JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

COURSE STRUCTURE AND SYLLABUS

For UG – R20

B. Tech - COMPUTER SCIENCE & ENGINEERING with Specialization

Common to

(i) **CSE (INTERNET OF THINGS) – Branch Code:49**
(ii) **INTERNET of THINGS - Branch Code:60**
(Applicable for batches admitted from 2020-2021)

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KAKINADA - 533 003, Andhra Pradesh, India

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COURSE STRUCTURE

I Year – I SEMESTER

S. No	Course Code	Subjects	L	T	P	Credits
1	BS1101	Mathematics - I	3	0	0	3
2	BS1104	Applied Physics	3	0	0	3
3	HS1101	Communicative English	3	0	0	3
4	ES1101	Computer Engineering Workshop	1	0	4	3
5	ES1102	Programming for Problem Solving Using C	3	0	0	3
6	HS1102	English Communication skills Laboratory	0	0	3	1.5
7	BS1105	Applied Physics Lab	0	0	3	1.5
8	ES1103	Programming for Problem Solving Using C Lab	0	0	3	1.5
Total Credits						**19.5**

I Year – II SEMESTER

S. No	Course Code	Subjects	L	T	P	Credits
1	BS1202	Mathematics – II	3	0	0	3
2	BS1206	Applied Chemistry	3	0	0	3
3	ES1204	Problem Solving Using Python	3	0	0	3
4	ES1205	Basic Electrical& Electronics Engineering	3	0	0	3
5	ES1206	Digital Logic Design	3	0	0	3
6	ES1207	Problem Solving Using Python Lab	0	0	3	1.5
7	BS1207	Applied Chemistry Lab	0	0	3	1.5
8	ES1208	Digital Logic Design Lab	0	0	3	1.5
9	MC1203	Constitution of India	2	0	0	0
Total Credits						**19.5**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – I SEMESTER

S. No	Course Code	Course Title	L	T	P	C
1.	BSC2101	Mathematics – III	3	0	0	3
2.	PCC2101	Mathematical Foundations of Computer Science	3	0	0	3
3.	PCC2102	Data Structures	3	0	0	3
4.	PCC2103	Operating Systems	3	0	0	3
5.	PCC2104	Java Programming	3	0	0	3
6.	PCC2105	Data Structures Lab	0	0	3	1.5
7.	PCC2106	OS&UNIX Programming Lab	0	0	3	1.5
8.	PCC2107	Java Programming Lab	0	0	3	1.5
9.	SC2101	Free and Open Source Software	0	0	4	2
10.	MC2101	Essence of Indian Traditional Knowledge	2	0	0	0
TOTAL						**21.5**

II Year – II SEMESTER

S. No	Course Code	Course Title	L	T	P	C
1.	ESC2201	Computer Organization& Architecture	3	0	0	3
2.	BSC2201	Probability and Statistics	3	0	0	3
3.	PCC2201	Formal Languages & Automata Theory	3	0	0	3
4.	PCC2202	Database Management Systems	3	0	0	3
5.	HSMC2201	Managerial Economics and Financial Accountancy	3	0	0	3
6.	ESC2202	Computer Organization& Architecture Lab	0	0	3	1.5
7.	PCC2203	R Programming Lab	0	0	3	1.5
8.	PCC2204	Database Management Systems Lab	0	0	3	1.5
9.	SC2201	Android Application Development	0	0	4	2
TOTAL						**21.5**
	Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)		4	0	0	4
	Internship 2 Months (Mandatory) during summer vacation					

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – I SEMESTER

S.No.	Course Code	Course Title	L	T	P	C
1	PCC3101	Design and Analysis of Algorithms	3	0	0	3
2	PCC3102	IoT Architecture and its Protocols	3	0	0	3
3.	PCC3103	Computer Networks	3	0	0	3
4.	OEC3101	**Open Elective-I** Open Electives offered by other departments/ Natural Language Processing (Job oriented course)	3	0	0	3
5.	PEC3101	**Professional Elective Courses – I** 1. Compiler Design 2. Principles of Programming Languages 3. Software Engineering 4. Computer Graphics 5. Advanced Computer Architecture	3	0	0	3
6.	PCC3104	Network Programming lab	0	0	3	1.5
7	PCC3105	Internet of Things Lab	0	0	3	1.5
8	SC3101	Web Application Development Using Full Stack – Frontend Development –Module -I	0	0	4	2
9.	MC3101	Environmental Science	2	0	0	0
		Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester	0	0	0	1.5
		Total				21.5
		Minor courses	4	0	0	4

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
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III Year – II SEMESTER

S.No.	Course Code	Course Title	L	T	P	C
1	PCC3201	Embedded System Design	3	1	0	3
2.	PCC3202	Machine Learning	3	0	0	3
3.	PCC3203	Sensors and Actuator Devices for IoT	3	0	0	3
4.	PEC3201	Professional Elective Courses-II (NPTEL/SWAYAM) **Duration: 12 Weeks Minimum** ***Course/subject title can't be repeated**	3	0	0	3
5.	OEC3201	**Open Elective-II** Open Electives offered by other departments/ Social Network and Semantic Web (Job Oriented Course)	3	0	0	3
6.	PCC3204	Embedded System Design Lab	0	0	3	1.5
7.	PCC3205	Machine Learning Lab	0	0	3	1.5
8.	PCC3206	Sensors and Actuator Devices for IoT Lab	0	0	3	1.5
9.	SC3201	Web Application Development Using Full Stack - Frontend Development –Module -II	0	0	4	2
10.	MC3201	1.Employability Skills-I 2.Employability Skills-II	2	0	0	0
		Total				21.5
		Minor courses	4	0	0	4
		Minor courses through SWAYAM	0	0	0	2
Industrial/Research Internship (Mandatory) 2 Months during summer vacation						

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I SEMESTER

S.No.	Course Code	Course Title	L	T	P	C
1	PEC4101	**Professional Elective courses – III** 1 Mobile Computing 2. Data Science 3. No SQL Databases 4. Privacy and Security in IOT 5. Programming and Interfacing with Microcontrollers	3	0	0	3
2.	PEC4102	**Professional Elective courses – IV** 1. Fog Computing 2. Cloud Computing 3. Mean Stack Technologies 4. Big Data Analytics for IoT 5. Cyber Security & Forensics	3	0	0	3
3.	PEC4103	**Professional Elective courses – V** 1. Deep Learning 2. Wearable Computing 3. Dev Ops 4. Block chain Technologies 5. Software Testing Methodologies	3	0	0	3
4.	OEC4101	**Open Elective-III** Open Electives offered by other departments/ Middleware Technologies (Job Oriented Course)	3	0	0	3
5.	OEC4102	**Open Elective-IV** Open Electives offered by other departments/ Multimedia And Rich Internet Applications (Job Oriented Course)	3	0	0	3
6.	HSMC4101	**Humanities and Social Science Elective** 1.Universal Human Values 2. Human Resources Development 3. Business Intelligence 4. Management And Organisational Behaviour 5. Strategic Management	3	0	0	3
7.	SC4101	Multimedia Application Development	0	0	4	2
8	Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester)		0	0	0	3
		Total credits				**23**
		Minor courses	4	0	0	4
		Minor courses through SWAYAM	0	0	0	2

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – II SEMESTER

Sl.No	Category	Code	Course Title	Hours per week			Credits
1	Major Project	PROJ	Project Project work, seminar and internship in industry	-	-	-	12
	INTERNSHIP (6 MONTHS)						
Total Credits							12

Open Electives to be offered by IoT for Other Branches:

Open Elective I: 1. Data Structures 2. Computer Networks 3. Data Base Management System 4. Problem Solving using Python	**Open Elective II:** 1. operating systems 2. Web Technologies 3. IoT Architecture and its Protocols 4. Artificial Intelligence
Open Elective III: 1. Big Data Analytics for IoT 2. Sensors and Actuator Devices for IoT 3.Embedded System Design 4. Data Science	**Open Elective IV:** 1. Programming and Interfacing with Microcontrollers 2. Cryptography and Network Security 3. Machine Learning 4. Mean Stack Technologies

Minor Degree in IoT offered to other branches

S.No	Year and Sem	Subject Title	L	T	P	C
1	II Year II Sem	IoT Architecture and its Protocols	3	1	0	4
2	III Year I Sem	Sensors and Actuator Devices for IoT	3	0	2	4
3	III Year II Sem	Privacy and Security in IOT	3	1	0	4
4	IV Year I Sem	Cloud Computing	3	1	0	4
5		02 MOOCS courses @ 2credits each ** 1. Introduction to Industry 4.0 and Industrial Internet of Things 2. Google Cloud Computing Foundations 3. Introduction to Embedded System Design 4. Wireless Ad Hoc and Sensor Networks				4
		Grand Total				20

Note: Out of the 20 Credits, 16 credits shall be earned by specified courses listed above.In addition to the 16 credits, students must pursue at least 2 courses throughMOOCs. The courses must be of minimum 8 weeks in duration.Student can register at any time after the completion of II B.Tech. I Sem.
****Choose 02 MOOCS courses @ 2credits each from SWAYAM/NPTEL.**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-I (BS1101)					

Course Objectives:

- This course will illuminate the students in the concepts of calculus.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.
- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- Apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)

UNIT I: Sequences, Series and Mean value theorems: (10 hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT II: Differential equations of first order and first degree: (10 hrs)

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

UNIT III: Linear differential equations of higher order: (10 hrs)

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, e^{ax} V(x) and x^nV(x) – Method of Variation of parameters.

Applications: LCR circuit, Simple Harmonic motion.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV: Partial differentiation: (10 hrs)

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V: Multiple integrals: (8 hrs)

Double and Triple integrals – Change of order of integration – Change of variables.

Applications: Finding Areas and Volumes.

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. **Joel Hass, Christopher Heil and Maurice D. Weir,** Thomas calculus, 14th Edition, Pearson.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press, 2013.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - I Semester		L	T	P	C
		3	0	0	3
APPLIED PHYSICS (BS1104)					

(For All Circuital Branches like ECE, EEE, CSE etc)

Unit-I:WaveOptics **12hrs**

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating(Qualitative).

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit Outcomes:
The students will be able to

- Explain the need of coherent sources and the conditions for sustained interference(L2)
- Identify engineering applications of interference(L3)
- Analyze the differences between interference and diffraction with applications(L4)
- Illustrate the concept of polarization of light and its applications(L2)
- Classify ordinary polarized light and extraordinary polarized light(L2)

Unit-II: Lasers andFiberoptics 8hrs

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

Unit Outcomes:
The students will be able to

- Understand the basic concepts of LASER light Sources(L2)
- Apply the concepts to learn the types of lasers(L3)
- Identifies the Engineering applications of lasers(L2)
- Explain the working principle of optical fibers(L2)
- Classify optical fibers based on refractive index profile and mode of propagation(L2)
- Identify the applications of optical fibers in various fields(L2)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Unit III: Quantum Mechanics, Free Electron Theory andBand theory 10hrs

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.

Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - V vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Unit Outcomes:

The students will be able to

- Explain the concept of dual nature of matter(L2)
- Understand the significance of wave function(L2)
- Interpret the concepts of classical and quantum free electron theories(L2)
- Explain the importance of K-Pmodel
- Classify the materials based on band theory(L2)
- Apply the concept of effective mass of electron(L3)

Unit-IV: Dielectric andMagneticMaterials 8hrs

DielectricMaterials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius- Mossotti equation-Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment -Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classificationof magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

Unit Outcomes:

The students will be able to

- Explain the concept of dielectric constant and polarization in dielectric materials(L2)
- Summarize various types of polarization of dielectrics(L2)
- Interpret Lorentz field and Claussius- Mosotti relation indielectrics(L2)
- Classify the magnetic materials based on susceptibility and their temperature dependence (L2)
- Explain the applications of dielectric and magnetic materials(L2)
- Apply the concept of magnetism to magnetic data storage devices(L3)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Unit – V: Semiconductors and Superconductors 10hrs

Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation- Hall effect – Hall coefficient –Applications of Hall effect.
Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDs – High T_c superconductors – Applications ofsuperconductors.

Unit Outcomes:
The students will be able to

- Classify the energy bands of semiconductors(L2)
- Interpret the direct and indirect band gap semiconductors(L2)
- Identify the type of semiconductor using Hall effect(L2)
- Identify applications of semiconductors in electronic devices(L2)
- Classify superconductors based on Meissner's effect(L2)
- Explain Meissner's effect, BCS theory & Josephson effect in superconductors(L2)

Text books:

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy" A Text book ofEngineering Physics"- S.Chand Publications, 11thEdition2019.
2. Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, 1st edition, Oxford press, 2015.
3. Applied Physics by P.K.Palanisamy 3rd edition, SciTechpublications, 2013.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker,10th edition, John Wiley&Sons, 2013.
2. Engineering Physics by M.R.Srinivasan, New Age international publishers, 2009.
3. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", 1st edition, Pearson Education,2018.
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, 1st edition, UniversityPress, 2010.
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, 3rd edition, Mc GrawHill, 2003.
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, CengageLearning, 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - I Semester		L	T	P	C
		3	0	0	3
COMMUNICATIVE ENGLISH (HS1101)					

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Learning Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Unit 1:
Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications
Lesson-2: Deliverance by Premchand from "**The Individual Society",**Pearson Publications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.
Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.
Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.
Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:
Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications
Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications.(Non-detailed)
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.
Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.**Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.
Pronunciation: Past tense markers, word stress-di-syllabic words

Unit 3:
Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications
Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications.(Non-detailed**)**
Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.Functional English:Complaining and Apologizing.
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.
Pronunciation: word stress-poly-syllabic words.

Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications
Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.**(Non-detailed)
Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.
Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.Writing SOP, writing for media.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.
Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms
Pronunciation: Contrastive Stress

Unit 5:
Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications
Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications.(Non-detailed)
Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.
Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.Functional English: Suggesting/Opinion giving.
Reading: Reading for comprehension. RAP StrategyIntensive reading and Extensive reading techniques.
Reading for Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Pronunciation: Stress in compound words
Prescribed text books for theory for Semester-I:
1. "**Infotech English**", Maruthi Publications. (Detailed)
2."**The Individual Society",** Pearson Publications.(Non-detailed)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Prescribed text book for Laboratory for Semesters-I & II:

1. "**Infotech English**", Maruthi Publications. (with Compact Disc)

Reference Books:

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - I Semester		L	T	P	C
		1	0	4	3
COMPUTER ENGINEERING WORKSHOP (ES1101)					

Course Objectives:

- To make the students aware of the basic hardware components of a computer and installation of operating system.
- To introduce Raptor Tool for flowchart creation.
- To introduce programming through Visual Programming tool using scratch.
- To get knowledge in awareness of cyber hygiene that is protecting the personal computer from getting infected with the viruses, worms and other cyber-attacks.
- To introduce the usage of Productivity tools in crafting professional word documents, excel spreadsheets and power point presentations using open office tools.

UNIT I

Simple Computer System: Central processing unit, the further need of secondary storage, Types of memory, Hardware, Software and people. Peripheral Devices: Input, Output and storage, Data Preparation, Factors affecting input, Input devices, Output devices, Secondary devices, Communication between the CPU and Input/ Output devices.

TASK 1: PC Hardware: PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered.

Every student should 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. Every student should disassemble and assemble the PC back to working condition.

TASK 2: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.

Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

UNIT II

Problem Solving and Programming: Algorithm development, Flowcharts, Looping, some programming features, Pseudo code, the one-zero game, some structured programming concepts, documents. Programming Languages: Machine Language and assembly language, high -level and low level languages, Assemblers, Compilers, and Interpreters

TASK 3: **Drawing flowcharts (Raptor Tool)**

1. Create flowcharts for take-off landing of an Aeroplane.
2. Create a flowchart to validate an email id entered by user.
3. Create flowchart to print first 50 prime numbers.

TASK 4: Productivity tool:LaTeX and Microsoft (MS) office: Importance of MS office, Details of the three tasks and features that should be covered in each, MS word, Power Point, Excel.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT III

Operating systems: Introduction, Evolution of operating systems, , Command Interpreter, Popular operating systems- Microsoft DOS, Microsoft Windows, UNIX and Linux.
Introduction to Unix Shell Commands, directory management commands, file operations, users commands, Time and Date commands.

TASK 5: Operating System Installation: Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.
TASK 6: Basic Commands: Unix Shell Commands, directory management commands, file operations, users commands, Time and Date commands.

UNIT IV

Computer Networks: Introduction to computer Networks, Network topologies-Bus topology, star topology, Ring topology, Mesh topology, Hybrid topology, Types of Networks: Local area Network, Wide Area Networks, Metropolitan Networks, Campus/ Corporate Area Network, Personal Area Network, Network Devices- Hub, Repeater, Switch, Bridge, Router, Gateway, Network interface Card, Basic Networking Commands.

TASK 7: 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 how to access the websites and email.
TASK 8: Networking Commands:

ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route

UNIT V

Introduction to HTML : Basics in Web Design, Brief History of Internet ,World Wide Web Why create a web site ,Web Standards, HTML Documents ,Basic structure of an HTML document Creating an HTML document ,Mark up Tags ,Heading-Paragraphs ,Line Breaks ,HTML Tags.

Elements of HTML: Introduction to elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia ,Working with Forms and controls.

TASK 9: Basic HTML tags
1.Head Section and Elements of Head Section, Paragraphs, Formatting Styles.
2. Colour tags, Creating Hyperlinks, Images, Tables, lists
3. HTML Forms, Form Attributes, Form Elements.

TASK 10: 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. Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. Usage of search engines like Google, Yahoo, ask.com and others should be demonstrated by student.
TASK 11: Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

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KAKINADA – 533 003, Andhra Pradesh, India
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Text Books:

1. Fundamentals of Computers –ReemaThareja-Oxford higher education
2. Computer Fundamentals, Anita Goel, Pearson Education, 2017
3. PC Hardware Trouble Shooting Made Easy, TMH
4. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.

Reference Books:

1) An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.
2) An Introduction to Computer studies –Noel Kalicharan-Cambridge

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FORPROBLEM SOLVING USING C (ES1102)					

Course Objectives
The objectives of Programming for Problem Solving Using C are

1) To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
2) To gain knowledge of the operators, selection, control statements and repetition in C
3) To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
4) To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
5) To assimilate about File I/O and significance of functions

UNIT I
Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers
Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.
Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.
Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions
Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

UNIT III
Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages
Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code **Enumerated, Structure, and Union:** The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application

UNIT IV
Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application
Processor Commands: Processor Commands

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion
Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions
Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

COURSE OUTCOMES:

Upon the completion of the course the student will learn

1) To write algorithms and to draw flowcharts for solving problems
2) To convert flowcharts/algorithms to C Programs, compile and debug programs
3) To use different operators, data types and write programs that use two-way/ multi-way selection
4) To select the best loop construct for a given problem
5) To design and implement programs to analyze the different pointer applications
6) To decompose a problem into functions and to develop modular reusable code

To apply File I/O operations

TEXT BOOKS:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson

REFERENCES:

1. Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill
2. Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson
3. Computer Fundamentals and Programming in C, PradipDey, Manas Ghosh, OXFORD

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LABORATORY (HS1102)					

TOPICS

UNIT I:

Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:

Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

UNIT III:

Stress in compound words,rhythm, intonation,accent neutralisation.

