KUMARAGURU COLLEGE OF TECHNOLOGY,

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049.

B.E., COMPUTER SCIENCE AND ENGINEERING

REGULATIONS 2018A(2021 Batch)

CURRICULUM AND SYLLABI

I to VIII Semesters

Department of Computer Science and Engineering

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VISION

To evolve as a School of Computer Science with centers of excellence having international reputation to serve the changing needs of Indian industry and society.

MISSION

- Computer Science and Engineering department is committed to bring out career oriented graduates who are industry ready through innovative practices of teaching-learning process.
- To cultivate professional approach, strong ethical values and team spirit along with leadership qualities among the graduates by organizing workshops, seminars and conferences periodically. Association with professional bodies and invitation to external experts should help this.
- To contribute towards techno-economic and social development of the nation through quality human resource and encouraging entrepreneurship among the young graduates.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The objectives of the Under Graduate programme in Computer Science and Engineering are to:

I. Enable graduates to be successful in their chosen careers, by applying their continual learning of Computer Science and Engineering in their work and life situations.

II. Enable graduates of the program to continue to adopt latest technologies and be critical learners displaying creativity and demonstrate to be leaders.

III. Prepare graduates of the program to be innovative product engineers catering to the requirements of the enterprises and society.

PROGRAM OUTCOMES (POs)

Graduates of BE-CSE programme will have the following abilities:

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Graduates of the Computer Science and Engineering Undergraduate Program will have the ability to:

PSO 1: Proficiently develop useful products by applying appropriate hardware and software technologies.

PSO 2: Organize heterogeneous data for accurate large-scale data processing using appropriate algorithms and tools

PSO 3: Understand modern networking technologies and apply programming skills to create scalable real-time applications.

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B.E COMPUTER SCIENCE AND ENGINEERING

CURRICULUM

Semester I										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18MAI1201	Linear Algebra and Calculus	Embedded - Theory & Lab	BS	3	0	2	0	4	
2	U18ENI1201	Fundamentals of Communication -I	Embedded - Theory & Lab	HS	2	0	2	0	3	
3	U18PHI1201	Engineering Physics	Embedded - Theory & Lab	BS	3	0	2	0	4	
4	U18CSI1201	Structured Programming using C	Embedded - Theory & Lab	ES	3	0	2	0	4	
5	U18EEI1201	Basic Electrical and Electronics Engineering	Embedded - Theory & Lab	ES	3	0	2	0	4	
6	U18INI1600	Engineering Clinic-I	Project based course with lab	ES	0	0	4	2	3	
								Total Credits	22	
								Total Contact Hours/week	30	

Semester II										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18MAI2201	Advanced Calculus and Laplace Transforms	Embedded - Theory & Lab	BS	3	0	2	0	4	U18MAI1201
2	U18ENI2201	Fundamentals of Communication-II	Embedded - Theory & Lab	HS	2	0	2	0	3	
3	U18BTI2201	Computational Biology	Embedded - Theory & Lab	BS	3	0	2	0	4	
4	U18CSI2201	Python Programming	Embedded - Theory & Lab	ES	2	0	2	0	3	
5	U18CSI2202	Digital Logic and Microprocessor	Embedded - Theory & Lab	PC	3	0	2	0	4	U18EEI1201
6	U18INI2600	Engineering Clinic-II	Project based course with lab	ES	0	0	4	2	3	U18INI1600
								Total Credits	21	
								Total Contact Hours/week	29	

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Semester III										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18MAT3102	Discrete Mathematics	Theory	BS	3	1	0	0	4	
2	U18CSI3201	Data Structures	Embedded - Theory & Lab	PC	3	0	2	0	4	
3	U18CSI3202	Object Oriented Programming	Embedded - Theory & Lab	PC	3	0	2	0	4	
4	U18CST3003	Computer Architecture	Theory	PC	3	0	0	0	3	
5	U18CSI3204	Database Management Systems	Embedded - Theory & Lab	PC	3	0	2	0	4	
6	U18INI3600	Engineering Clinic-III	Project based course with lab	ES	0	0	4	2	3	U18INI2600
								Total Credits	22	
								Total Contact Hours/week	28	

Semester IV										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18MAI4201	Probability and Statistics	Embedded - Theory & Lab	BS	3	0	2	0	4	
2	U18CST4001	Design and Analysis of Algorithms	Theory	PC	3	0	0	0	3	U18CSI3201
3	U18CSI4202	Operating Systems	Embedded - Theory & Lab	PC	3	0	2	0	4	U18CST3003
4	U18CST4003	Theory of Computation	Theory	PC	3	0	0	0	3	U18MAT3102
5	U18CSI4204	Software Engineering	Embedded - Theory & Lab	PC	3	0	2	0	4	U18CSI3202
6	U18INI4600	Engineering Clinic-IV	Project based course with lab	ES	0	0	4	2	3	U18INI3600
								Total Credits	21	
								Total Contact Hours/week	27	

