types and Consensus Mechanism:** Introduction, Decentralization and Distribution, Types of Block chain, Consensus Protocol.

**Cryptocurrency —Bitcoin, Altcoin and Token:** Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

**UNIT-II**

**Public Blockchain System:** Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.

**SmartContracts:** Introduction, SmartContract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

**UNIT-III**

**Private Blockchain System:** Introduction, Key Characteristics of Private Blockchain, Need of PrivateBlockchain, Private Blockchain Examples, Private Blockchain and Open Source, E-commerce SiteExample, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

**Consortium Blockchain:** Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.

**Initial Coin Offering:** Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

#### **UNIT-IV**

**Security in Blockchain:** Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.

**Applications of Block chain:** Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain In SupplyChain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

#### **UNIT-V**

**Block chain Case Studies:** Case Study1–Retail, Case Study2 –Banking and Financial Services, CaseStudy 3 – Healthcare, Case Study 4 – Energy and Utilities.

**Blockchain Platform using Python:** Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.

**Blockchain platform using Hyperledger Fabric:** Introduction, Components of Hyperledger Fabric Network, Chain codes from Developer. [ibm.com](http://ibm.com), Blockchain Application Using Fabric Java SDK.

#### **TEXTBOOK:**

1. “BlockchainTechnology”, ChandramouliSubramanian, AshaA. George, AbhilasjKAandMeena Karthikeyan, Universities Press.

#### **REFERENCEBOOKS:**

1. MichaelJuntaoYuan, BuildingBlockchainApps, Pearson, India.
2. BlockchainBlueprintforEconomy, MelanieSwan, SPDO'reilly.
3. BlockchainforBusiness, JaiSinghArun, JerryCuomo, NitinGaur, Pearson.



<b>2022-23 Onwards (MR-22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech. VIII Semester</b>		
<b>Code:</b>	<b>IOT SECURITY</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

### Course Objectives:

- Understand the various attacks and importance of Security aspects in IoT
- Understand the techniques, protocols and security towards Gaming models
- Understand security and privacy challenges of IoT
- Understand the application of blockchain technology for IoT Security

### Course Outcomes:

- Incorporate the best practices learnt to identify the attacks and mitigate the same
- Adopt the right security techniques and protocols during the design of IoT products
- Assimilate and apply the skills learn tonciphers and blockchains when appropriate
- Describe the essential components of IoT
- Find appropriate security / privacy solutions for IoT

### UNIT-I

Fundamentals of IoT and Security and its need, Prevent Unauthorized Access to Sensor Data, Blockciphers, Introduction to Blockchain, Introduction of IoT devices, IoT Security Requirements, M2MSecurity, Message integrity Modeling faults and adversaries Difference among IoT devices, computers, and embedded devices.

### UNIT-II

IoT and cyber – physical systems RFID Security, Authenticated encryption By zantine Generals problem sensors and actuators in IoT, IoT security (vulnerabilities, attacks, and counter measures), Cyber Physical Object Security, Hash functions Consensus algorithms and their scalability problems Accelerometer, photoresistor, buttons

### UNIT-III

Security engineering for IoT development Hardware Security, Merkle trees and Elliptic curves digital signatures, verifiable random functions, Zero-knowledge systems motor, LED, vibrator, IoT security lifecycle, Front-end System Privacy Protection, Management, Secure IoT Databases, Public-key crypto(PKI), blockchain, the challenges, and solutions, analog signal vs. digital signal

### UNIT-IV

Data Privacy Networking Function Security Trees signature algorithms proof of work, Proof of stake, Networking in IoT Device/User Authentication in IoT IoT Networking Protocols, Cryptocurrencies, alternatives to Bitcoin consensus, Bitcoin scripting language and the iruse Real-time communication

## UNIT-V

Introduction to Authentication Techniques, Secure IoT Lower Layers, Bitcoin P2P network, Ethereum and Smart Contracts, Bandwidth efficiency, Data Trustworthiness in IoT, Secure IoT Higher Layers, Distributed consensus, Smart Contract Languages and verification challenges, Data analytics in IoT –simple data analyzing methods

### TEXTBOOKS:

1. B.Russell and D.Van Duren, "Practical Internet of Things Security," Packt Publishing, 2016.
2. Fei HU, "Security and Privacy Internet of Things (IoTs): Models, Algorithms and Implementations", CRC Press, 2016
3. Narayanan et al., "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction," Princeton University Press, 2016.

### REFERENCE BOOKS:

1. A. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies," O'Reilly, 2014.
2. T. Alpcan and T. Basar, "Network Security: A Decision and Game-theoretic Approach," Cambridge University Press, 2011.
3. Security and the IoT ecosystem, KPMG International, 2015.
4. Internet of Things: IoT Governance, Privacy and Security Issues" European Research Cluster.
5. Ollie Whitehouse, "Security of Things: An Implementers' Guide to Cyber-Security for Internet of Things Devices and Beyond", NCC Group, 2014.
6. Josh Thompson, 'Blockchain: The Blockchain for Beginners, Guide to Blockchain Technology and Blockchain Programming', CreateSpace Independent Publishing Platform, 2017.

<b>2022-23 Onwards (MR22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech VIII Sem</b>		
<b>Code:</b>	<b>Open Elective-III</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 3</b>		<b>3</b>	<b>-</b>	<b>-</b>

<b>2021-22 Onwards (MR22)</b>	<b>MALLA REDDY ENGINEERING COLLEGE (Autonomous)</b>	<b>B.Tech VIII Sem</b>		
<b>Code: C00P3</b>	<b>Project stage-II including Seminar</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Credits: 11</b>		<b>-</b>	<b>-</b>	<b>22</b>