UNIT IV:

Listening to short audio texts and identifying the context and specific pieces of information toanswer a series of questions in speaking.

UNIT V:

Newspapers reading;Understanding and identifying key terms and structures useful for writing reports.

Prescribed text book: "**Infotech English**", Maruthi Publications.

References:

1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press. .
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - I Semester		L	T	P	C
		0	0	3	1.5
APPLIED PHYSIC LAB (BS1105)					

(For All Circuital Branches like CSE, ECE, EEE etc.)

(Any 10 of the following listed experiments)

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedgemethod.
2. Determination of radius of curvature of a given plano convex lens by Newton'srings.
3. Determination of wavelengths of different spectral lines in mercury spectrumusing diffraction grating in normal incidence configuration.
4. Determination of dispersive power of theprism.
5. Determination of dielectric constant using charging and dischargingmethod.
6. Study the variation of B versus H by magnetizing the magnetic material (B-Hcurve).
7. Determination of numerical aperture and acceptance angle of an opticalfiber.
8. Determination of wavelength of Laser light using diffractiongrating.
9. Estimation of Planck's constant using photoelectriceffect.
10. Determination of the resistivity of semiconductor by four probemethod.
11. To determine the energy gap of a semiconductor using p-n junctiondiode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor usingHall Effect .
14. Measurement of resistance of a semiconductor with varyingtemperature.
15. Resistivity of a Superconductor using four probe method & Meissnereffect.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers,2017.

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I Year - I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FORPROBLEM SOLVING USING C LAB (ES1103)					

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

By the end of the Lab, the student

- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - II (BS1202)					

Course Objectives

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various realworld problems and their applications.

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

- Develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- Solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- Evaluate approximating the roots of polynomial and transcendental equations by different algorithms (L5)
- Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations (L3)

Unit I: Solving systems of linear equations, Eigen values and Eigen vectors:(10 hrs)
Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous equations linear equations – Gauss Elimination for solving system of equations – Eigen values and Eigen vectors and their properties.

Unit-II: Cayley-Hamilton theorem and Quadratic forms: (10 hrs)
Cayley- Hamilton theorem (without proof) – Finding inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms –Reduction of quadratic form to canonical forms by orthogonal transformation.
Singular values of a matrix, singular value decomposition (Ref. Book – 1).

UNIT III: Iterative methods: (8 hrs)
Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations.

UNIT IV: Interpolation: (10 hrs)
Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V: Numerical integration and solution of ordinary differential equations: (10 hrs)
Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order).

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 43^{rd} Edition, Khanna Publishers.
2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. David Poole, Linear Algebra- A modern introduction, 4^{th} Edition, Cengage.
2. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
3. M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
4. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press.

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I Year - II Semester		L	T	P	C
		3	0	0	3
APPLIED CHEMISTRY (BS1206)					

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

COURSE OBJECTIVES

- ***Importance*** of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- ***Outline*** the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- ***Explain*** the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- ***Recall*** the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- ***Outline*** the basics of computational chemistry and molecular switches

UNIT I: POLYMER TECHNOLOGY **8 hrs**

Polymerisation:-Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.

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

- ***Analyze*** the different types of composite plastic materials and ***interpret***the mechanism of conduction in conducting polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION **10 hrs**

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Corrosion:-Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).

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

- ***Utilize*** the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and c***ategorize*** the reasons for corrosion and study methods to control corrosion.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT III: MATERIAL CHEMISTRY **10 hrs**

Part I*:* ***Non-elementalsemiconducting materials:-*** Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators &magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II:

Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals:- Introduction-types-applications.

Super conductors:-Type –I, Type II-characteristics and applications

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

- ***Synthesize*** nanomaterials for modern advances of engineering technology.
- ***Summarize the*** preparation of semiconductors; analyze the applications of liquid crystals and superconductors.

UNIT IV:SPECTROSCOPIC TECHNIQUES &NON-CONVENTIONAL ENERGY SOURCES 10 hrs

Part A: **SPECTROSCOPIC TECHNIQUES**

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR [instrumentation and differentiation of sp, sp^2, sp^3 and IR stretching of functional groups (alcohols, carbonyls, amines) applications], magnetic resonance imaging and CT scan (procedure & applications).

Part B*:* NON-CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

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

- ***Analyze*** the principles of different analytical instruments and their applications.
- ***Design*** models for energy by different natural sources.

UNIT V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY **8 hrs**

Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies

***Molecular switches*:** characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

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

- ***Obtain*** the knowledge of computational chemistry and molecular machines

Standard Books:

1. P.C. Jain and M. Jain "**Engineering Chemistry**", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "**Engineering Chemistry**", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "**A Textbook of Engineering Chemistry**", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
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Reference:

1. K. Sesha Maheshwaramma and Mridula Chugh, "**Engineering Chemistry**", Pearson India Edn.
2. O.G. Palana, "**Engineering Chemistry**", Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "**Preparation and characterization of materials**" Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "**Textbook of Nanoscience and Nanotechnology**", University press (latest edition)

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year – II Semester		L	T	P	C
		3	0	0	3
PROBLEM SOLVING USING PYTHON (ES1204)					

Course Objectives:
The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

UNIT I
Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.
Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.
Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II
Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop
Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III
List and Dictionaries: Lists, Defining Simple Functions, Dictionaries
Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.
Modules: Modules, Standard Modules, Packages.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

UNIT V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming: Introduction to Programming Concepts with Scratch.

Text Books

1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2) Python Programming: A Modern Approach, VamsiKurama, Pearson.

Reference Books:

1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

e-Resources:

1) https://www.tutorialspoint.com/python3/python_tutorial.pdf

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - II Semester		L	T	P	C
		3	0	0	3
BASIC ELECTRICAL & ELETRONICS ENGINEERING (ES1205)					

This course introduces the student, the fundamentals of electrical engineering concepts needed for future courses to be learned. The first three units cover the electric circuit laws, theorems and electrical machines. The next two units cover the principles of Electro static and electromechanical conversions, measurement of electrical quantities, electrical safety and batteries.

Course Objectives:

- Study the basic DC and AC networks used in electrical circuits.
- Study the basic concepts of electrical engineering.
- Demonstrate the concepts of electrical wiring and safety.
- To understand the principle of operation and construction details of DC machines & Transformers.
- To understand the principle of operation and construction details of alternator and 3-Phase Inductionmotor.

UNIT I

Introduction: Concept of Potential difference, voltage, current, Fundamental linear passive and active elements to their functional current-voltage relation, voltage source and current sources, ideal and practical sources, concept of dependent and independent sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis, Concept of work, power and energy.
Series – Parallel Circuits – Inductive & Capacitive networks.

UNIT II

DC Circuits: Current-voltage relations of the electric network by mathematical equations to analyze the network (Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem), Superposition theorem. Simplifications of networks using series-parallel, Star/Delta transformation.

AC Circuits: AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor.

UNIT III

Dc Machines:
Principle of operation of DC generator – EMF equation - Types of DC machine – Torque equation – Applications.
Transformers:
Principle of operation and construction of single phase transformers – EMF equation – Losses.

UNIT IV

AC Rotating Machines:
Principle of operation and construction of alternators– Types of alternators – Principle of operation ofsynchronous motor - Principle of operation of 3-Phase induction motor – Slip-torque characteristics - Efficiency –Applications.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Unit V

Rectifiers & Linear ICs:

PN junction diodes - Diode applications(Half wave and bridge rectifiers).Characteristics of operation amplifiers (OP-AMP) - application of OP-AMPs (inverting, non-inverting, integrator and differentiator). Transistors:PNP and NPN junction transistor, transistor as an amplifier- Transistor amplifier - Frequency response of CEamplifier - Concepts of feedback amplifier.

Text Book(s)

1. B. L. Theraja, A Textbook of Electrical Technology, (vol. I), 1/e, Chand and Company Ltd., New Delhi, 2005.
2. V. K. Mehta, Basic Electrical Engineering, 6/e, S. Chand and Company Ltd., New Delhi, 2012.
3. J. Nagrath and Kothari, Theory and problems of Basic Electrical Engineering, 2/e, Prentice Hall of India Pvt. Ltd., 2017.
4. Electrical Technology by Surinder Pal Bali, Pearson Publications.
5. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI, 2006.

References

1. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, 2/e, Oxford University Press, 2011.
2. Smarjith Ghosh, Fundamentals of Electrical and Electronics Engineering, 1/e, Prentice Hall (India) Pvt. Ltd., 2004.
3. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group
4. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications
5. Basic Electrical Engineering by Nagsarkar,Sukhija, Oxford Publications,2nd edition
6. Industrial Electronics by G.K. Mittal, PHI

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - II Semester		L	T	P	C
		3	0	0	3
DIGITAL LOGIC DESIGN (ES1206)					

Course Objective

- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, theory of Boolean algebra and map method for minimization of switching functions.
- To introduce the basic tools for design of combinational and sequential digital logic.
- To learn simple digital circuits in preparation for computer engineering.

UNIT- I: Digital Systems and Binary Numbers
Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc..

UNIT -II: Concept of Boolean algebra
Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.
Gate level Minimization
Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, Exclusive-OR Function.

UNIT- III:Combinational Logic
Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, HDL Models of Combinational Circuits.
Realization of Switching Functions Using PROM, PAL and PLA.

UNIT- IV: Synchronous Sequential Logic
Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

UNIT -V: Registers and Counters
Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

OUTCOMES:
- A student who successfully fulfills the course requirements will have demonstrated:
- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them forlogic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

- Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
- Students will be able to design various sequential circuits starting from flip-flop to registers and counters.

TEXT BOOKS:

1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage.

REFERENCE BOOKS:

1. Digital Logic and Computer Design, M.Morris Mano, PEA.
2. Digital Logic Design, Leach, Malvino, Saha, TMH.
3. Modern Digital Electronics, R.P. Jain, TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - II Semester		L	T	P	C
		0	0	3	1.5
PROBLEM SOLVING USING PYTHON LAB (ES1207)					

Course Objectives:
The aim of Python Programming Lab is
- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Course Outcomes:
By the end of this lab, the student is able to
- Write, Test and Debug Python Programs
- Use Conditionals and Loops for Python Programs
- Use functions and represent Compound data using Lists, Tuples and Dictionaries
- Use various applications using python

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.

2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

```
*
**
***
****
```

6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and Not close otherwise.
8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
11) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
12) Write a program that generates a list of 20 random numbers between 1 and 100.
    Print the list.
    Print the average of the elements in the list.
    Print the largest and smallest values in the list.
    Print the second largest and second smallest entries in the list
    Print how many even numbers are in the list.
13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.
15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].
16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements,it is much shorter with lists and it is also easier to add new conversions if you use lists.
17) Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
18) Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
19) Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.
20) Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.
21) Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.
22) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
23) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
    Do this using the sort method. (b) Do this without using the sort method.
24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.
27) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.
28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.
30) Write a Python class to implement pow(x, n).
31) Write a Python class to reverse a string word by word.
32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
33) Write a program to demonstrate Try/except/else.
34) Write a program to demonstrate try/finally and with/as.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - II Semester		L	T	P	C
		0	0	3	1.5
APPLIED CHEMISTRY LAB (BS1207)					

Course Objective

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, Volumetric titrations, quantitative analysis
Determination of HCl using standard Na_2CO_3 solution.

1. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
2. Determination of Mn^{+2} using standard oxalic acid solution.
3. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
4. Determination of Cu^{+2} using standard hypo solution.
5. Determination of temporary and permanent hardness of water using standard EDTA solution.
6. Determination of Fe^{+3} by a colorimetric method.
7. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
8. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
9. Determination of the concentration of strong acid vs strong base (by conductometric method).
10. Determination of strong acid vs strong base (by potentiometric method).
11. Determination of Mg^{+2} presentin an antacid.
12. Determination of $CaCO_3$ present in an egg shell.
13. Estimation of Vitamin C.
14. Determination of phosphoric content in soft drinks.
15. Adsorption of acetic acid by charcoal.
16. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - II Semester		L	T	P	C
		0	0	3	1.5
DIGITAL LOGIC DESIGN LAB (ES1208)					

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce the concept of digital and binary systems.
- To know the concepts of Combinational circuits.
- Be able to design and analyze Sequential logic circuits.
- To understand the concepts of flip-flops, registers and counters.
- Students will learn and understand the basics of logic gates and circuits.

COURSE OUTCOMES:

- A student who successfully fulfils the course requirements will have demonstrated:
- CO1: To learn about the basics of gates.
- CO2: To understand, analyse and design the basic digital circuits and any digital design in real
- time applications.
- CO3: Construct basic combinational circuits and verify their functionalities.
- CO4: Apply the design procedures to design basic sequential circuits.
- CO5: An ability to measure and record the experimental data, analyse the results, and prepare a formal laboratory report.

List of Experiments:

1. Verification of Basic Logic Gates.
2. Implementing all individual gates with Universal Gates NAND & NOR.
3. Design a circuit for the given Canonical form, draw the circuit diagram and verify the De-Morgan laws.
4. Design a Combinational Logic circuit for 8x1 MUX and verify the truth table.
5. Verify the data read and data write operations for the IC 74189.
6. Construct Half Adder and Full Adder using Half Adder and verify the truth table.
7. Design a 4-bit Adder/Subtractor.
8. Design and realization of 4-bit comparator.
9. Design and implement a 3 to 8 decoder using gates.
10. Design and realization of a 4-bit Gray to Binary and Binary to Gray converter.
11. Implementation of Master Slave Flip-Flop with J-K Flip- Flop and verify the truth table for race around condition.
12. Design a Decade Counter and verify the truth table.
13. Design and implement a 4-bit shift register using Flip flops.
14. Design and Verify the 4-bit synchronous.
15. Design and verify 4-bit ripple counter (Asynchronous).

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

TEXT BOOKS:

1. Digital Design ,4/e, M.Morris Mano, Michael D Ciletti, PEA.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage.
3. Digital Logic Design, Leach, Malvino, Saha,TMH.

REFERENCES:

1. Switching and Finite Automata Theory,3/e,Kohavi, Jha, Cambridge.
2. Verilog HDL primer, Jaya Bhaskar, PEA.
3. Modern Digital Electronics, R.P. Jain, TMH.
4. Digital Fundamentals, Thomas L. Floyd, Pearson Education, ISBN:9788131734483.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

I Year - II Semester		L	T	P	C
		2	0	0	0
CONSTITUTION OF INDIA (MC1203)					

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court
- Controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative.

UNIT-I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes:

After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes:-After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

Learning outcomes:-After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT-IV

A Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PanchayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO
ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy
Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organization

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women
Learning outcomes:-After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government andPolitics Hans
7. J. Raj IndianGovernment and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

Constitution Course Outcomes:

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - III (BSC2101)					

Course Objectives:

- To familiarize the techniques in partial differentialequations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real worldapplications.

Course Outcomes:

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

- Interpret the physical meaning of different operators such as gradient, curl and divergence(L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations(L3)
- Find or compute the Fourier series of periodic signals(L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms(L3)
- Identify solution methods for partial differential equations that model physical processes(L3)

UNIT I: Vectorcalculus:
Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential. Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II: LaplaceTransforms:
Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III: Fourier series andFourierTransforms:
Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.
Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

UNIT IV: PDE of first order:
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V: Second order PDE and Applications:

Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type e^{ax+by},sin(ax+ by), cos(ax+ by), $x^m y^n$.

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Text Books:

1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, KhannaPublishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. GrawHill Education.

Reference Books:

1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition,Wiley-India.
2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3) Peter O' Neil, Advanced Engineering Mathematics,Cengage.
4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford UniversityPress.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – I Semester		L	T	P	C
		3	0	0	3
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (PCC2101)					

Course Objectives:

This course is designed to:

- To introduce the students to the topics and techniques of discrete methods and combinatorialreasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computerscience

Course Outcomes:

At the end of the course student will be able to

- Demonstrate skills in solving mathematicalproblems
- Comprehend mathematical principles andlogic
- Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Manipulate and analyze data numerically and/or graphically using appropriateSoftware
- Communicate effectively mathematical ideas/results verbally or inwriting

UNIT I

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II

Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

UNIT III

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem, Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler'sTheorems

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving In homogeneous Recurrence Relations.

UNIT V

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

Text Books:

1) Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGrawHill.
2) Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGrawHill.

Reference Books:

1) Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall ofIndia.
2) Discrete Mathematical Structures, BernandKolman, Robert C. Busby and Sharon Cutler Ross,PHI.
3) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGrawHill.

e-Resources:

1) https://nptel.ac.in/courses/106/106/106106094/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – I Semester		L	T	P	C
		3	0	0	3
DATA STRUCTURES (PCC2102)					

Course Objectives:

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract datatypes
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used byalgorithms

Course Outcomes:

After completing this course a student will be able to:

- Summarize the properties, interfaces, and behaviors of basic abstract datatypes
- Discuss the computational efficiency of the principal algorithms for sorting &searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversingtrees

UNIT I

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Deques, Priority Queues, Multiple Queues.

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees-AVL Trees, Insertion, Deletion andRotations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims &Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

1) Data Structures Using C. 2nd Edition.ReemaThareja,Oxford.
2) Data Structures and algorithm analysis in C, 2nd ed, Mark AllenWeiss.

Reference Books:

1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, UniversitiesPress.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, BehrouzA. Forouzon, Cengage.
3) Data Structures with C, Seymour LipschutzTMH

e-Resources:

1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – I Semester		L	T	P	C
		3	0	0	3
OPERATING SYSTEMS (PCC2103)					

Course Objectives:

The objectives of this course is to

- Introduce to the internal operation of modern OperatingSystems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling,deadlock, memory management, and filesystems
- Understand File Systems in Operating System like UNIX/Linux andWindows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk)Mechanism
- Analyze Security and Protection Mechanism in OperatingSystem

Course Outcomes:

After learning, the course the students should be able to:

- Describe various generations of Operating System and functions of OperatingSystem
- Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare theirperformance
- Solve Inter Process Communication problems using Mathematical Equations by various methods
- Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page ReplacementTechniques
- Outline File Systems in Operating System like UNIX/Linux andWindows

UNIT I

Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

UNIT II

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.
Multithreaded Programming: Multithreading models, thread libraries, threading issues.
Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, multiple processor scheduling, thread scheduling.
Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT III

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging,Segmentation.

Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

UNIT IV

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.
File Systems: Files, Directories, File system implementation, management and optimization.
Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT V

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.
System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification.
Case Studies: Linux, Microsoft Windows.

Text Books:

1) SilberschatzA, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (forInterprocess Communication and Filesystems.)