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Semester V										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18CSI5201	Computer Networks	Embedded - Theory & Lab	PC	3	0	2	0	4	
2	U18CST5002	Agile Software Development	Theory	PC	3	0	0	0	3	U18CSI4204
3	U18CSI5203	No SQL Databases	Embedded - Theory & Lab	PC	3	0	2	0	4	U18CSI3204
4	U18CST5004	Social Media Marketing	Theory	PC	3	0	0	0	3	
5	U18CSI5205	Mobile Application Development using Android	Embedded - Theory & Lab	ES	1	0	4	0	3	
6	U18OE-----	Open Elective	Theory	OE	3	0	0	0	3	
7	U18CSE----	Programme Elective- I	Theory	PE	3	0	0	0	3	
								Total Credits	23	
								Total Contact Hours/week	28	

Semester VI										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18CSI6201	Internet and Web Programming	Embedded - Theory & Lab	PC	3	0	2	0	4	
2	U18CST6002	Wireless Networks and Mobile Systems	Theory	PC	3	0	0	0	3	U18CSI5201
3	U18CSI6203	Data Warehousing and Data Mining	Embedded - Theory & Lab	PC	3	0	2	0	4	U18CSI5203
4	U18CST6004	Software Testing	Theory	PC	3	0	0	0	3	U18CST5002
5	U18OE-----	Open Elective	Theory	OE	3	0	0	0	3	
6	U18CSE----	Programme Elective- II	Theory	PE	3	0	0	0	3	
								Total Credits	20	
								Total Contact Hours/week	22	

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Semester VII										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18CSI7201	Cloud Computing	Embedded - Theory & Lab	PC	3	0	2	0	4	U18CSI5201
2	U18CST7002	Machine Learning Techniques	Theory	PC	3	0	0	0	3	U18CSI6203
3	U18CSE----	Programme Elective-III	Theory	PE	3	0	0	0	3	
4	U18CSE----	Programme Elective-IV	Theory	PE	3	0	0	0	3	
5	U18CSP7703	Project Phase-I	Project only Course	PW	0	0	0	6	3	
								Total Credits	16	
								Total Contact Hours/week	20	

Semester VIII										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18CSP8701	Project Phase-II	Project only Course	PW	0	0	0	24	12	
								Total Credits	12	
								Total Contact Hours/week	24	

Total Credits	157

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Mandatory Courses										
S.No	**Couse Code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	**Semester**
1	U18CHT4000	Environmental Science and Engineering	Theory	MC	3	0	0	0	0	4
2	U18INT5000	Constitution of India	Theory	MC	2	0	0	0	0	5
3	U18VET4101	Universal Human Values-II	Theory	HS	3	0	0	0	0	4

Programme Electives									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
Data Analytics									
1.	U18CSE0001	Big Data Technologies	Theory	PE	3	0	0	0	3
2.	U18CSE0002	Data Visualization	Theory	PE	3	0	0	0	3
3.	U18CSE0003	Artificial Intelligence	Theory	PE	3	0	0	0	3
Networking									
1.	U18CSE0004	IoT Architecture and Protocols	Theory	PE	3	0	0	0	3
2.	U18CSE0005	Adhoc and Sensor Networks	Theory	PE	3	0	0	0	3
3.	U18CSE0006	Software Defined Networks	Theory	PE	3	0	0	0	3
4.	U18CSE0007	Cryptography and Network Security	Theory	PE	3	0	0	0	3
5.	U18CSE0012	Blockchain Technology and Applications	Theory	PE	3	0	0	0	3
General									
1.	U18CSE0008	Principles of Compiler Design	Theory	PE	3	0	0	0	3
2.	U18CSE0009	Graphics and Multimedia	Theory	PE	3	0	0	0	3
3.	U18CSE0010	Information Security	Theory	PE	3	0	0	0	3
4.	U18CSE0011	Declarative Development of Customized Applications	Theory	PE	2	0	0	2	3
5.	U18CSE0013	Professional Readiness for Innovation, Employability And Entrepreneurship	Theory	PE	3	0	0	0	3

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Courses Offered by Forge (for Protosem Students)

S.No	Course Code	Course Name	Course Type	Credits
1.	U18CSPS11	Applied Design Thinking	OE	3
2.	U18CSPS12	Electronic System Design	PE	3
3.	U18CSPS13	Embedded System Design and Development	PE	3
4.	U18CSPS14	Artificial Intelligence of Things	PC	3
5.	U18CSPS15	App Development and Android Things	PE	3
6.	U18CSPS16	Industrial Design and Product Development	PE	3
7.	U18CSPS17	Startup Fundamentals	OE	3
8.	U18CSPS18	IPR Fundamentals and Patent Drafting	OE	3
9.	U18CSPS19	MUP Product Design and Development	ES	3
10.	U18CSPS23	Computational Hardware	PE	3
11.	U18CSPS24	Coding for Innovators	PE	3
12.	U18CSPS25	Prototype Development	PE	3
13.	U18CSPS28	Data Life Cycle Management	PE	3
14.	U18CSPS29	ML/MLOps	PE	3