Reference Books:

1) Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill,2012.
2) Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education,2009
3) Nutt G, Operating Systems, 3rd edition, Pearson Education,2004.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105214/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – I Semester		L	T	P	C
		3	0	0	3
JAVA PROGRAMMING(PCC2104)					

Course Objectives:

The learning objectives of this course are:

- To identify Java language components and how they work together inapplications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using classlibraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Javaapplications
- To understand how to design applications with threads inJava
- To understand how to use Java APIs for programdevelopment

Course Outcomes:

By the end of the course, the student will be

- Able to realize the concept of Object Oriented Programming & Java Programming Constructs
- Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and variouskeywords
- Apply the concept of exception handling and Input/ Outputoperations
- Able to design the applications of Java & Javaapplet
- Able to Analyze& Design the concept of Event Handling and Abstract Window Toolkit

UNIT I

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value andbyReference, Keyword this.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final andStatic.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.
Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces,Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto- unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal AdjustersClass.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class StringBuilder.
Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.
Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Text Books:

1) JAVA one step ahead, Anitha Seth, B.L.Juneja,Oxford.
2) The complete Reference Java, 8th edition, Herbert Schildt,TMH.
3) JAVA Programming for Core and Advanced Learners, Sagayaraj, Denis, Karthik, Gajalakshmi, Universities Press.

References Books:

1) Introduction to java programming, 7th edition by Y Daniel Liang,Pearson
2) Constructive JAVA Programming, Sagayaraj, Denis, Karthik, Gajalakshmi, Universities Press.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – I Semester		L	T	P	C
		0	0	3	1.5
DATA STRUCTURES LAB (PCC2105)					

Course Objectives:
The objective of this lab is to
- Demonstrate procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
- Understand dynamic memory management techniques using pointers, constructors, destructors,etc
- Demonstrate the concept of function overloading, operator overloading, virtual functions and polymorphism,inheritance.
- Demonstrate the different data structuresimplementation.

Course Outcomes:
By the end of this lab the student is able to
- Use basic data structures such as arrays and linkedlist.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortestpaths.
- Use various searching and sortingalgorithms.

Exercise1:

Write recursive program which computes the n^{th}Fibonacci number, for appropriate values of n. Analyzebehavior of the program Obtain the frequency count of the statement for various values of n.

Exercise 2:
Write recursive program for the following
a) Write recursive and non recursive C program for calculation of Factorial of aninteger
b) Write recursive and non recursive C program for calculation of GCD (n,m)
c) Write recursive and non recursive C program for Towers of Hanoi : N disks are to be transferred from peg S to peg D with Peg I as the intermediatepeg.

Exercise 3:
a) Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a givenlist.
b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a givenlist.
c) Write C program that use both recursive and non recursive functions to perform Fibonacci search for a Key value in a givenlist.

Exercise 4:
a) Write C program that implement Bubble sort, to sort a given list of integers in ascendingorder
b) Write C program that implement Quick sort, to sort a given list of integers in ascendingorder
c) Write C program that implement Insertion sort,to sort a given list of integers in ascendingorder

Exercise 5:
a) Write C program that implement heap sort, to sort a given list of integers in ascendingorder
b) Write C program that implement radix sort, to sort a given list of integers in ascendingorder
c) Write C program that implement merge sort, to sort a given list of integers in ascendingorder

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Exercise 6:
a) Write C program that implement stack (its operations) usingarrays
b) Write C program that implement stack (its operations) using Linkedlist

Exercise 7:
a) Write a C program that uses Stack operations to Convert infix expression into postfix expression
a) Write C program that implement Queue (its operations) usingarrays.
b) Write C program that implement Queue (its operations) using linkedlists

Exercise 8:
a) Write a C program that uses functions to create a singly linkedlist
b) Write a C program that uses functions to perform insertion operation on a singly linkedlist
c) Write a C program that uses functions to perform deletion operation on a singly linkedlist

Exercise 9:
a) Adding two large integers which are represented in linked listfashion.
b) Write a C program to reverse elements of a single linkedlist.
c) Write a C program to store a polynomial expression in memory using linkedlist
d) Write a C program to representation the given Sparse matrix usingarrays.
e) Write a C program to representation the given Sparse matrix using linkedlist

Exercise10:
a) Write a C program to Create a Binary Tree ofintegers
b) Write a recursive C program for Traversing a binary tree in preorder, inorder andpostorder.
c) Write a non recursive C program for Traversing a binary tree in preorder, inorder andpostorder.
d) Program to check balance property of atree.

Exercise 11:
a) Write a C program to Create a BST
b) Write a C program to insert a node into a BST.
c) Write a C program to delete a node from a BST.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – I Semester		L	T	P	C
		0	0	3	1.5
OS & UNIX PROGRAMMING LAB (PCC2106)					

Course Objectives:

- To understand the design aspects of operatingsystem
- To study the process management concepts & Techniques
- To study the storage managementconcepts
- To familiarize students with the Linuxenvironment
- To learn the fundamentals of shellscripting/programming

Course Outcomes:

- To use Unix utilities and perform basic shell control of theutilities
- To use the Unix file system and file accesscontrol
- To use of an operating system to developsoftware
- Students will be able to use Linux environmentefficiently
- Solve problems using bash for shellscripting

1) a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm,
   mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout,shutdown.
   b) Study of vieditor
   c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operatingsystem
   d) Study of Unix/Linux file system (treestructure)
   e) Study of .bashrc, /etc/bashrc and Environmentvariables.
2) Write a C program that makes a copy of a file using standard I/O, and systemcalls
3) Write a C program to emulate the UNIX ls–lcommand.
4) Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls–l |sort
5) Simulate the following CPU scheduling algorithms:
   (a) Round Robin (b) SJF (c) FCFS (d) Priority
6) Multiprogramming - Memory management-Implementation of fork (), wait (), exec() and exit (), Systemcalls
7) Simulate thefollowing:
   a) Multiprogramming with a fixed number of tasks (MFT)
   b) Multiprogramming with a variable number of tasks(MVT)
8) Simulate Bankers Algorithm for Dead LockAvoidance
9) Simulate Bankers Algorithm for Dead LockPrevention.
10) Simulate the following page replacementalgorithms:
    a) FIFO b) LRU c) LFU
11) Simulate the following File allocation strategies
    a) Sequenced (b) Indexed (c)Linked

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

12) Write a C program that illustrates two processes communicating using shared memory

13) Write a C program to simulate producer and consumer problem using semaphores

14) Write C program to create a thread using pthreads library and let it run its function.

15) Write a C program to illustrate concurrent execution of threads using pthreads library.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – I Semester		L	T	P	C
		0	0	3	1.5
JAVA PROGRAMMING LAB (PCC2107)					

Course Objectives:
The aim of this lab is to
- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language
- Learn use of Java in a variety of technologies and on different platforms

Course Outcomes:
By the end of the course student will be able to write java program for
- Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
- Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
- Construct Threads, Event Handling, implement packages, developing applets

Exercise - 1 (Basics)
a) Write a JAVA program to display default value of all primitive data type of JAVA
b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.
c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)
a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
b) Write a JAVA program to sort for an element in a given list of elements using bubble sort
c) Write a JAVA program to sort for an element in a given list of elements using merge sort.
d) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3 (Class, Objects)
a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)
a) Write a JAVA program to implement constructor overloading.
b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)
a) Write a JAVA program to implement Single Inheritance
b) Write a JAVA program to implement multi-level Inheritance
c) Write a java program for abstract class to find areas of different shapes

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Exercise - 6 (Inheritance - Continued)
a) Write a JAVA program give example for "super"keyword.
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)
a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)
a) Write a JAVA program that implements Runtime polymorphism
b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)
a) Write a JAVA program for creation of Illustrating throw
b) Write a JAVA program for creation of Illustrating finally
c) Write a JAVA program for creation of Java Built-in Exceptions
d) d)Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)
a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable)
b) Write a program illustrating is Alive and join()
c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)
a) Write a JAVA program Producer Consumer Problem
b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)
a) Write a JAVA program illustrate class path
b) Write a case study on including in class path in your os environment of your package.
c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)
a) Write a JAVA program to paint like paint brush in applet.
b) Write a JAVA program to display analog clock using Applet.
c) Write a JAVA program to create different shapes and fill colors using Applet.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year - I Semester		L	T	P	C
		0	0	4	2
FREE AND OPEN SOURCE SOFTWARE (SC2101)					

Course Objectives:

The student should be made to:

- Be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects.
- Be familiar with participating in a FOSS project
- Learn scripting language like Python or Perl
- Learn programming language like Ruby
- Learn some important FOSS tools and techniques

1. Getting started with Linux basic commands and directory structure, execute file, directory operations.
2. Linux commands for redirection, pipes, filters, job control, file ownership, file permissions, links and file system hierarchy.
3. Shell Programming : Write shell script to show various system configuration like
    1 Currently logged user and his log name
    2 Your current shell
    3 Your home directory
    4 Your operating system type
    5 Your current path setting
    6 Your current working directory
    7 Show Currently logged number of users
4. Write shell script to show various system configuration like
    1About your OS and version, release number, kernel version
    2 Show all available shells
    3 Show mouse settings
    4 Show computer CPU information like processor type, speed etc
    5 Show memory information
    6 Show hard disk information like size of hard-disk, cache memory, modeletc
    7 File system (Mounted)
5. Shell script program for scientific calculator.
6. Version Control System setup and usage using GIT.
    1 Creating a repository
    2 Checking out a repository
    3 Adding content to the repository
    4 Committing the data to a repository
7. Shell script to implement a script which kills every process which uses more than as pecified value of memory or CPU and is run upon system start.
8. Running PHP : simple applications like login forms after
9. Advanced linux commands curl, wget, ftp, ssh and grep

10. Application deployment on a cloud-based LAMP stack/server with PHP eg: Open shift, Linode etc.
11. Virtualisation environment (e.g., xen, kqemu, virtualbox or lguest) to test anapplications, new kernels and isolate applications. It could also be used to exposestudents to other alternate OSs like *BSD
12. Introduction to packet management system : Given a set of RPM or DEB, how to buildand maintain, serve packages over http or ftp. and also how do you configure clientsystems to access the package repository.
13. Installing various software packages. Either the package is yet to be installed or an older version is existing. The student can practice installing the latest version. Of course,this might need Internet access.
    1 Install samba and share files to windows
    2 Install Common Unix Printing System(CUPS)

TEXT BOOK:

Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, “Linux in a Nutshell”, Sixth Edition, OReilly Media, 2009.

REFERENCES:

Philosophy of GNU URL: http://www.gnu.org/philosophy/.
Linux Administration URL: http://www.tldp.org/LDP/lame/LAME/linux-admin-made-easy/.
The Python Tutorial available at http://docs.python.org/2/tutorial/.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year - I Semester		L	T	P	C
		2	0	0	0
ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (MC2101)					

Course Objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system

- The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledge system
- To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act2003
- The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection
- To know the student traditional knowledge in different sector

Course Outcomes:

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

- Understand the concept of Traditional knowledge and itsimportance
- Know the need and importance of protecting traditionalknowledge
- Know the various enactments related to the protection of traditionalknowledge
- Understand the concepts of Intellectual property to protect the traditionalknowledge

UNITI

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT II

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act);B:The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

UNIT IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Reference Books:

1) Traditional Knowledge System in India, by Amit Jha,2009.
2) Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan2012.
3) Traditional Knowledge System in India by Amit Jha Atlantic publishers,2002
4) "Knowledge Traditions and Practices of India" Kapil Kapoor, MichelDanino

e-Resources:

1) https://www.youtube.com/watch?v=LZP1StpYEPM
2) http://nptel.ac.in/courses/121106003/

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – II Semester		L	T	P	C
		3	0	0	3
COMPUTER ORGANIZATION & ARCHITECTURE (ESC2201)					

Course Objectives:

The course objectives of Computer Organization are to discuss and make student familiar with the

- Principles and the Implementation of ComputerArithmetic
- Operation of CPUs including RTL, ALU, Instruction Cycle andBusses
- FundamentalsofdifferentInstructionSetArchitecturesandtheirrelationshiptothe CPU Design
- Memory System and I/OOrganization
- Principles of Operation of Multiprocessor Systems andPipelining

Course Outcomes:

By the end of the course, the student will

- Develop a detailed understanding of computersystems
- Cite different number systems, binary addition and subtraction, standard, floating-point, and microoperations
- Develop a detailed understanding of architecture and functionality ofcentral processing unit
- Exemplify in a better way the I/O and memoryorganization
- Illustrate concepts of parallel processing, pipelining and inter processor communication

UNIT I

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating, Point Representation. Other Binary Codes, Error Detection Codes.

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT II

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 Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description.

UNIT III

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

Micro programmed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

UNIT V

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.

Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:

1) Computer System Architecture, M. Morris Mano, Third Edition, Pearson,2008.
2) Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5/e, McGraw Hill,2002.

Reference Books:

1) Computer Organization and Architecture, William Stallings, 6/e, Pearson,2006.
2) Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson,2005.
3) Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer, 2006.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105163/
2) http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – II Semester		L	T	P	C
		3	0	0	3
PROBABILITY AND STATISTICS (BSC2201)					

Course Objectives:

- To familiarize the students with the foundations of probability and statisticalmethods
- To impart probability concepts and statistical methods in various applicationsEngineering

Course Outcomes:

Upon successful completion of this course, the student should be able to

- Classify the concepts of data science and its importance (L4) or(L2)
- Interpret the association of characteristics and through correlation and regression tools (L4)
- Make use of the concepts of probability and their applications(L3)
- Apply discrete and continuous probability distributions(L3)
- Design the components of a classical hypothesis test(L6)
- Infer the statistical inferential methods based on small and large sampling tests(L4)

UNIT I

Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNITII

Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Method of least squares – Straight line – parabola – Exponential – Powercurves.

UNIT III

Probability and Distributions: Probability – Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normaldistributions.

UNIT IV

Sampling Theory:Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT V

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

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Text Books:

1) Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson,2008.
2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e,Sultan Chand & Sons Publications,2012.

Reference Books:

1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineersand the Scientists,8th Edition, Pearson2007.
2) Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8thEdition, Cengage.
3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists,4th Edition, Academic Foundation, 2011.
4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson,2010.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – II Semester		L	T	P	C
		3	0	0	3
FORMAL LANGUAGES AND AUTOMATA THEORY (PCC2201)					

Course Objectives:

- To learn fundamentals of Regular and Context Free Grammars andLanguages
- To understand the relation between Regular Language and Finite Automata andmachines
- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators
- To understand the relation between Contexts free Languages, PDA andTM
- To learn how to design PDA as acceptor and TM asCalculators

Course Outcomes:

By the end of the course students can

- Classify machines by their power to recognize languages.
- Summarize language classes & grammars relationship among them with the helpof Chomskyhierarchy
- Employ finite state machines to solve problems incomputing
- Illustrate deterministic and non-deterministicmachines
- Quote the hierarchy of problems arising in the computerscience

UNIT I

Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with Є-Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT II

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, InterConversion.

UNIT III

Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, Є-Productions and Unit Productions, Normal Forms-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT IV

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Two Stack Pushdown Automata, Application of PushdownAutomata.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V

Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:

1) Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson,2008
2) Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishraand N. Chandrasekharan, 3rd Edition, PHI, 2007

Reference Books:

1) Elements of Theory of Computation, Lewis H.P. &Papadimition C.H., Pearson/PHI
2) Theory of Computation, V. Kulkarni, Oxford University Press,2013
3) Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill,2014

e-Resources:

1) https://nptel.ac.in/courses/106/104/106104028/

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – II Semester		L	T	P	C
		3	0	0	3
DATABASE MANAGEMENT SYSTEMS (PCC2202)					

Course Objectives:

- To introduce about database managementsystems
- To give a good formal foundation on the relational model of data and usage of RelationalAlgebra
- To introduce the concepts of basic SQL as a universal Databaselanguage
- To demonstrate the principles behind systematic database design approaches bycovering conceptual design, logical design throughnormalization
- To provide an overview of physical design of a database system, by discussing Databaseindexing techniques and storagetechniques

Course Outcomes:

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

- Describe a relational database and object-orienteddatabase
- Create, maintain and manipulate a relational database usingSQL
- Describe ER model and normalization for databasedesign
- Examine issues in data storage and query processing and can formulate appropriatesolutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for thedatabase.

UNIT II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce- codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form(5NF).

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.
Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing, Comparison of File Organizations, Indexes and PerformanceTuning

Text Books:

1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke,TMH
2) Database System Concepts,5/e, Silberschatz, Korth,TMH

Reference Books:

1) Introduction to Database Systems, 8/e C J Date,PEA.
2) Database Management System, 6/e RamezElmasri, Shamkant B. Navathe,PEA
3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, CengageLearning.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105175/
2)https://www.geeksforgeeks.org/introduction-to-nosql/

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – II Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY (HSMC2201)					

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of BusinessCycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

UNIT-I

Introduction to Managerial Economics and demand Analysis:
Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT – II:

Theories of Production and Cost Analyses:
Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs – Cost –Volume- Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:
Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT – IV:

Introduction to Accounting & Financing Analysis:
Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT – V:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and ProfitabilityIndex)

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination ofinputs.
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS:

A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

REFERENCES:

1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & CompanyLtd,
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New editionedition
3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & CompanyLtd,
4. MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House PvtLtd
5. I.M Pandey, Financial Management , Vikas Publishing House PvtLtd
6. V. Maheswari, Managerial Economics, S. Chand & CompanyLtd,

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KAKINADA – 533 003, Andhra Pradesh, India
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II Year – II Semester		L	T	P	C
		0	0	3	1.5
COMPUTER ORGANIZATION& ARCHITECTURE LAB (ESC2202)					

Course Objectives:
Upon completion of the Course, the students will be able to:
- Know the characteristics of various components.
- Understand the utilization of components

Course Outcomes:
At the end of this course, students will demonstrate the ability to
- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Solve elementary problems by assembly language programming
- Implement assembly language program for given task for 8086 microprocessor.

List of Experiments:
1. Realization of Boolean Expressions using Gates
2. Design and realization logic gates using universal gates
3. Design a JK Flip-Flop, Edge triggered J-K NAND Flip Flop and show its functionality Handle race condition and clock gating in your circuit.
4. Design a 4 – bit Adder / Subtractor
5. Combinational logic circuits: Implementation of Boolean functions using logic gates
6. Arithmetic operations using logic gates; Implementation of Multiplexers, Demultiplexers, Encoders, Decoders; Implementation of Boolean functions using Multiplexers/Decoders
7. Study of sequential logic circuits: Implementation of flip flops, Verify the excitation tables of various FLIP-FLOPS.
8. Design and realization a Synchronous and Asynchronous counter using flip-flops
9. Design and realization of an 8-bit parallel load and serial out shift register using flipflops
10. Implementation of counters, Design and realization a Synchronous and Asynchronous counter using flip-flops
11. Design and realization of 4x1 mux, 8x1mux using 2x1 mux

    Write assembly language programs in 8086 for the following: (MASAM can also be used)
    1. To add two 8 bit number (A+B=RESULT with a carry and without a carry).
    2. To subtract one 8 bit number from another (A-B=RESULT with a borrow and without a borrow).
    3. To find out AND, OR, NOT, XOR, NAND, NOR, XNOR of two 8 bit number.
    4. To find out addition of two 16 bit numbers.
    5. To find out subtraction of two 16 bit numbers.
    6. To evaluate the expression a = b + c –d * e

    Considering 8-bit, 16 bit and 32-bit binary numbers as b, c, d, e.

    Take the input in consecutive memory locations and results also Display the results by using "int xx" of 8086. Validate program for the boundary conditions.
12. To take N numbers as input. Perform the following operations on them.
    a. Arrange in ascending and descending order.
    b. Find max and minimum
    c. Find average

Considering 8-bit, 16-bit binary numbers and 2-digit, 4 digit and 8-digit BCD numbers. Display the results by using "int xx" of 8086. Validate program for the boundary conditions.

13. To implement the above operations as procedures and call from the main procedure.
14. To find the factorial of a given number as a Procedure and call from the main program which display the result.

Note: Experiments can be done using Logic board, Easy CPU, RT Slim, Little Man Computer (LMC), Assemblers for 8085 programming, 8086 based trainer kits, MIPS simulator PC Spim, Xilinx schematic editor and simulation tools or any other choice

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – II Semester		L	T	P	C
		0	0	3	1.5
R PROGRAMMING LAB (PCC2203)					

Course Objective: In this course student will learn about the fundamentals of R programming, standard R libraries,solid understanding of R functions,write programs using the R and gain skills in R programming Language, get acquaintances with Arrays, Files, Strings, Packages, and distributions using R.

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

1. Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming.
2. Implement the concepts of R Script to extract the data from data frames and file operations.
3. Implement the various statistical techniques using R.
4. Extend the functionality of R by using add-on packages
5. Use R Graphics and Tables to visualize results of various statistical operations on data

LIST OF LAB PROGRAMS:
Week 1:

Installing R and R Studio
Basic functionality of R, variable, data types in R

Week 2:

a) Implement R script to show the usage of various operators available in R language.
b) Implement R script to read person‘s age from keyboard and display whether he is eligible for voting or not.
c) Implement R script to find biggest number between two numbers.
d) Implement R script to check the given year is leap year or not.

Week 3:

a) Implement R Script to generate first N natural numbers.
b) Implement R Script to check given number is palindrome or not.
c) Implement R script to print factorial of a number.
d) Implement R Script to check given number is Armstrong or not.

Week 4:

a) Implement R Script to perform various operations on string using string libraries.
b) Implement R Script to check given string is palindrome or not.
c) Implement R script to accept line of text and find the number of characters, number of vowels and number of blank spaces in it.
d) Implement R script for Call-by-value and Call-by-reference

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Week 5:

a) Implement R Script to create a list.
b) Implement R Script to access elements in the list.
c) Implement R Script to merge two or more lists. Implement R Script to perform matrix operation

Week 6:

Implement R script to perform following operations:
a) various operations on vectors
b) Finding the sum and average of given numbers using arrays.
c) To display elements of list in reverse order.
d) Finding the minimum and maximum elements in the array.

Week 7:

a) Implement R Script to perform various operations on matrices
b) Implement R Script to extract the data from data frames.
c) Write R script to display file contents.
d) Write R script to copy file contents from one file to another

Week 8:

a) Implement R Script to create a Pie chart, Bar Chart, scatter plot andHistogram.
b) Implement R Script to perform mean, median, mode, range, summary, variance, standard deviation operations.
c) Introduction to ggplot2 graphics

Week 9:

a) Implement R Script to perform Normal, Binomial distributions.
b) Implement R Script to perform correlation, Linear and multiple regression.

Week 10:

Introduction to Non-Tabular Data Types: Time series, spatial data, Network data.
Data Transformations: Converting Numeric Variables into Factors, Date Operations, String Parsing, Geocoding

Week 11:

Introduction Dirty data problems: Missing values, data manipulation, duplicates, forms of data dates, outliers, spelling

Week 12:

Data sources: SQLite examples for relational databases, Loading SPSS and SAS files, Reading from Excel and Google Spreadsheets, API and web scraping examples

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

References:

1. R Cookbook Paperback – 2011 by Teetor Paul O Reilly Publications
2. Beginning R: The Statistical Programming Language by Dr. Mark Gardener, Wiley Publications
3. R Programming For Dummies by JorisMeysAndrie de Vries, Wiley Publications
4. Hands-On Programming with R by Grolemund, O Reilly Publications
5. Statistical Programming in R by KG Srinivas G.M. Siddesh, Chetan Shetty &Sowmya B.J. - 2017 edition
6. R Fundamentals and Programming Techniques, ThomasLumely.
7. R for Everyone Advanced Analytics and Graphics, Jared P. Lander- Addison WesleySeries
8. The Art of R Programming, Norman Matloff, CengageLearning
9. Maria DoloresUgarte,AnaF.Militino,AlanT.Arnholt–ProbabilityandStatisticswithR2nd Edition on, CRC Press,2016.
10. R-programming for Data science, RogerD.Peng.
11. An Introduction to statistical learning-with applications in R, Trevor Hastie and Rob Tibshirani.

Web Links

1. URL: https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf (Online Resources)
2. http://nptel.ac.in/courses/106104135/48
3. http://nptel.ac.in/courses/110106064/

Software requirements:

1. The R statistical software program. Available from: https://www.r-project.org/
2. R Studio an Integrated Development Environment (IDE) for R. Available from: https://www.rstudio.com/

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – II Semester		L	T	P	C
		0	0	3	1.5
DATABASE MANAGEMENT SYSTEMS LAB (PCC2204)					

Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DMLCommands
- Declare and enforce integrity constraints on adatabase
- Writing Queries using advanced concepts ofSQL
- Programming PL/SQL including procedures, functions, cursors andtriggers

Course Outcomes:

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

- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL Build PL/SQL programs including stored procedures, functions, cursors and triggers.

List of Exercises:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char,to_date)
5.
   i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records werefound)
   ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQLblock.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCEfunctions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATIONERROR.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

8. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
9. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
10. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
11. Create a table and perform the search operation on table using indexing and non-indexing techniques.

Text Books/Suggested Reading:

1) Oracle: The Complete Reference by OraclePress
2) Nilesh Shah, "Database Systems Using Oracle", PHI,2007
3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education,2007

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

II Year – II Semester		L	T	P	C
		0	0	4	2
ANDROID APPLICATION DEVELOPMENT (SC2201)					

Course Objectives:

- To learn how to develop Applications in android environment.
- To learn how to develop user interface applications.
- To learn how to develop URL related applications.

1. (a) Create an Android application that shows Hello + name of the user and run it on an emulator.
   (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.

2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use
(a) Linear Layout , (b) Relative Layout and
(c) Grid Layout or Table Layout.

3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a “Back” button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.

4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.

5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.

6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.

7. Create a user registration application that stores the user details in a database table.

8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Note:
Android Application Development with MIT App Inventor:For the first one week, the student is advised to go through the App Inventor from MIT which gives insight into the various properties of each component. The student should pay attention to the properties of each components, which are used later in Android programming. Following are useful links:

1. http://ai2.appinventor.mit.edu
2. https://drive.google.com/file/d/0B8rTtW_91YclTWF4czdBMEpZcWs/view

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – I Semester		L	T	P	C
		3	0	0	3
DESIGN AND ANALYSIS OF ALGORITHMS					

Course Objectives:

- To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

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

- Describe asymptotic notation used for denoting performance of algorithms
- Analyse the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
- List and describe various algorithmic approaches
- Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches
- Apply graph search algorithms to real world problems
- Demonstrate an understanding of NP- Completeness theory and lower bound theory

UNIT I:

Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, Asymptotic notation, Randomized Algorithms. Sets & Disjoint set union: introduction, union and find operations. Basic Traversal & Search Techniques: Techniques for Graphs, connected components and Spanning Trees, Bi-connected components and DFS.

UNIT II :

Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort. The Greedy Method: The general Method, container loading, knapsack problem, Job sequencing with deadlines, minimum-cost spanning Trees.

UNIT III :

Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, single source shortest paths: general weights, optimal Binary search trees, 0/1 knapsack, reliability Design, The travelling salesperson problem, matrix chain multiplication.

UNIT IV:

Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, and knapsack problem. Branch and Bound: FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem, Traveling salesperson problem.

UNIT V:

NP-Hard and NP-Complete problems: Basic concepts, Cook’s Theorem. String Matching: Introduction, String Matching-Meaning and Application, Naive String Matching Algorithm, Rabin-Karp Algorithm, Knuth-Morris-Pratt Automata, Tries, Suffix Tree.

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KAKINADA – 533 003, Andhra Pradesh, India

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Text Books:

1) Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, " Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.

2) Harsh Bhasin, " Algorithms Design & Analysis", Oxford University Press.

Reference Books:

1) Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, GalgotiaPiblications, 2008.

2) S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – I Semester		L	T	P	C
		3	0	0	3
IOT ARCHITECTURE AND ITS PROTOCOLS					

Course Outcomes:
CLO1: Understand about IoT overview including requirements.
CLO2: Learn IoT related protocols and specifications.
CLO3: Develop a project of IoT mock-up application of their own.

UNIT I:
Introduction to the Internet of Things (IoT) Overview of WSN, IoT, IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M Communication. IoT/M2M Systems Layers and Design Standardization, Communication Technologies, Data Enrichment, Data Consolidation and Device Management at Gateway. Examples of IoT, Ease of Designing and Affordability Use Case Studies: Smart Home, Smart City, Precision Agriculture

UNIT II :
IoT Sensors and Devices Sensing the Real-world using Analog and Digital Sensors, MEMS, LIDAR, Depth, ultrasonic, etc. Industrial IoT, Automotive IoT, Actuator, RFID Technology. Cloud computing Paradigm for Data Collection, Storage and Computing, Everything as a Service and Cloud Service Models for IoT.

UNIT III :
IoT Networks and Protocols Introduction, Web Communication Protocols: Constrained Applications Protocol (CoAP), Lightweight Machine-to-Machine Communication; Message Queue Telemetry Transport (MQTT). Introduction to Internet Connectivity Principles, Internet Connectivity, InternetBased Communication, IP Addressing in the IoT, Media Access Control, LowPAN and LoRaWAN. Application Layer Protocols: HTTP, HTTPS, FTP and Telnet.

UNIT IV:
Advance topics in IoTSecurity and Privacy Requirements, Threat Analysis, IoT Layered Attacker Model, Access Control and Secure Message Communication, Security Models. IoT Hardware (development Boards): Raspberry pi, Arduino, NodeMCU, etc

UNIT V:
IoT Capstone Project Lab Experiments Network programming hands on guide. Hands-on exercises on IoT hardware and software.

Text Books:
1) Raj Kamal, “Internet of Things: Architecture and Design Principles”. TMH Publications, 2017.
2) OvidiuVermesan& Peter Friess, “Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers Series in Communications, 2017.
Reference Books:
1) Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – I Semester		L	T	P	C
		3	0	0	3
COMPUTER NETWORKS					

Course Objectives:

- Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model
- Study data link layer concepts, design issues, and protocols
- Gain core knowledge of Network layer routing protocols and IP addressing
- Study Session layer design issues, Transport layer services, and protocols
- Acquire knowledge of Application layer and Presentation layer paradigms and protocols

Course Outcomes:

- Illustrate the OSI and TCP/IP reference model
- Analyze MAC layer protocols and LAN technologies
- Design applications using internet protocols
- Implement routing and congestion control algorithms
- Develop application layer protocols

UNIT I:

Introduction: History and development of computer networks, Basic Network Architectures: OSI reference model, TCP/IP reference model, and Networks topologies, types of networks (LAN, MAN, WAN, circuit switched, packet switched, message switched, extranet, intranet, Internet, wired, wireless).

UNIT II :

Physical layer: Line encoding, block encoding, scrambling, modulation demodulation (both analog and digital), errors in transmission, multiplexing (FDM, TDM, WDM, OFDM, DSSS), Different types of transmission media. Data Link Layer services: framing, error control, flow control, medium access control. Error & Flow control mechanisms: stop and wait, Go back N and selective repeat. MAC protocols: Aloha, slotted aloha, CSMA, CSMA/CD, CSMA/CA, polling, token passing, scheduling.

UNIT III :

Local Area Network Technology: Token Ring. Error detection (Parity, CRC), Ethernet, Fast Ethernet, Gigabit Ethernet, Personal Area Network: Bluetooth and Wireless Communications Standard: Wi-Fi (802.11) and Wi-MAX.

UNIT IV:

Network layer: Internet Protocol, IPv6, ARP, DHCP, ICMP, Routing algorithms: Distance vector, Link state, Metrics, Inter-domain routing. Sub netting, Super netting, Classless addressing, Network Address Translation.

UNIT V:

Transport layer: UDP, TCP. Connection establishment and termination, sliding window, flow and congestion control, timers, retransmission, TCP extensions, Queuing theory, Single and multiple server queuing models, Little's formula. Application Layer. Network Application services and protocols including e-mail, www, DNS, SMTP, IMAP, FTP, TFTP, Telnet, BOOTP, HTTP, IPSec, Firewalls.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Text Books:

1) Computer Networks , Andrew S. Tanenbaum, David J. Wetherall, Pearson Education India; 5 edition, 2013

2) Data Communication and Networking , Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2012

Reference Books:

1) Computer Networks: A Systems Approach, LL Peterson, BS Davie, Morgan-Kauffman , 5th Edition, 2011.
2) Computer Networking: A Top-Down Approach JF Kurose, KW Ross, Addison-Wesley, 5th Edition, 2009
3) Data and Computer Communications, William Stallings, Pearson, 8th Edition, 2007

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – I Semester		L	T	P	C
		3	0	0	3
COMPILER DESIGN					

Course Objectives:

- To study the various phases in the design of a compiler
- To understand the design of top-down and bottom-up parsers
- To understand syntax directed translation schemes
- To introduce LEX and YACC tools
- To learn to develop algorithms to generate code for a target machine

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

- Design, develop, and implement a compiler for any language
- Use LEX and YACC tools for developing a scanner and a parser
- Design and implement LL and LR parsers
- Design algorithms to perform code optimization in order to improve the performance of a program in terms of space and time complexity
- Apply algorithms to generate machine code

UNIT I:
Language Processors, the structure of a compiler, the science of building a compiler, programming language basics. Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

UNIT II :
Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Recursive and Non recursive top down parsers, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars, Parser Generators.

UNIT III :
Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, and Implementing L-Attributed SDD's. Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Back patching, Switch-Statements, Intermediate Code for Procedures.

UNIT IV:
Run-Time Environments: Storage organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace Based Collection. Machine-Independent Optimizations: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial Redundancy Elimination, Loops in Flow Graphs.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V:

Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator. Machine-dependent Optimizations: Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

Text Books:

1) Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson.
2) Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.

Reference Books:

1) Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
2) The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH
3) Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – I Semester		L	T	P	C
		3	0	0	3
PRINCIPLES OF PROGRAMMING LANGUAGES					

Course Objectives:

- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms

Course Outcomes:

- Describe the syntax and semantics of programming languages and gain practical knowledge in lexical analysis and parsing phases of a compiler
- Make use of different constructs in programming languages with merits and demerits
- Design and implement sub programs in various programming languages
- Developing the knowledge on different programming language features like object- orientation, concurrency, exception handling and event handling
- Analyzing functional paradigm and ability to write small programs using Scheme and ML and Develop programs logic paradigm and ability to write small programs using Prolog

UNIT I:
Syntax and semantics: Evolution of programming languages, describing syntax, context, free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive - decent bottom - up parsing.

UNIT II :
Data, data types, and basic statements: Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and Boolean expressions, assignment statements, mixed mode assignments, control structures – selection, iterations, branching, guarded Statements.

UNIT III :
Subprograms and implementations: Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping.

UNIT IV:
Object- orientation, concurrency, and event handling: Object – orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores, Monitors, message passing, threads, statement level concurrency, exception handling, event handling.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V:

Functional programming languages: Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, Programming with ML

Logic programming languages: Introduction to logic and logic programming, Programming with Prolog, multi - paradigm languages.

Text Books:

1) Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.
2) Programming Languages, Principles & Paradigms, 2ed, Allen B Tucker, Robert E Noonan, TMH.

Reference Books:

1) R. Kent Dybvig, "The Scheme programming language", Fourth Edition, MIT Press, 2009.
2) Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Prentice Hall, 1998.
3) Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009.
4) W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – I Semester		L	T	P	C
		3	0	0	3
SOFTWARE ENGINEERING					

Course Objectives:

- Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
- Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
- Give exposure to Software Design techniques

Course Outcomes: Students taking this subject will gain software engineering skills in the following areas:

- Ability to transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods

UNIT I:
The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II :
Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III :
Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, FlowOrientedModeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.

UNIT IV:
Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for Web Apps, Designing Traditional Components, Component-Based Development.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V:

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Web App Interface Design, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for Web Apps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

Text Books:

1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:

1) Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
2) Software Engineering, Ugrasen Suman, Cengage.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – I Semester		L	T	P	C
		3	0	0	3
COMPUTER GRAPHICS					

Course Objectives:

- Understand the fundamental concepts and theory of computer graphics
- Understand modelling, and interactive control of 3D computer graphics applications
- The underlying parametric surface concepts be understood
- Learn multimedia authoring tools.

Course Outcomes: Upon successful completion of the course, students will be able to:

- Use the principles and commonly used paradigms and techniques of computer graphics
- Write basic graphics application programs including animation
- Design programs to display graphic images to given specifications

UNIT I:

INTRODUCTION: Application areas of computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices.

UNIT II :

OUTPUT PRIMITIVES: Points and lines, line drawing algorithms, mid-point circle algorithm, Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm. 2-D GEOMETRICAL TRANSFORMATIONS: Translation, scaling, rotation, reflection and shear transformation matrix representations and homogeneous co-ordinates, composite transformations, transformations between coordinates

UNIT III :

2-D VIEWING : The viewing pipe-line, viewing coordinat4 reference frame, window to view-port co-ordinate transformations, viewing function, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland Hodge man polygon clipping algorithm.

UNIT IV:

3-D OBJECT REPRESENTATION: spline representation, Hermit curve, Bezier curve and B-spline curve, Polygon surfaces, quadric surfaces, , Solid modeling Schalars – wire frame, CSG, B-rep. Bezier and B-spline surfaces, Basic illumination models, shading algorithms

UNIT V:

3-D GEOMETRIC TRANSFORMATIONS: Translation, rotation, scaling, reflection and shear transformation and composite transformations. Visible surface detection methods: Classification, back-face detection, depth buffer, scan-line, depth sorting

COMPUTER ANIMATION: Design of animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specification

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Text Books:

1. Computer Graphics C version/ Donald Hearn and M. Pauline Baker/Pearson/PHI
2. Computer Graphics Principles & practice-second edition in C/ Foley, Van Dam, Feiner and Hughes / Pearson Education

Reference Books:

1. Computer Graphics Second edition/ Zhigandxiang, Roy Plastock, Schaum's outlines/Tata Mc-Graw hill edition.
2. Procedural elements for Computer Graphics/David F Rogers/Tata Mc Graw hill, 2nd edition.
3. Principles of Interactive Computer Graphics/ Neuman and Sproul/TMH.
4. Computer Graphics/ Steven Harrington/TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – I Semester		L	T	P	C
		3	0	0	3
ADVANCED COMPUTER ARCHITECTURE					

Course Objectives:

- Understand the Concept of Parallel Processing and its applications
- Implement the Hardware for Arithmetic Operations
- Analyze the performance of different scalar Computers
- Develop the Pipelining Concept for a given set of Instructions
- Distinguish the performance of pipelining and non pipelining environment in a processor

Course Outcomes:

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

- Illustrate the types of computers, and new trends and developments in computer architecture
- Outline pipelining, instruction set architectures, memory addressing
- Apply ILP using dynamic scheduling, multiple issue, and speculation
- Illustrate the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges
- Apply multithreading by using ILP and supporting thread-level parallelism (TLP)

UNIT I:

Computer Abstractions and Technology: Introduction, Eight Great Ideas in Computer Architecture, Below Your Program, Under the Covers, Technologies for Building Processors and Memory, Performance, The Power Wall, The Sea Change: The Switch from Uni-processors to Multiprocessors, Benchmarking the Intel Core i7, Fallacies and Pitfalls.

UNIT II :

Instructions: Language of the Computer: Operations of the Computer Hardware, Operands of the Computer Hardware, Signed and Unsigned Numbers, Representing Instructions in the Computer, Logical Operations, Instructions for Making Decisions, Supporting Procedures in Computer Hardware, Communicating with People, MIPS Addressing for 32-Bit Immediates and Addresses, Parallelism and Instructions: Synchronization, Translating and Starting a Program, A C Sort Example to Put It All Together, Arrays versus Pointers, ARMv7 (32-bit) Instructions, x86 Instructions, ARMv8 (64-bit) Instructions.

UNIT III :

Arithmetic for Computers: Introduction, Addition and Subtraction, Multiplication, Division, Floating Point, Parallelism and Computer Arithmetic: Subword Parallelism, Streaming SIMD Extensions and Advanced Vector Extensions in x86, Subword Parallelism and Matrix Multiply.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV:

The Processor: Introduction, Logic Design Conventions, Building a Data path, A Simple Implementation Scheme, An Overview of Pipelining, Pipelined Datapath and Control, Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, The ARM Cortex-A8 and Intel Core i7 Pipelines.

UNIT V:

Large and Fast: Exploiting Memory Hierarchy: Introduction, Memory Technologies, The Basics of Caches, Measuring and Improving Cache Performance, Dependable Memory Hierarchy, Virtual Machines, Virtual Memory, A Common Framework for Memory Hierarchy, Using a Finite-State Machine to Control a Simple Cache, Parallelism and Memory Hierarchies: Cache Coherence, Parallelism and Memory Hierarchy: Redundant Arrays of Inexpensive Disks, Advanced Material: Implementing Cache Controllers, The ARM Cortex-A8 and Intel Core i7 Memory Hierarchies.

Text Books:

1) Computer Organization and Design: The hardware and Software Interface, David A Patterson, John L Hennessy, 5th edition, MK.
2) Computer Architecture and Parallel Processing – Kai Hwang, Faye A.Brigs, Mc Graw Hill.

Reference Books:

1. Modern Processor Design: Fundamentals of Super Scalar Processors, John P. Shen and Miikko H. Lipasti, Mc Graw Hill.
2) Advanced Computer Architecture – A Design Space Approach – DezsoSima, Terence Fountain, Peter Kacsuk , Pearson.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year–I Semester		L	T	P	C
		0	0	3	1.5
NETWORK PROGRAMMING LAB					

Course Objectives:

- Understand and apply different network commands
- Analyzedifferentnetworkingfunctionsandfeaturesforimplementingoptimalsolutions Applydifferentnetworkingconceptsforimplementingnetworksolution
- Implement different network protocols

Course Outcomes:

- Apply the basics of Physical layer in real time applications
- Apply data link layer concepts, design issues, and protocols
- Apply Network layer routing protocols and IP addressing
- Implement the functions of Application layer and Presentation layer paradigms and Protocols

Experiments:

1) Implement the data link layer framing methods such as character stuffing and bit stuffing.
2) Write a C program to develop a DNS client server to resolve the given hostname.
3) Implement on a data set of characters the three CRC polynomials – CRC-12, CRC-16andCRC-CCIP.
4) Implement Dijkstra's algorithm to compute the Shortest path in a graph.
5) Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table at each node using distance vector routing algorithm
6) Take an example subnet of hosts. Obtain broadcast tree for it.
7) Write a client-server application for chat using UDP
8) Implement programs using raw sockets(like packet capturing and filtering)
9) Write a C program to perform sliding window protocol.
10) Get the MAC or Physical address of the system using Address Resolution Protocol.
11) Simulate the Implementing Routing Protocols using border gate way protocol(BGP)
12) Simulate the OPEN SHORTEST PATH FIRST routing protocol based on the cost assigned to the path.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year–I Semester		L	T	P	C
		0	0	3	1.5
INTERNET OF THINGS LAB					

Course Objectives:

- To introduce the raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of distance sensor on IoT devices

Course Outcomes:

- Ability to introduce the concept of M2M (machine to machine) with necessary protocols and get awareness in implementation of distance sensor
- Get the skill to program using Python Scripting Language which is used in many IoT devices

Experiments:

1. Getting started with Raspberry Pi, Install Raspian on your SD card
2. Python-based IDE (integrated development environments) for the

   Raspberry Pi and how to trace and debug Python code on the device
3. Using Raspberry pi

   a. Calculate the distance using distance sensor.

   b. Basic LED functionality.

4. Raspberry Pi interact with online services through the use of public APIs and SDKs
5. Using Arduino

   a. Calculate the distance using distance sensor.

   b. Basic LED functionality.

   c. Calculate temperature using temperature sensor

6. Using Node MCU

   a. Calculate the distance using distance sensor.

   b. Basic LED functionality.

Text Books:

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: 978935023975

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – I Semester		L	T	P	C
		0	0	4	2
Web Application Development Using Full Stack -Frontend Development –Module -I					

Course Objectives:

The objective of this lab is to provide understanding about the core concepts of front end programming for web application

Course Outcomes:

By the end of this lab the student is able to

- Analyze a webpage and identify its elements and attributes.
- Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet
- Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone
- Create web pages using HTML and Cascading Style Sheets.

Perform experiments related to the following concepts:

A) HTML

1) Introduction to HTML
2) Browsers and HTML
3) Editor's Offline and Online
4) Tags, Attribute and Elements
5) Doctype Element
6) Comments
7) Headings, Paragraphs ,and Formatting Text
8) Lists and Links
9) Images and Tables

B) CSS

1) Introduction CSS
2) Applying CSS to HTML
3) Selectors, Properties and Values
4) CSS Colours and Backgrounds
5) CSS Box Model
6) CSS Margins, Padding, and Borders
7) CSS Text and Font Properties
8) CSS General Topics

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – I Semester		L	T	P	C
		2	0	0	0
ENVIRONMENTAL SCIENCE					

Course Objectives: The aim of this course is

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT II

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT III

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books:

1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, CengageLearning.
2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – II Semester		L	T	P	C
		3	1	0	3
EMBEDDED SYSTEM DESIGN					

Course Outcomes:

- Explain the functional blocks of an embedded system and its software development processes
- Explain the theoretical background and practical experience in the design and development of sophisticated embedded system
- Familiarize the importance of safety and reliability in Contemporary Embedded system design
- Describe the Embedded system design techniques for performance optimization
- Enumerate the knowledge of Embedded system in the areas of Distributed Embedded System

UNIT I:

FUNDAMENTALS OFEMBEDDEDSYSTEM - Introduction of embedded system – Processor-Memory-Peripherals- Software Algorithms-Microcontroller-Microprocessor based – board based .Compilation Process in Embedded System: Compiling code-pre processor- compilation-linking and loading-Symbols, references and relocation-linker/loader. Debugging Techniques: High Level language simulation – low level simulation – onboard debugger – task level debugging – symbolic debug-Emulation.

UNIT II :

HARDWARE SOFTWARE CO-DESIGN Introduction and Motivation, Co-design Process Overview, Development Lifecycles - Specification, Modelling Tools and Languages, Techniques of Hardware Software Co - design -Partitioning, Co Simulation, Co-Synthesis, Co-Verification.

UNIT III :

SAFETYANDRELIABILITY Techniques, Proactive Approach - Software Solutions – Approaches, Hardware Solutions– Approaches, Steps to a Safe Design, Extreme Reliability - Long Life Applications, Critical Components, Dealing with Failure, Specification.

UNIT IV:

OPTIMIZATION AND PERFORMANCE ANALYSIS Introduction, Basic Measures, Real time Considerations – Hard, Soft, Firm , Time Loading – Simulation, Instrumentation, Response Time, Memory Loading, Performance Evaluation, Performance Optimization, Hardware Accelerators, Hardware Platforms - Microprocessors and FPGAS, Optimizing Power Consumption ,Trade-offs.

UNIT V:

DISTRIBUTED SYSTEMS Introduction, Local and Remote Models, Intra and Inter System Communication, Protocols, Error Management – Failure Detection, Reconfiguration, Recovery idempotent Systems, Pipes, Streams, and Sockets, Remote Services and Procedures, Design Issues, Synchronous and Asynchronous Procedures

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Text Books:

1. Steve Heath "Embedded Systems Design" Second Edition ,Elsevier.
2. Frank Vahid& Tony Givargis "Embedded System Design-A Unified Hardware/Software Introduction" Third Edition, John Wiley & Sons Inc.Reprint 2010.
3. Michael Barr & Anthony Massa "Programming Embedded Systems-with C & GNU Development tools" Second Edition, O'REILLY,Reprint-2007.
4. Arnold S.Berger "Embedded Systems Design", CMP Books

Reference Books:

1. David E.Simon "An Embedded Software primer" Pearson Publication.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – II Semester		L	T	P	C
		3	0	0	3
MACHINE LEARNING					

Course Objectives:

- Gain knowledge about basic concepts of Machine Learning
- Study about different learning algorithms
- Learn about of evaluation of learning algorithms
- Learn about Dimensionality reduction

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

- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Apply Dimensionality reduction techniques
- Design application using machine learning techniques

UNIT I:Introduction

Definition of learning systems, Goals and applications of machine learning, Aspects of developing a learning system: training data, concept representation, function approximation. Inductive Classification: The concept learning task, Concept learning as search through a hypothesis space, General-to-specific ordering of hypotheses, Finding maximally specific hypotheses, Version spaces and the candidate elimination algorithm, Learning conjunctive concepts, The importance of inductive bias.

UNIT II :Decision Tree Learning

Representing concepts as decision trees, Recursive induction of decision trees, Picking the best splitting attribute: entropy and information gain, Searching for simple trees and computational complexity, Occam's razor, Over fitting, noisy data, and pruning. Experimental Evaluation of Learning Algorithms: Measuring the accuracy of learned hypotheses. Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing.

UNIT III :Computational Learning Theory

Models of learnability: learning in the limit; probably approximately correct (PAC) learning. Sample complexity for infinite hypothesis spaces, Vapnik-Chervonenkis dimension. Rule Learning: Propositional and First-Order, Translating decision trees into rules, Heuristic rule induction using separate and conquer and information gain, First-order Horn-clause induction (Inductive Logic Programming) and Foil, Learning recursive rules, Inverse resolution, Golem, and Progol.

UNIT IV:Artificial Neural Networks

Neurons and biological motivation, Linear threshold units. Perceptrons: representational limitation and gradient descent training, Multilayer networks and back propagation, Hidden layers and constructing intermediate, distributed representations. Over fitting, learning network structure, recurrent networks. Support Vector Machines: Maximum margin linear separators. Quadractic programming solution to finding maximum margin separators. Kernels for learning non-linear functions.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V:Bayesian Learning

Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logisitic regression. Bayes nets and Markov nets for representing dependencies. Instance-Based Learning: Constructing explicit generalizations versus comparing to past specific examples. k-Nearest-neighbor algorithm. Case-based learning.

Text Books:

1) T.M. Mitchell, “Machine Learning”, McGraw-Hill, 1997.
2) Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Reference Books:

1) EthernAlpaydin, “Introduction to Machine Learning”, MIT Press, 2004.
2) Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3) Andreas C. Müller and Sarah Guido “Introduction to Machine Learning with Python: A Guide for Data Scientists”, Oreilly.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – II Semester		L	T	P	C
		3	0	0	3
SENSORS AND ACTUATOR DEVICES FOR IOT					

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes:

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

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

UNIT II:
IoT and M2M- Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT III:
IoT Physical Devices and Endpoints- Introduction to Arduino and 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.

UNIT IV:
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 Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V:
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

Text Books:
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 Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

Reference Books:
1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 Editors OvidiuVermesan
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.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year–II Semester		L	T	P	C
		0	0	3	1.5
EMBEDDED SYSTEM DESIGN LAB					

Course Objectives : The student should be made to:

- Learn the working of ARM processor
- Understand the Building Blocks of Embedded Systems
- Learn the concept of memory map and memory interface
- Write programs to interface memory, I/Os with processor
- Study the interrupt performance

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

- Write programs in ARM for a specific Application
- Interface memory, A/D and D/A convertors with ARM system
- Analyze the performance of interrupt
- Write program for interfacing keyboard, display, motor and sensor.
- Formulate a mini project using embedded system

Experiments:

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Mailbox.
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDS.
10. Interfacing stepper motor and temperature sensor.
11. Implementing zigbee protocol with ARM.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year– II Semester		L	T	P	C
		0	0	3	1.5
MACHINE LEARNING LAB					

Course Objectives:

- The objective of this lab is to get an overview of the various machine learning techniques and Implement those using Python.

Course Outcomes:

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

- Understand complexity of Machine Learning algorithms and their limitations
- Understand modern notions in data analysis-oriented computing
- Perform experiments of Machine Learning Algorithms using real-world data

Experiments:

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is theprobability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)
2. Extract the data from database using python
3. Implement k-nearest neighbours classification using python
4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e., 3 centroids)

   VAR1 VAR2 CLASS
   1.713 1.586 0
   0.180 1.786 1
   0.353 1.240 1
   0.940 1.566 0
   1.486 0.759 1
   1.266 1.106 0
   1.540 0.419 1
   0.459 1.799 1
   0.773 0.186 1
5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

   medium skiing design single twenties no -> highRisk
   high golf trading married forties yes -> lowRisk
   low speedway transport married thirties yes -> medRisk
   medium football banking single thirties yes -> lowRisk
   high flying media married fifties yes -> highRisk
   low football security single twenties no -> medRisk
   medium golf media single thirties yes -> medRisk
   medium golf transport married forties yes -> lowRisk
   high skiing banking single thirties yes -> highRisk
   low golf unemployed married forties yes -> highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `med Risk' in the dataset

6. Implement linear regression using python.
7. Implement Naïve Bayes theorem to classify the English text
8. Implement an algorithm to demonstrate the significance of genetic algorithm
9. Implement the finite words classification system using Back-propagation algorithm

Text Books:

1. Machine Learning – Tom M. Mitchell, MGH
2. Fundamentals of Speech Recognition By Lawrence Rabiner and Biing – Hwang Juang.

Reference Book:

1. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year– II Semester		L	T	P	C
		0	0	3	1.5
SENSORS AND ACTUATOR DEVICES FOR IOT LAB					

Course Objectives:

1. Learn how to execute Linux commands and Python programs on Raspberry Pi.
2. Learn how to interface and control different sensors and actuators on Raspberry Pi.
3. Develop simple IoT Applications.

Course Outcomes:

1. Able to execute different Linux commands on Raspberry Pi.
2. Write and execute Python programs on Raspberry Pi.
3. Interface LEDs and program them on Raspberry Pi.
4. Use various sensors like temperature, humidity, smoke, light, etc. and be able to control web camera, network, and relays connected to the Raspberry Pi.

Experiments:

1. Execute various Linux commands in command terminal window on Raspberry Pi:
   ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo,cron, chown, chgrp, ping etc.
2. Run some Python programs on Raspberry Pi:
   a. Read your name and print Hello message with name.
   b. Read two numbers and print their sum, difference, product and division.
   c. Word and character count of a given string.
   d. Area of a given shape (rectangle, triangle and circle) reading shape and appropriate
   e. values from standard input.
   f. Print a name 'n' times, where name and n are read from standard input, using for and
   g. while loops.
   h. Handle Divided by Zero Exception.
   i. Print current time for 10 times with an interval of 10 seconds.
   j. Read a file line by line and print the word count of each line.
   k. Light an LED through Python program.
   l. Get input from two switches and switch on corresponding LEDs.
   m. Flash an LED at a given on time and off time cycle, where the two times are taken from a
   n. file.
   o. Flash an LED based on cron output (acts as an alarm).
3. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
4. Access an image through a Raspberry Pi web cam.
5. Control a light source using web page.
6. Implement an intruder system that sends an alert to the given email.
7. Get the status of a bulb at a remote place (on the LAN) through web.
8. Get an alarm from a remote area (through LAN) if smoke is detected.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – II Semester		L	T	P	C
		0	0	4	2
Web Application Development Using Full Stack -Frontend Development –Module -II					

Course Objectives:

The objective of this lab is to build strong foundation of JavaScript which will help developer to apply JavaScript concepts for responsive web frontend development

Course Outcomes:

By the end of this lab the student is able to

- develop of the major Web application tier- Client side development
- participate in the active development of cross-browser applications through JavaScript
- Develop JavaScript applications that transition between states

Perform experiments related to the following concepts:

1) Introduction to JavaScript
2) Applying JavaScript (internal and external)
3) Understanding JS Syntax
4) Introduction to Document and Window Object
5) Variables and Operators
6) Data Types and Num Type Conversion
7) Math and String Manipulation
8) Objects and Arrays
9) Date and Time
10) Conditional Statements
11) Switch Case
12) Looping in JS
13) Functions

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

DEPARTMENTOF COMPUTERSCIENCE&ENGINEERING

III Year–II Semester		L	T	P	C
		2	0	0	0
EMPLOYABILITY SKILLS-I					

Course Objectives: The aim of this course is

- To explore and practice basic communication skills
- To learn skills for effective discussions & team work
- To assess and improve personal grooming

Course Outcomes: By the end of this course the student

- Establish effective communication with employers, supervisors ,and co-workers
- Identifytoexploretheirvaluesandcareerchoicesthroughindividualskillassessments
- Adapts positive attitude and appropriate body language
- Interpretthecorecompetenciestosucceedinprofessionalandpersonallife

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

1) Soft Skills: An Introduction–Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development.
2) Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue.
3) Positivity and Motivation: Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels.
4) Interpersonal Communication: Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills;corporatecommunicationstyles–assertion,persuasion,negotiation.
5) Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking.
6) Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective.
7) Non-Verbal Communication: Importance and Elements ;Body Language.
8) Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.

References Books:

1) BarunK.Mitra, Personality Development andSoftSkills,OxfordUniversityPress,2011.
2) S.P.Dhanavel,EnglishandSoftSkills,OrientBlackswan,2010.
3) R.S.Aggarwal,AModernApproachtoVerbal&Non-VerbalReasoning,S.Chand&CompanyLtd.,2018.
4) Raman,Meenakshi&Sharma,Sangeeta,TechnicalCommunicationPrinciplesandPractice,OxfordUniversityPress,2011.
5) R.S.Aggarwal,AModernApproachtoVerbal&Non-VerbalReasoning,S.Chand&CompanyLtd.,2018.
6) Raman,Meenakshi&Sharma,Sangeeta,TechnicalCommunicationPrinciplesandPractice,OxfordUniversityPress,2011.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year–II Semester		L	T	P	C
		2	0	0	0
EMPLOYABILITY SKILLS-II					

Course Objectives:

The main of this course is

- To learn how to make effective presentations and impressive interviews
- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self-management skills for the work site

Course Outcomes:

By the end of this course, the student

- Recite the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Apply their core competencies to succeed in professional and personal life

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

1) Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success.
2) Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness.
3) Etiquette and Manners – Social and Business.
4) Time Management – Concept, Essentials, Tips.
5) Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.
6) Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills.
7) Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resoultion.
8) Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Managemet of Stress
9) Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertivness Skills.
10) Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

References Books:

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand&
4. Company Ltd., 2018.
5. Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice,
6. Oxford University Press, 2011.
7. Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill
8. India, 2012.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
MOBILE COMPUTING					

Course Objectives:

- To study the emerging technologies in the context of wireless networks
- To understand the mobile computing environment
- To learn about pervasive computing environment

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

- Interpret Wireless local area networks (WLAN): MAC design principles, 802.11 WIFI
- Discuss fundamental challenges in mobile communications and potential Techniques in GSM
- Demonstrate Mobile IP in Network layer
- Elaborate TCP/IP Protocols and database issues
  Illustrate different data delivery methods and synchronization protocols
- Develop applications that are mobile-device specific and demonstrate current Practice in mobile computing contexts

UNIT I:

Mobile Communications: An Overview- Mobile Communication-guided transmission, unguided transmission- signal propagation frequencies, antennae, modulation, modulation methods and standards for voice-oriented data communication standards, modulation methods and standards for data and voice communication, mobile computing- novel applications and limitations, mobile computing architecture, mobile system networks. Mobile devices and systems: Cellular networks and frequency reuse, Mobile smart phones, Smart mobiles and systems, handheld pocket computers, Hand held devices, Smart systems, Limitations of mobile devices.

UNIT II :

GSM and other 2G Architectures: GSM-services and system architecture, Radio interfaces of GSM, Protocols of GSM, Localization, Call handling, GPRS system architecture. Wireless medium access control, CDMA, 3G, 4G and 5G Communication: Modulation, Multiplexing, Controlling the medium access, Spread spectrum, Coding methods, IMT-20003G wireless communication standards, WCDMA 3G communication standards, CDMA 3G communication standards, Broadband wireless access, 4G networks, 5G Networks.

UNIT III :

Mobile IP Network layer: IP and Mobile IP network layers: OSI layer functions, TCP/IP and Internet protocol, Mobile internet protocol; Packet delivery and Handover Management; Location Management: Agent Discovery; Mobile TCP Introduction to Mobile Ad-hoc network: fixed infrastructure architecture, MANET infrastructure architecture; MANET: properties, spectrum, applications; Security in Ad-hoc network; Wireless sensor networks; sensor network applications.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV:
Synchronization: Synchronization in mobile computing systems, Usage models for Synchronization in mobile application, Domain-dependant specific rules for data synchronization, Personal information manager, synchronization and conflict resolution strategies, synchronizer; Mobile agent: mobile agent design, aglets; Application Server.

UNIT V:
Mobile Wireless Short Range Networks and Mobile Internet: Wireless networking and wireless LAN, Wireless LAN (WLAN) architecture, IEEE 802.11protocol layers, Wireless application protocol (WAP)-WAP1.1 architecture, wireless datagram protocol (WDP), Wireless Transport Layer Security (WTLS), wireless transaction and session layers, wireless application environment.

Text Books:

1) Mobile Computing, 2nd edition, Raj kamal, Oxford,2011
2) Mobile Computing, Technology Applications and Service Creation, 2nd Edition, Asoke K Talukder, Hasanahmed, Roopa R Yavagal, McGraw Hill,2017

Reference Books:

1) “Principles of Mobile Computing,” 2nd Edition, UWE Hansmann, LotherMerk, Martin S. Nocklous, Thomas Stober, Springer.2003

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
DATA SCIENCE					

Course Objectives:

- Provide you with the knowledge and expertise to become a proficient data scientist
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science
- Learn to statistically analyze a dataset
- Explain the significance of exploratory data analysis (EDA) in data science
- Critically evaluate data visualizations based on their design and use for communicating stories from data

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

- Describe what Data Science is and the skill sets needed to be a data scientist
- Illustrate in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modelling, Fit a model to data
- Use R to carry out basic statistical modelling and analysis
- Apply basic tools (plots, graphs, summary statistics) to carry out EDA
- Describe the Data Science Process and how its components interact
- Use APIs and other tools to scrap the Web and collect data
- Apply EDA and the Data Science process in a case study

UNIT I:

Introduction, The Ascendance of Data, Motivating Hypothetical: Data Sciencester, Finding Key Connectors, The Zen of Python, Getting Python, Virtual Environments, Whitespace Formatting, Modules, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries defaultdict, Counters, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Automated Testing and assert, Object Oriented Programming, Iterables and Generators, Randomness, Regular Expressions, Functional Programming, zip and Argument Unpacking, args and kwargs, Type Annotations, How to Write Type Annotations.

UNIT II :

Visualizing Data: matplotlib, Bar Charts, Line Charts, Scatterplots. Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation. Gradient Descent: The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent.

UNIT III :

Getting Data: stdin and stdout, Reading Files, Scraping the Web, Using APIs, Working with Data: Exploring Your Data Using Named Tuples, Data classes, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction. Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV:
Machine Learning: Modeling, Over fitting and Under fitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, Naive Bayes, Simple Linear Regression, Multiple Regression, Digression, Logistic Regression

UNIT V:
Clustering: The Idea, The Model, Choosing k, Bottom-Up Hierarchical Clustering. Recommender Systems: Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness, Collaboration, Interpretability, Recommendations, Biased Data, Data Protection IPython, Mathematics, NumPy, pandas, scikit-learn, Visualization.

Text Books:

1) Joel Grus, "Data Science From Scratch", OReilly.
2) Allen B.Downey, "Think Stats", OReilly.

Reference Books:

1) Doing Data Science: Straight Talk From The Frontline, 1 st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013
2) Mining of Massive Datasets, 2 nd Edition, Jure Leskovek, AnandRajaraman and Jeffrey Ullman, v2.1, Cambridge University Press, 2014
3) "The Art of Data Science", 1 st Edition, Roger D. Peng and Elizabeth matsui, Lean Publications, 2015
4) "Algorithms for Data Science", 1 st Edition, Steele, Brian, Chandler, John, Reddy, Swarna, springers Publications, 2016

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
No SQL DATABASES					

Course Objectives:

- To understand the basic concepts and the applications of database systems. To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

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

- Identify what type of NoSQL database to implement based on business requirements (key-value, document, full text, graph, etc.)
- Apply NoSQL data modeling from application specific queries
- Use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing

UNIT I:

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

UNIT II :

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data.

UNIT III :

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

UNIT IV:

NoSQL Stores: Similarities Between Sql And Mongodb Query Features, Accessing Data From Column-Oriented Databases Like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution In Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

UNIT V:

Indexing and Ordering Data Sets : Essential Concepts Behind A Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Text Books:

1) PramodSadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional, 2012.

2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications, 2013.

Reference Books:

1) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN: 978-0-470- 94224-6

2) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
PRIVACY AND SECURITY IN IoT					

Course Objectives:

- Ability to understand the Security requirements in IoT.
- Understand the cryptographic fundamentals for IoT
- Ability to understand the authentication credentials and access control
- Understand the various types Trust models and Cloud Security.

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

- Apply Security and privacy concepts in IoT devices
- Gain knowledge on types of Vulnerabilities
- Familiar with Encryption & Decryption algorithms

UNIT I:INTRODUCTION: SECURING THE INTERNET OF THINGS

Security Requirements in IoT Architecture - Security in Enabling Technologies - Security Concerns in IoT Applications. Security Architecture in the Internet of Things - Security Requirements in IoT - Insufficient Authentication/Authorization - Insecure Access Control - Threats to Access Control, Privacy, and Availability - Attacks Specific to IoT. Vulnerabilities – Secrecy and Secret-Key Capacity - Authentication/Authorization for Smart Devices - Transport Encryption – Attack & Fault trees.

UNIT II :CRYPTOGRAPHIC FUNDAMENTALS FOR IOT

Cryptographic primitives and its role in IoT – Encryption and Decryption – Hashes – Digital Signatures – Random number generation – Cipher suites – key management fundamentals – cryptographic controls built into IoT messaging and communication protocols – IoT Node Authentication

UNIT III :IDENTITY & ACCESS MANAGEMENT SOLUTIONS FOR IOT

Identity lifecycle – authentication credentials – IoT IAM infrastructure – Authorization with Publish / Subscribe schemes – access control

UNIT IV:PRIVACY PRESERVATION AND TRUST MODELS FOR IOT

Concerns in data dissemination – Lightweight and robust schemes for Privacy protection – Trust and Trust models for IoT – self-organizing Things - Preventing unauthorized access.

UNIT V:CLOUD SECURITY FOR IOT

Cloud services and IoT – offerings related to IoT from cloud service providers – CloudIoT security controls – An enterprise IoT cloud security architecture – New directions in cloud enabled IoT computing.

Text Books:

1. Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren
2. Securing the Internet of Things Elsevier
3. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
Programming and Interfacing With Micro Controllers					

Course Objectives:

- Understand advanced and emerging networking technologies
- Obtain skills to do advanced networking research and programming
- Learn how to use software programs to perform varying and complex networking tasks
- Expand upon the knowledge learned and apply it to solve real world problems

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

UNIT I:INTRODUCTION
Introduction – History - Creative Coding Platforms - Open Source Platforms – PIC -Arduino, Sketch, Raspberry Pi, Iterative coding methodology – Python Programming -Mobile phones and similar devices - Arm Devices - Getting used to Arduino – Sensor Characterization: Safety, Basic Electronics (circuit theory, measurements, parts identification) Sensors and Software: Understanding Processing Code Structure, variables and flow control, Interfacing to the Real World.

UNIT II :SOFTWARE FRAMEWORKS
Software: openFrameworks as our IDE (C/C++) - "Arduino" Language (C/C++) -Hardware: Desktop / Laptop / Raspberry Pi - How to approach a programming problem Representing "reality" with computers. Digital vs. Analog circuits, audio, communication, etc.Analog to Digital Conversion (ADC) - Digital to Analog Conversion(DAC) – Microcontrollers

UNIT III :HARDWARE COMMUNICATION
Communication – Serial& Parallel - Hardware to Hardware Communication - I2C/IIC(Inter-Integrated Circuit) - SPI (Serial Peripheral Interface) – Serial UART Communication - Introduction to the command line – git/github. Introduction to Programming: A comparative studio between Arduino + open Frameworks–Arduino compatible Microcontrollers Sensors and Actuators

UNIT IV:ADVANCED I/O INTERFACING
Advanced I/O – open Frameworks: Live Network feeds (push and pull) – Data persistence(saving data and preferences) - Database interface (MySQL, SQLite, XML, PHP/Web) -Arduino:Wired/Wireless Networking

UNIT V:IoT, FUTURE AND PERSPECTIVES
Talking to the cloud: Baby steps to Internet of Things, TCP/IP and UDP - Building peerto peer communication system using Bluetooth &WiFi– Experiments

Text Books:
1. Programming Interactivity, Second Edition By Josha Noble, 2012
2. Programming the Raspberry Pi: Getting Started with Python 2E, 2016

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
FOG COMPUTING					

Course Objectives:

- To understand the basics of FOG Computing
- To understand the architecture of FOG computing and challenges
- The applications of FOG computing in different contexts.

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

- Become familiar with the concepts of Fog
- Understand the architecture and its components and working of components and its performance
- Explore Fog on security , multimedia and smart data
- Model the fog computing scenario

UNIT I: INTRODUCTION TO FOG COMPUTING

Fog Computing-Definition-Characteristics-Application Scenarios - Issues -Fog Computing and Internet of Things-Pros and Cons-Myths of Fog Computing - Need and Reasons for Fog Computing Fog Computing and Edge Computing - IoT, FOG, Cloud Benefits

UNIT II : ARCHITECTURE

Working Procedure -Performance Evaluation Components- Software Systems – Architecture-Modelling and Simulation –Challenges

UNIT III : FOG PROTOCOLS

Fog Protocol-Fog Kit- Proximity Detection Protocols- DDS/RTPS computing protocols

UNIT IV : MANAGEMENT OF DATA AND SECURITY ANALYSIS

Smart Management of Big Data-Smart Data-Structure of Smart Data- Smart Data Life Cycle-System Architecture-Multi-dimensional Payment Plan- -Security and Privacy Issues-Multimedia Fog Computing-Architecture- De duplication-Hybrid Secure De duplication- Security Challenges-Security Requirements.

UNIT V: CASE STUDY

Case Study: Wind Farm - Smart Traffic Light System, Wearable Sensing Devices, Wearable Event Device ,Wearable System, Demonstrations , Post Application Example Event Applications Example.

Text Books:

1. Ivan Stojmenovic, Sheng Wen ," The Fog Computing Paradigm: Scenarios and Security Issues" Proceedings of the 2014 Federated Conference on Computer Science and Information Systems pp. 1–8
2. Fog Computing: Helping the Internet of Things Realize its Potential Amir Vahid Dastjerdi and Rajkumar Buyya, University of Melbourne

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Reference Books:

1. Multi-Dimensional payment Plan in Fog Computing with Moral Hazar, Yanru Zhang,Nguyen H. Tran,DusitNiyato, and Zhu Han,IEEE,2016
2. Farhoud Hosseinpour, Juha Plosila,Hannu Tenhunen,"An Approach for Smart management of Big Data in the Fog Computing Context", IEEE 8th International Conference on Cloud Computing Technology and Science, 2016
3. Hua-Jun Hong, Jo-Chi Chuang and Cheng-HsinHsu,"Animation Rendering on Multimedia Fog computing Platforms", IEEE 8th International Conference on Cloud Computing Technology and Science, 2016.
4. Dongyoung Koo, Youngjoo Shin, Joobeom Yun, junbeomHur,"A Hybrid deduplicaton for secure and Efficiet data Outsourcing n Fog Computing", IEEE 8th International Conference on Cloud Computing Technology and Science,2016.
5. Fog Computing: A Platform for Internet of Things and Analytics, FlavioBonomi, Rodolfo Milito, Preethi Natarajan and Jiang Zhu, Big Data and Internet of Things: A Roadmap for Smart Environments, Studies in Computational Intelligence 546, DOI: 10.1007/978-3-319-05029-4_7, © Springer International Publishing Switzerland 2014.
6. Fog Computing and Its Role in the Internet of Things,FlavioBonomi, Rodolfo Milito, Jiang Zhu, SateeshAddepalli, MCC'12, August 17, 2012, Helsinki, Finland. Copyright 2012 ACM 978-1-4503-1519-7/12/08... $15.00.
7. A Survey of Fog Computing: Concepts, Applications and Issues,Shanhe Yi, Cheng Li, Qun Li, Mobidata'15, June 21, 2015, Hangzhou, China. Copyright c 015 ACM 978-1-4503-3524-9/15/06 ...$15.00. DOI: http://dx.doi.org/10.1145/2757384.2757397.
8. Security and Privacy Issues of Fog Computing: A Survey,Shanhe Yi, Zhengrui Qin, and Qun Li
9. IEEE INTERNET OF THINGS JOURNAL, VOL. XX, NO. X, JUNE 2017 1 LoDPD: A Location Difference-based Proximity Detection Protocol for Fog Computing Yan Huo∗ , Member, IEEE, Chunqiang Hu†, Member, IEEE,, Xiaowei Qi∗ , Tao Jing∗ .
10. Fog Protocol and FogKit: A JSON-Based Protocol and Framework for Communication Between Bluetooth-Enabled Wearable Internet of Things Devices Spencer Lewson,by Spencer Lewson June 2015.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
CLOUD COMPUTING					

Course Objectives:

- To implement Virtualization
- To implement Task Scheduling algorithms
- Apply Map-Reduce concept to applications
- To build Private Cloud
- Broadly educate to know the impact of engineering on legal and societal issues involved

Course Outcomes:

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

- Interpret the key dimensions of the challenge of Cloud Computing
- Examine the economics, financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
- Evaluate own organizations' needs for capacity building and training in cloud computing related IT areas
- Illustrate Virtualization for Data- Center Automation

UNIT I:

Introduction: Network centric computing, Network centric content, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. Parallel and Distributed Systems: introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, and model concurrency with Petri Nets.

UNIT II :

Cloud Infrastructure: At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing, Cloud Computing : Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, HPC on cloud.

UNIT III :

Cloud Resource virtualization: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades, Cloud Resource Management and Scheduling: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV:

Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2), Cloud

Security: Cloud security risks, security – a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.

UNIT V:

Cloud Application Development: Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming (Text Book 1), Google: Google App Engine, Google Web Toolkit (Text Book 2), Microsoft: Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

Text Books:

1) Cloud Computing, Theory and Practice,1st Edition, Dan C Marinescu, MK Elsevier publisher ,2013
2) Cloud Computing, A Practical Approach, 1st Edition, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH,2017

Reference Books:

1) Mastering Cloud Computing, Foundations and Application Programming,1st Edition, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH,2013
2) Essential of Cloud Computing, 1st Edition, K Chandrasekharan, CRC Press, 2014.
3) Cloud Computing, A Hands on Approach, ArshdeepBahga, Vijay Madisetti, Universities Press, 2014.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
MEAN STACK TECHNOLOGIES					

Course Objectives:

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
- Writing optimized front end code HTML and JavaScript
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
- Design and implementation of Robust and Scalable Front End Applications

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

- Enumerate the Basic Concepts of Web &Markup Languages
- Develop web Applications using Scripting Languages & Frameworks
- Make use of Express JS and Node JS frameworks
- Illustrate the uses of web services concepts like restful, react js
- Apply Deployment Techniques & Working with cloud platform

UNIT I:
Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

UNIT II :
JavaScript: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.

UNIT III :
Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules. Express.js: Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

UNIT IV:
RESTful Web Services: Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests. React Js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V:

Mongo DB: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

Text Books:

1) Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2) Web Technologies, Uttam K Roy, Oxford
3) Pro Mean Stack Development, ELadElrom, Apress
4) Restful Web Services Cookbook, SubbuAllamraju, O'Reilly
5) JavaScript & jQuery the missing manual, David sawyer mcfarland, O'Reilly
6) Web Hosting for Dummies, Peter Pollock, John Wiley Brand

Reference Books:

1) Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006).
2) Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012).
3) Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4) An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.
5) Express.JS Guide,The Comprehensive Book on Express.js, AzatMardan, Lean Publishing.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
BIG DATA ANALYTICS FOR IoT					

Course Objectives:

- To learn the concepts of big data analytics
- To learn the concepts about Internet of things
- To understand and implement smart systems

Course Outcomes:

- Understand the different types of Big Data platforms
- Familiar with the fog computing concepts
- Understanding the cloud computing concepts

UNIT I:BIG DATA PLATFORMS FOR THE INTERNET OF THINGS

Big Data Platforms for the Internet of Things: network protocol- data dissemination –current state of art- Improving Data and Service Interoperability with Structure,Compliance, Conformance and Context Awareness: interoperability problem in the IoT context- Big Data Management Systems for the Exploitation of Pervasive Environments - Big Data challenges and requirements coming from different Smart City applications

UNIT II :RFID FALSE AUTHENTICATIONS

On RFID False Authentications: YA TRAP – Necessary and sufficient condition forfalse authentication prevention - Adaptive Pipe lined Neural Network Structure in Self aware Internet of Things: self-healing systems- Role of adaptive neural network-Spatial Dimensions of Big Data: Application of Geographical Concepts and Spatial Technology to the Internet of Things- Applying spatial relationships, functions, and models

UNIT III :FOG COMPUTING

Fog Computing: A Platform for Internet of Things and Analytics: a massively distributed number of sources - Big Data Metadata Management in Smart Grids:semantic inconsistencies – role of metadata

UNIT IV:WEB ENHANCED BUILDING

Toward Web Enhanced Building Automation Systems: heterogeneity between existinginstallations and native IP devices - loosely-coupled Web protocol stack –energy saving in smart building- Intelligent Transportation Systems and Wireless Access in Vehicular Environment Technology for Developing Smart Cities: advantages and achievements- Emerging Technologies in Health Information Systems: Genomics Driven Wellness Tracking and Management System (GO-WELL) – predictive care –personalized medicine

UNIT V:SUSTAINABILITY DATA AND ANALYTICS

Sustainability Data and Analytics in Cloud-Based M2M Systems – potentialstakeholders and their complex relationships to data and analytics applications – SocialNetworking Analysis - Building a useful understanding of a social network – LeveragingSocial Media and IoT to Bootstrap Smart Environments : lightweight Cyber PhysicalSocial Systems - citizen actuation

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Text Books:

1) Stackowiak, R., Licht, A., Mantha, V., Nagode, L.," Big Data and The Internet of Things Enterprise Information Architecture for A New Age", Apress, 2015.
2. Dr. John Bates , "Thingalytics - Smart Big Data Analytics for the Internet of Things", john Bates, 2015.6) Web Hosting for Dummies, Peter Pollock, John Wiley Brand

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
CYBER SECURITY & FORENSICS					

Course Objectives:

- Able to identify security risks and take preventive steps
- To understand the forensics fundamentals
- To understand the evidence capturing process
- To understand the preservation of digital evidence

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

- Enumerate the computer forensics fundamentals
- Describe the types of computer forensics technology
- Analyze various computer forensics systems
- Illustrate the methods for data recovery, evidence collection and data seizure
- Identify the Role of CERT-In Security

UNIT I:

Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

UNIT II :

Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares,Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.

UNIT III :

Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT IV:

Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V:

Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, DigitalSignatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

Text Books:

1) SunitBelapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.
2) Nelson Phillips and EnfingerSteuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

Reference Books:

1) Michael T. Simpson, Kent Backman and James E. Corley, "Hands on Ethical Hacking and Network Defence", Cengage, 2019.
2) Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3) Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" , Cengage,2018.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
DEEP LEARNING					

Course Objectives:

- Demonstrate the major technology trends driving Deep Learning
- Build, train and apply fully connected deep neural networks
- Implement efficient (vectorized) neural networks
- Analyze the key parameters and hyper parameters in a neural network's architecture

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

- Demonstrate the mathematical foundation of neural network
- Describe the machine learning basics
- Differentiate architecture of deep neural network
- Build a convolutional neural network
- Build and train RNN and LSTMs

UNIT I:

Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis. Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT II :

Machine Learning: Basics and Underfitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

UNIT III :

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV:

Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks.

UNIT V:

Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

Text Books:

1) Ian Goodfellow, YoshuaBengio, Aaron Courville, “Deep Learning”, MIT Press,2016.
2) Josh Patterson and Adam Gibson, “Deep learning: A practitioner's approach”, O'Reilly Media, First Edition, 2017.

Reference Books:

1) Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O’Reilly, Shroff Publishers, 2019.
2) Deep learning Cook Book, Practical recipes to get started Quickly, DouweOsinga, O’Reilly, Shroff Publishers, 2019.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
Wearable Computing					

Course Objectives:

- Understand advanced and emerging technologies
- Obtain skills to do advanced research and programming
- Learn how to use software programs to perform varying and complex tasks
- Expand upon theknowledge learned and apply it to solve real world problems

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

UNIT I: INTRODUCTION

Introduction – History - Creative Coding Platforms - Open Source Platforms – PIC - Arduino, Sketch, Raspberry Pi, Iterative coding methodology – Python Programming - Mobile phones and similar devices - Arm Devices - Basic Electronics (circuit theory, measurements, parts identification) Sensors and Software: Understanding ProcessingCode Structure, variables and flow control, Interfacing to the Real World

UNIT II : SOFTWARE HARDWARE FRAMEWORKS

Software: open Frameworks as our IDE (C/C++) - "Arduino" Language (C/C++) - Hardware: Desktop / Laptop / Raspberry Pi - How to approach a programming problem Representing "reality" with computers.Digital vs. Analog circuits, audio, communication, etc.Analog to Digital Conversion (ADC) - Digital to Analog Conversion(DAC)– Microcontrollers - Communication – Serial& Parallel - Hardware to HardwareCommunication - I2C/IIC (Inter-Integrated Circuit) - SPI (Serial Peripheral Interface) – Serial UART Communication

UNIT III :CYBERNETICS AND HUMANISTIC INTELLIGENCE

Wearables - Augmented Reality – Mixed Reality.Case studies, Oculus Rift (2012, 2013), AR versus VR - IoT and Wearables: Smart Cites and Wearable Computing as aform of urban design - Advanced I/O – openFrameworks:Live Network feeds (push and pull) - Data persistence (saving data and preferences) - Database interface (MySQL,sqLite, XML, PHP/Web) - Arduino:Wired/Wireless Networking (hardware vs. USB proxy) - Software serial (RS-232) talking to other devices - Advanced sensor/device communication SPI - Advance IC interfacing / Bitbanging (bitwise operators) - Linux – GPIO

UNIT IV:THE WORLD OF THE FUTURE – INTERNET OF EVERYTHING

Humanistic Intelligence, Mann 1998. Wearable Computing and IoT (Internet of Things) The scalespace theory; sur/sousveillance; integrity; VeillanceContract; Humanistic Intelligence; MedialityAxis? Overview of Mobile and Wearable Computing, Augmented Reality, and Internet of Things. The fundamental axes of the Wearables + IoT + AR space - Free-roaming AR: Wearable Computing, Wireless, Sensing, and Metasensing with light bulbs Phenomenal Augmented Reality: Real world physical phenomena asthe fundamental basis of mobile and wearable AR.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V:FUTURE AND PERSPECTIVES

Internet of Everything – The Future and perspectives – Challenges

Text Books:

1.“Practical Electronics for Inventors, Third Edition,” by Paul Scherzand Simon Monk. 2016
2. Intel Galileo and Intel Galileo Gen 2API Features and Arduino Projects for Linux Programmers, Ramon, Manoel 2014 (Open Access)
3. Fundamentals of Wearable Computers and Augmented Reality, Second Edition by Woodrow Bar field 2015
4.Making Sense of Sensors: End-to-End Algorithms and Infrastructure Design By OmeshTickoo, Ravi Iyer 2016
5. Programming Interactivity, Second Edition By Josha Noble, 2012
6. Programming the Raspberry Pi: Getting Started with Python 2E, 2016

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
Dev Ops					

Course Objectives:

- Dev Ops improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

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

- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility
- Describe Dev Ops & Dev Sec Ops methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools

UNIT I:
Phases of Software Development life cycle. Values and principles of agile software development.

UNIT II :
Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, Dev Ops delivery pipeline, Dev Ops eco system.

UNIT III :
Dev Ops adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes.

UNIT IV:
CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment , Benefits of CI/CD, Metrics to track CICD practices

UNIT V:

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:

1) The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
2) What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Reference Books:

1) Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.
2) The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Microservices, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016
3) Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
4) Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and microservices, 1st Edition, Dave Harrison, Knox Lively, Apress publications, 2019

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
Block Chain Technologies					

Course Objectives:

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from block chain technology into their own projects.

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

- Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
- Identify the risks involved in building Block chain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Block chain implementations and Understand Crypto currency markets
- Examine how to profit from trading crypto currencies.

UNIT I:

Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Block chain. Evolution of Block chain : Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Block chain Evolution, Consortia, Forks, Public Block chain Environments, Type of Players in Block chain Ecosystem, Players in Market.

UNIT II :

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain, data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with block chain solutions, life cycle of block chain transaction.

UNIT III :

Architecting Block chain solutions: Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, Architecture with Block chain Platforms, Approach for Designing Block chain Applications.

UNIT IV:

Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppelin Contracts

UNIT V:

Hyper ledger Block chain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyper ledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

Advanced Concepts in Block chain: Introduction, Inter Planetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Block chain with IoT and AI/ML Quantum Computing and Block chain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

Text Books:

1) Ambadas, Arshad Sarfarz Ariff, Sham "Block chain for Enterprise Application Developers", Wiley
2) Andreas M. Antonpoulos, "Mastering Bitcoin: Programming the Open Block chain" , O'Reilly

Reference Books:

1) Block chain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2) Block chain: Blueprint for a New Economy, Melanie Swan, O'Reilly

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
SOFTWARE TESTING METHODOLOGIES					

Course Objectives:

- To study fundamental concepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing
- To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report
- To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing
- To understand software test automation problems and solutions
- To learn how to write software test documents and communicate with engineers in various forms

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

- Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods
- Design and conduct a software test process for a software project
- Analyze the needs of software test automation
- Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects
- Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web based and object oriented software testing problems
- Write test cases for given software to test it before delivery to the customer and write test scripts for both desktop and web based applications

UNIT I:

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing. Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology. Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation.

UNIT II :

Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing. White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing.

UNIT III :

Static Testing: Inspections, Structured Walkthroughs, Technical Reviews. Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing. Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression

testing types, Regression testing techniques.

UNIT IV:

Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite Software Quality Management: Software Quality metrics, SQA models. Debugging: process, techniques, correcting bugs.

UNIT V:

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit . Test Automation using Selenium tool. Testing Object Oriented Software: basics, Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems.

Text Books:

1) Software Testing, Principles and Practices, Naresh Chauhan, Oxford
2) Software Testing, Yogesh Singh, CAMBRIDGE

Reference Books:

1) Foundations of Software testing, Aditya P Mathur, 2ed, Pearson
2) Software testing techniques – Baris Beizer, Dreamtech, second edition.
3) Software Testing, Principles, techniques and Tools, M G Limaye, TMH
4) Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
UNIVERSAL HUMAN VALUES					

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

Course Outcomes:

On completion of this course, the students will be able to

- Understand the significance of value inputs in a classroom and start applying them in their life and profession
- Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
- Understand the role of a human being in ensuring harmony in society and nature.
- Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

UNIT I:Introduction to Value Education

1. Value Education, Definition, Concept and Need for Value Education.
2. The Content and Process of Value Education.
3. Basic Guidelines for Value Education.
4. Self-exploration as a means of Value Education.
5. Happiness and Prosperity as parts of Value Education.

UNIT II :Harmony in the Human Being

1. Human Being is more than just the Body.
2. Harmony of the Self ('I') with the Body.
3. Understanding Myself as Co-existence of the Self and the Body.
4. Understanding Needs of the Self and the needs of the Body.
5. Understanding the activities in the Self and the activities in the Body.

UNIT III :Harmony in the Family and Society and Harmony in the Nature

1. Family as a basic unit of Human Interaction and Values in Relationships.
2. The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory, Gratitude and Love.
3. Comprehensive Human Goal: The Five Dimensions of Human Endeavour.
4. Harmony in Nature: The Four Orders in Nature.
5. The Holistic Perception of Harmony in Existence.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV:Social Ethics

1. The Basics for Ethical Human Conduct.
2. Defects in Ethical Human Conduct.
3. Holistic Alternative and Universal Order.
4. Universal Human Order and Ethical Conduct.
5. Human Rights violation and Social Disparities.

UNIT V:Professional Ethics

1. Value based Life and Profession.
2. Professional Ethics and Right Understanding.
3. Competence in Professional Ethics.
4. Issues in Professional Ethics – The Current Scenario.
5. Vision for Holistic Technologies, Production System and Management Models.

Text Books:

1. A.N Tripathy, New Age International Publishers, 2003.
2. Bajpai. B. L , , New Royal Book Co, Lucknow, Reprinted, 2004
3. Bertrand Russell Human Society in Ethics & Politics

Reference Books:

1.Corliss Lamont, Philosophy of Humanism
2.Gaur. R.R. ,Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
3.Gaur. R.R. ,Sangal. R ,Bagaria. G.P, Teachers Manual Excel Books, 2009.
4.I.C. Sharma . Ethical Philosophy of India Nagin & co Julundhar
5.Mortimer. J. Adler, – Whatman has made of man
6.William Lilly Introduction to Ethic Allied Publisher

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
HUMAN RESOURCE DEVELOPMENT					

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

Course Outcomes: On completion of this course, the students will be able to

- Understand the significance of value inputs in a classroom and start applying them in their life and profession
- Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
- Understand the role of a human being in ensuring harmony in society and nature.

UNIT I:

Macro Perspective: HRD Concept, Origin and Need, HRD as a Total System; Approaches to HRD; Human Development and HRD; HRD at Macro and Micro Climate.

UNIT II :

Micro Perspective: Areas of HRD; HRD Interventions Performance Appraisal, Potential Appraisal, Feedback and Performance Coaching, Training, Career Planning, OD or Systems Development, Rewards, Employee Welfare and Quality of Work Life and Human Resource Information; Staffing for HRD: Roles of HR Developer; Physical and Financial Resources for HRD; HR Accounting; HRD Audit, Strategic HRD.

UNIT III :

Instructional Technology for HRD : Learning and HRD; Models and Curriculum; Principles of Learning; Group and Individual Learning; Transactional Analysis; Assessment Centre; Behaviour Modeling and Self Directed Learning; Evaluating the HRD

UNIT IV:

Human Resource Training and Development : Concept and Importance; Assessing Training Needs; Designing and Evaluating T&D Programmes; Role, Responsibilities and challenges to Training Managers.

UNIT V:

Training Methods: Training with in Industry (TWI): On the Job & Off the Job Training; Management Development: Lecture Method; Role Play; In-basket Exercise; Simulation; Vestibule Training; Management Games; Case Study; Programmed Instruction; Team Development; Sensitivity Training; Globalization challenges and Strategies of Training Program, Review on T&D Programmes in India.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Text Books:

1. Nadler, Leonard :Corporat Human Resource Development, Van Nostrand Reinhold, ASTD, New York .
2. Rao, T.V and Pareek, Udai: Designing and Managing Human Resource Systems, Oxford IBH Pub. Pvt.Ltd., New Delhi , 2005.

Reference Books:

1) Rao, T.V: Readings in HRD, Oxford IBH Pub. Pvt. Ltd., New Delhi , 2004.
2) Viramani, B.R and Seth, Parmila: Evaluating Management Development, Vision Books, NewDelhi . 5. Rao, T.V.(et.al): HRD in the New Economic Environment, Tata McGraw-Hill Pub.Pvt, Ltd., New Delhi , 2003.
3) Rao, T.V: HRD Audit, Sage Publications, New Delhi .

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
BUSINESS INTELLIGENCE					

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

Course Outcomes: On completion of this course, the students will be able to

- Understand the significance of value inputs in a classroom and start applying them in their life and profession
- Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
- Understand the role of a human being in ensuring harmony in society and nature.

UNIT I:

Introduction to Business Intelligence: The Business pressure-Responses and support modelDefinition of BI- Architecture of BI- Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business intelligence-Value driven and Information usePerformance metrics and key performance indicators-horizontal use cases for BI.

UNIT II :

Data Ware Housing: Definitions and concepts-DW process an Innovation-Data Warehousing Implementation-Data warehousing Administration-Security Issues and future trends. Business Performance Management-Overview Strategic plan, monitor, performance measurement, BPM methodologies-BPM Techniques-Performance dashboard and scorecards

UNIT III :

Data Mining for Business Intelligence: Data mining concepts and definitions-Data mining applications - Artificial neural Networks for data mining - Text and web mining-Natural language processing-Text mining applications-Text mining process-tools-Web mining overviewWeb content overview-Web structure mining-Web usage mining.

UNIT IV:

Business Rules: The Value Preposition of Business Rules - Business rules approach-Business rule system - Sources of business rules and management approach.

UNIT V:

Business Intelligence Implementation: Business Intelligence and integration - Implementation - connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI. Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Text Books:

1. Amit Johri "Business Intelligence" Himalaya, 2012
2. Rajiv Sabherwal "Business Intelligence" Wiley Publications, 2012

Reference Books:

1. Carlo Vercellis "Business Intelligence" Wiley Publications, 2012
2. Nina Godbole&SunitBelapure" Cyber Security" Wiley india 2012.
3. Jawadekar, MIS Text and Cases, TMH, 2012 6. Efraim Turban et al. "Business Intelligence" 2e, Pearson Education, 2012

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
MANAGEMENT AND ORGANIZATIONAL BEHAVIOR					

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

Course Outcomes:

On completion of this course, the students will be able to

- Understand the significance of value inputs in a classroom and start applying them in their life and profession
- Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
- Understand the role of a human being in ensuring harmony in society and nature.

UNIT I:

Nature of Management - Social Responsibili Ties of Business - Manager and Environment Levels in Management - Managerial Skills - Planning - Steps in Planning Process - Scope and Limitations - Short Range and Long Range Planning - Flexibility in Planning ¬Characteristics of a sound Plan - Management by Objectives (MBO) - Policies and Strategies - Scope and Formulation - Decision Making - Techniques and Processes.

UNIT II :

Organising - Organisation Structure and Design - Authority and Responsibility Relationships - Delegation of Authority and Decentralisation - Interdepartmental Coordination - Emerging Trends in Corporate Structure, Strategy and Culture - Impact of Technology on Organisational design - Mechanistic vs Adoptive Structures - Formal and Informal Organisation.

UNIT III :

Perception and Learning - Personality and Individual Differences - Motivation and Job Performance - Values, Attitudes and Beliefs - Stress Management - Communication Types-Process - Barriers - Making Communication Effective.

UNIT IV:

Group Dynamics - Leadership - Styles - Approaches - Power and Politics - Organisational Structure - Organisational Climate and Culture - Organisational Change and Development.

UNIT V:

Comparative Management Styles and approaches - Japanese Management Practices Organisational Creativity and Innovation - Management of Innovation - Entrepreneurial Management - Benchmarking - Best Management Practices across the world - Select cases of Domestic & International Corporations - Management of Diversity.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Text Books:

1. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, Organizational Behaviour, Pearson, 16e, 2017.
2. Richard L. Daft, New Era of Management, Cengage Learning, 11e, 2017.
3. AfsanehNahavandi, Robert B. Denhardt, Janet V. Denhardt, Maris P. Aristigueta, Organizational Behaviour, Sage Publications, 2015.
4. Ricky W Griffin, Management Principles and Practices, Cengage Learning, 11e, 2017.
5. Laurie J. Mullins, Management and Organizational Behaviour, Pearson Publications, 9e, 2017
6. Ramesh B. Rudani, Management and Organizational Behaviour Tata McGraw hill, 2011.

Reference Books:

1. Schermerhorn, Hunt and Osborn, Organisational behavior, John Wiley, 9th Edition, 2008.
2. UdaiPareek, Understanding Organisational Behaviour, 2nd Edition, Oxford Higher Education, 2004.
3. Mc Shane & Von Glinov, Organisational Behaviour, 4th Edition, Tata Mc Graw Hill, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
STRATEGIC MANAGEMENT					

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

Course Outcomes:

On completion of this course, the students will be able to

- Understand the significance of value inputs in a classroom and start applying them in their life and profession
- Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
- Understand the role of a human being in ensuring harmony in society and nature.

UNIT I:Introduction

Meaning,Scope and Importance of Strategic Management, Nature of Strategic Management, Characteristics,Strategic Management Process,Strategic Management Model,Dimension and Levels of Strategy, Role of strategists in business Policy.

UNIT II :Strategy Formulation

Corporate Planning,Concept of Planning,Planning Process,Types of Planning,Strategic Planning,Strategic Decision Making,Vision, mission, and purpose,objectives and goals of a business organization-Types of strategies –Guidelines for crafting successful business strategies.

UNIT III :

Environmental Appraisal, External Analysis:Industry analysis,remote environmentanalysis,competitive analysis,global environmental analysis, Internal Analysis:Resource-based view of the firm,Capabilities, core competence,value chain analysis,VRHN analysis,distinctive competency,sustainable competitive advantage and profitability, SWOT Analysis, Synergy.

UNIT IV:

Strategic Analysis and Choice, Environmental Threat and Opportunity Profile (ETOP);BCG, TOWS, GE ,Directional Policy Matrix-Organizational Capability Profile –Strategic Advantage Profile Corporate Level strategies-growth, stability, renewal, corporate portfolio analysis, grand strategies,McKinsey's7s Framework. Business Level Strategies-Michael Porter's Generic strategies, Functional level strategies.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V:

Strategy Implementation and Evaluation, Strategy Implementation: Structure, Systems and People,issues in implementation, Model of Strategic Implementation, Project implementation,
Procedural implementation, Resource Allocation, Budgets, Organization Structure, Strategy and Organisation Structure, Different Types of Organisational Structure, Social responsibilities and Ethics-Building a capable organization-Functional issues. Symptoms of malfunctioning of strategy-Operations Control and Strategic Control, An overview of Strategic Evaluation and
Control-Measurement of performance-Analyzing variances-Role of organizational systems in evaluation. Strategic Management for non-profit organizations.

Text Books:

1. Strategic Management, Fred R. David, Pearson Education
2. Strategic Management and Business Policy, Thomas L Wheelen, J. David Hunger and KrishRangarajan, Pearson Education

Reference Books:

1. Strategic Management: An Integrated approach, Hill W.L. Charles & Jones R. Gareth
2. Business Policy and Strategic Management, AzharKazmi, Tata McGraw Hill
3. Strategic Management -The Indian Context, R.Srinivasan, Prentice Hall of India, 2012

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		0	0	4	2
MULTIMEDIA APPLICATION DEVELOPMENT					

Basic Multimedia programs using PHOTOSHOP

01. Write a program to visualize a given image in different forms using features like brightness, contrast, blur etc.
02. Write a program to design a visiting card containing at least one Graphic and Text information.
03. Write a program to prepare a cover page for any book in your subject area.
04. Write a program to use appropriate tools from the tool box to cut the objects from three files (F1.jpg, F2.jpg, F3.jpg) ; Organize them in a single file and apply feather effects.

Multimedia Programs developed using FLASH

05. Write a Program to perform motion twinning operation using flash
06. Write a Program to create a 24 spokes on a wheel using flash.
07. Write a Program to change and object shape using a shape twinning concept.
08. Write a program to create an animated e-card using adobe Flash.
09. Write a Program to create an animation to represent the Growing Moon.
10. Write a Program to create an animation to indicate a ball bouncing on Steps
11. Write a Program to simulate a ball hitting another ball.
12. Write a Program to change a circle into a square using Flash.

Rich Internet Applications (RIA) using Adobe Flex and Ajax

13. Write an MXML code to display Hello World using Flex.
14. Create a Flex Project using Flash Builder IDE to run Hello World Application.
15. Implement an AJAX program to fetch RSS feeds from a well-known RSS feed site. Provide a scrolling display of latest news on your page. You can use xparser.js if you like.
16. Implement an RSS-based search feature. Have a text box and a button in your page for the same. Show the results in a separate which has the results as hyperlinks, which the user can click.
17. Use the Reverse AJAX technique to build a web-based chat application. The application is one-way browser-based. That is, we have a window in which one user types his messages. From other other side, the second user directly updates a file on the server(instead of a browser area).
18. A file on a server has information about cricket players. The fields represent name,country, matches, runs and centuries. The fields are separated by colons (:). The front end screen has a text field in which the user can enter a country. The server returns details of all players belonging to that country in the form of one big JSON object. The client parses the JSON object and builds an HTML table to print the results. Implement the server side script and the client code.
19. Write an Ajax enabled address book web application that interacts with a web service to obtain data and to modify data in a server-side database.
20. Write a Calendar web application built using Dojo toolkit

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Minor Degree Course Subjects

III Year – I Semester		L	T	P	C
		3	0	2	4
SENSORS AND ACTUATOR DEVICES FOR IOT					

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes:

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

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

UNIT II:
IoT and M2M- Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT III:
IoT Physical Devices and Endpoints- Introduction to Arduino and 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.

UNIT IV:
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 Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT V:
IoT Physical Servers and Cloud Offerings– Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a REST ful web API

Text Books:
1. Internet of Things - A Hands-on Approach, ArshdeepBahga 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 Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

Reference Books:
1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 EditorsOvidiuVermesan
2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

Experiments:
1. Execute various Linux commands in command terminal window on Raspberry Pi: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo,cron, chown, chgrp, ping etc.
2. Run some Python programs on Raspberry Pi:
   a. Read your name and print Hello message with name.
   b. Read two numbers and print their sum, difference, product and division.
   c. Word and character count of a given string.
   d. Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input.
   e. Print a name 'n' times, where name and n are read from standard input, using for and while loops.
   f. Handle Divided by Zero Exception.
   g. Print current time for 10 times with an interval of 10 seconds.
   h. Read a file line by line and print the word count of each line.
3. Light an LED through Python program.
4. Get input from two switches and switch on corresponding LEDs.
5. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
6. Flash an LED based on cron output (acts as an alarm).
7. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
8. Access an image through a Raspberry Pi web cam.
9. Control a light source using web page.
10. Implement an intruder system that sends an alert to the given email.
11. Get the status of a bulb at a remote place (on the LAN) through web.
12. Get an alarm from a remote area (through LAN) if smoke is detected.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – II Semester		L	T	P	C
		3	1	0	4
PRIVACY AND SECURITY IN IoT					

Course Objectives:

- Ability to understand the Security requirements in IoT.
- Understand the cryptographic fundamentals for IoT
- Ability to understand the authentication credentials and access control
- Understand the various types Trust models and Cloud Security.

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

- Apply Security and privacy concepts in IoT devices
- Gain knowledge on types of Vulnerabilities
- Familiar with Encryption & Decryption algorithms

UNIT I:INTRODUCTION: SECURING THE INTERNET OF THINGS

Security Requirements in IoT Architecture - Security in Enabling Technologies - Security Concerns in IoT Applications. Security Architecture in the Internet of Things - Security Requirements in IoT - Insufficient Authentication/Authorization - Insecure Access Control - Threats to Access Control, Privacy, and Availability - Attacks Specific to IoT. Vulnerabilities – Secrecy and Secret-Key Capacity - Authentication/Authorization for Smart Devices - Transport Encryption – Attack & Fault trees.

UNIT II :CRYPTOGRAPHIC FUNDAMENTALS FOR IOT

Cryptographic primitives and its role in IoT – Encryption and Decryption – Hashes – Digital Signatures – Random number generation – Cipher suites – key management fundamentals – cryptographic controls built into IoT messaging and communication protocols – IoT Node Authentication

UNIT III :IDENTITY & ACCESS MANAGEMENT SOLUTIONS FOR IOT

Identity lifecycle – authentication credentials – IoT IAM infrastructure – Authorization with Publish / Subscribe schemes – access control

UNIT IV:PRIVACY PRESERVATION AND TRUST MODELS FOR IOT

Concerns in data dissemination – Lightweight and robust schemes for Privacy protection – Trust and Trust models for IoT – self-organizing Things - Preventing unauthorized access.

UNIT V:CLOUD SECURITY FOR IOT

Cloud services and IoT – offerings related to IoT from cloud service providers – CloudIoT security controls – An enterprise IoT cloud security architecture – New directions in cloud enabled IoT computing.

Text Books:

1. Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren
2. Securing the Internet of Things Elsevier
3. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	1	0	4
CLOUD COMPUTING					

Course Objectives:

- To implement Virtualization
- To implement Task Scheduling algorithms
- Apply Map-Reduce concept to applications
- To build Private Cloud
- Broadly educate to know the impact of engineering on legal and societal issues involved

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

- Interpret the key dimensions of the challenge of Cloud Computing
- Examine the economics, financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
- Evaluate own organizations' needs for capacity building and training in cloud computing related IT areas
- Illustrate Virtualization for Data- Center Automation

UNIT I:

Introduction: Network centric computing, Network centric content, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. Parallel and Distributed Systems: introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, and model concurrency with Petri Nets.

UNIT II :

Cloud Infrastructure: At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing, Cloud Computing : Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, HPC on cloud.

UNIT III :

Cloud Resource virtualization: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades, Cloud Resource Management and Scheduling: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

UNIT IV:

Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2), Cloud

Security: Cloud security risks, security – a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.

UNIT V:

Cloud Application Development: Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming (Text Book 1), Google: Google App Engine, Google Web Toolkit (Text Book 2), Microsoft: Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

Text Books:

1) Cloud Computing, Theory and Practice,1st Edition, Dan C Marinescu, MK Elsevier publisher ,2013
2) Cloud Computing, A Practical Approach, 1st Edition, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH,2017

Reference Books:

1) Mastering Cloud Computing, Foundations and Application Programming,1st Edition, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH,2013
2) Essential of Cloud Computing, 1st Edition, K Chandrasekharan, CRC Press, 2014.
3) Cloud Computing, A Hands on Approach, ArshdeepBahga, Vijay Madisetti, Universities Press, 2014.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Job Oriented Elective Subjects

III Year – I Semester		L	T	P	C
		3	0	0	3
NATURAL LANGUAGE PROCESSING					

Course Objectives:

This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web.

Course Outcomes: On completion of this course, the students will be able to

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms
- Able to design different language modeling Techniques.

UNIT I:
Finding the Structure of Words:
Words and Their Components, Issues and Challenges, Morphological Models
Finding the Structure of Documents:
Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT II :Syntax Analysis:
Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

UNIT III :Semantic Parsing:
Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT IV:
Predicate-Argument Structure, Meaning Representation Systems, Software.
Discourse Processing:Cohension, Reference Resolution, Discourse Cohension and Structure

UNIT V: Language Modeling:

Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Text Books:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and ImedZitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

Reference Books:

1. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

III Year – II Semester		L	T	P	C
		3	0	0	3
SOCIAL NETWORK AND SEMANTIC WEB					

Course Objectives:
Explain the fundamentals of Semantic Web technologies. Implementation of• semantic web applications and the architectures of social networking Social network performance analysis

Course Outcomes: On completion of this course, the students will be able to

- Demonstrate the semantic web technologies like RDF Ontology and others
- Learn the various semantic web applications
- Identify the architectures and challenges in building social networks
- Analyze the performance of social networks using electronic sources

UNIT I:
Web Intelligence Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

UNIT II :
Knowledge Representation for the Semantic Web Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web – Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema

UNIT III :
Ontology Engineering, Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

UNIT IV:
Semantic Web Applications, Services and Technology Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base, XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods.

UNIT V:
Social Network Analysis and semantic web What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

Text Books:

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008.
1. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

Reference Books:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group).
3. Programming the Semantic Web, T.Segaran, C.Evans, J.Taylor, O'Reilly.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
		3	0	0	3
MIDDLEWARE TECHNOLOGIES					

Course Objectives:

Course Outcomes: On completion of this course, the students will be able to

UNIT I:
CLIENT / SERVER CONCEPTS Client server – File server – Database server – Group server – Object server – Web server – Middleware – General middleware – Service specific middleware – Client / server building blocks – RPC – Messaging – Peer-to-peer.

UNIT II :EJB ARCHITECTURE
EJB architecture – Overview of EJB software architecture – View of EJB – Conversation – Building and deploying EJB – Roles in EJB.

UNIT III :EJB APPLICATIONS
EJB session beans – EJB entity beans – EJB clients – EJB deployment – Building an application with EJB.

UNIT IV:CORBA
CORBA – Distributed systems – Purpose – Exploring CORBA alternatives – Architecture overview – CORBA and networking model – CORBA object model – IDL – ORB – Building an application with CORBA.

UNIT V:COM
COM – Data types – Interfaces – Proxy and stub – Marshalling – Implementing server/ client – Interface pointers – Object creation – Invocation – Destruction – Comparison COM and CORBA – Introduction to .NET – Overview of .NET architecture – Marshalling – Remoting.

Text Books:
1. Robert Orfali, Dan Harkey and Jeri Edwards, “The Essential Client / Server Survival Guide”, Galgotia Publications Pvt.Ltd,Third Edition, 2002.
2. Tom Valesky, ”Enterprise Java Beans”, Pearson Education, 2002.
3. Jason Pritchard, “COM and CORBA Side by Side”, Addison Wesley, 2000
4. Joel Murach,Anne Boehm “ C#”, Murach,2012.

Reference Books:
1. Mowbray, “Inside CORBA”, Pearson Education, 2002
2. Jeremy Rosenberger, “Teach Yourself CORBA in 14 days”, TEC Media, 2000.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE –INTERNET OF THINGS (IoT)

IV Year – I Semester		L	T	P	C
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MULTIMEDIA AND RICH INTERNET APPLICATIONS					

Course Objectives:
This course aims to further develop students' competency in producingdynamic and creative graphic solutions for multimedia productions. It provides students withthe basic concepts and techniques of interactive authoring. Artistic visual style and layoutdesign are stressed, as well as the editing and integration of graphic images, animation, videoand audio files. The course allows students to master industry-wide software andtechnologies to create highly interactive, rich internet applications.

Course Outcomes: On completion of this course, the students will be able to
- Ability to design a short films and teaching material for better understanding.
- Ability to apply different multimedia development tools to produce web based and
- Stand-alone user interfaces.

UNIT I:
Fundamental concepts in Text and Image: Multimedia and hypermedia, World Wide Web, overview of multimedia software tools. Graphics and image data representation graphics/image data types, file formats, Color in image and video: color science, color models in images, color models in video.

UNIT II :
Fundamental concepts in video and digital audio: Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio.
Multimedia Data Compression: Lossless compression algorithms, Lossy compression algorithms, Image compression standards.

UNIT III :
Basic Video compression techniques, Case study: MPEG Video Coding I, Basic Audio compression techniques, Case study: MPEG Audio compression.
Web 2.0
What is web 2.0, Search, Content Networks, User Generated Content, Blogging, Social Networking, Social Media, Tagging, Social Marking, Rich Internet Applications, Web Services, Mashups, Location Based Services, XML, RSS, Atom, JSON, and VoIP, Web 2.0Monetization and Business Models, Future of the Web.

UNIT IV:
Rich Internet Applications(RIAs) with Adobe Flash : Adobe Flash- Introduction, Flash Movie Development, Learning Flash with Hands-on Examples, Publish your flash movie, Creating special effects with Flash, Creating a website splash screen, action script, web sources.
Rich Internet Applications(RIAs) with Flex 3 - Introduction, Developing with Flex 3,Working with Components, Advanced Component Development, Visual Effects and Multimedia.

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UNIT V:

Ajax- Enabled Rich Internet Application : Introduction, Traditional Web Applications vsAjax Applications, Rich Internet Application with Ajax, History of Ajax, Raw Ajax exampleusing xml http request object, Using XML, Creating a full scale Ajax Enabled application,Dojo Tool Kit.

Text Books:

1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI Learning, 2004 UNITS 1,2,3
2. AJAX, Rich Internet Applications, and Web Development for Programmers, Paul J Deitel and Harvey M Deitel, Deitel Developer Series, Pearson Education. UNITS 4,5

Reference Books:

1. Professional Adobe Flex 3, Joseph Balderson, Peter Ent, et al, Wrox Publications,Wiley India, 2009.
2. Multimedia Communications: Applications, Networks, Protocols and Standards, FredHalsall, Pearson Education, 2001, rp 2005.
3. Multimedia Making it work, Tay Vaughan, 7th edition, TMH, 2008.
4. Introduction to multimedia communications and Applications, Middleware, Networks,K. R. Rao, Zoran, Dragored, Wiley India, 2006, rp. 2009.
5. Multimedia Computing, Communications & Applications, Ralf Steinmetz and KlaraNahrstedt, Pearson Education, 2004
6. Principles of Multimedia, Ranjan Parekh, TMH, 2006.
7. Multimedia in Action, James E. Shuman, Cengage Learning, 198, rp 2008.