One Credit Courses offered by Industry

S.No	Course Code	Course Name	Industry Name
1.	U18CSIN001	Cyber Forensics	Alfa Beta Gamma Cyber Solutions, Coimbatore
2.	U18CSIN002	Augmented Reality	Meticulous Academy of Xcellence, Chennai
3.	U18CSIN003	Web Application Development using NodeJS	Teknoturf Info Services Pvt Ltd, Coimbatore

Open Elective Courses

S.No	Course Code	Course Name	Credits
1.	U18CSO0001	Data structures and Applications	3
2.	U18CSO0002	Database Application Development using Open Source Technologies	3
3.	U18CSO0003	Web Programming with XML	3
4.	U18CSO0004	Web Design	3
5.	U18CSO0005	Deep Learning for Computer Vision with Python and R	3
6.	U18CSO0006	Introduction to Internet of Things for Core Engineering	3
7.	U18CSO0007	2D Graphic Designing	3
8.	U18CSO0008	Data Analytics using Python	3
9.	U18CSO0009	Android Development with Java	3
10	U18CSO0010	AI and Deep Learning Fundamentals	3
11	U18CSO0011	Social Data Analytics and Visualization	3

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Bridge course (2021 batch onwards)

S.No	Course Code	Course Name	Credits
1.	U18CST0101	Basics of Computing	2

MINOR SPECIALIZATION (2019 BATCH ONWARDS)

INTERNET OF THINGS

S.No	Course code	Course Title	Course Mode	L	T	P	J	C	Prerequisite
1.	U18CSR3001	IoT Fundamentals and Applications	Theory	3	0	0	0	3	-
2.	U18CSR4202	IoT Protocols and Programming	Embedded	2	0	2	0	3	U18CSR3001
3.	U18CSR5203	IoT Analytics	Embedded	3	0	2	0	4	U18CSR4202
4.	U18CSR6004	Industrial IoT	Theory	3	0	0	0	3	U18CSR3001
5.	U18CSR7705	Capstone Project	Project	0	0	0	4	2	-
Total credits								**15**	

CYBER SECURITY

S.No	Course code	Course Title	Course Mode	L	T	P	J	C	Pre-requisite
1.	U18CSR3011	Introduction to Cyber Security	Theory	3	0	0	0	3	-
2.	U18CSR4012	Network Security and cryptography	Theory	3	0	0	0	3	U18CSR3011
3.	U18CSR5213	Ethical Hacking and Network Defense	Embedded	3	0	2	0	4	U18CSR4012
4.	U18CSR6214	Cyber Forensics	Embedded	2	0	2	0	3	-
5.	U18CSR7715	Mini Project	Project	0	0	0	2	1	-
6.	U18CSR7516	Industry Interaction	Practical	0	0	2	0	1	-
Total Credits								**15**	

ENTERPRISE NETWORKING AND NETWORK PROGRAMMING

S. No.	Course code	Course Title	Course Mode	L	T	P	J	C	Pre-requisite
1.	U18CSR3221	CCNA - Introduction to Networks	Embedded	2	0	2	0	3	-
2.	U18CSR4222	CCNA – Switching, Routing & Wireless Essentials	Embedded	2	0	2	0	3	U18CSR3221
3.	U18CSR5223	CCNA - Enterprise Networking, Security & Automation	Embedded	2	0	2	0	3	U18CSR4222
4.	U18CSR6224	TCP/IP Socket Programming using Python	Embedded	3	0	2	0	4	U18CSI2201
5.	U18CSR7725	Mini Project	Project	0	0	0	2	1	-
6.	U18CSR7526	Industry Interaction	Practical	0	0	2	0	1	
Total Credits								**15**	

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SEMESTER I

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U18MAI1201 LINEAR ALGEBRA AND CALCULUS
(Common to All branches)

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Identify eigenvalues and eigenvectors and apply Cayley Hamilton theorem.
CO2: Apply orthogonal diagonalisation to convert quadratic form to canonical form.
CO3: Solve first order ordinary differential equations and apply them to certain physical situations.
CO4: Solve higher order ordinary differential equations.
CO5: Evaluate the total derivative of a function, expand the given function as series and locate the maximum and minimum for multivariate function.
CO6: Determine Rank, Inverse, Eigenvalues, Eigenvectors of the given matrix, Maxima-Minima of the function and Solving Differential equations using MATLAB

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S			M				M	M		M	M	M	M
CO2	S	S			M				M	M		M	M		M
CO3	S	S			M				M	M		M	M	M	M
CO4	S	S			M				M	M		M		W	M
CO5	S	S			M				M	M		M		M	
CO6	S	S			M				M	M		M	M	M	M

COURSE ASSESSMENT METHODS:

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)

INDIRECT

1. Course-end survey

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THEORY COMPONENT CONTENTS

MATRICES **6 Hours**

Rank of a matrix – Consistency of a system of linear equations - Rouche's theorem - Solution of a system of linear equations - Linearly dependent and independent vectors– Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley Hamilton theorem (excluding proof)

DIAGONALISATION OF A REAL SYMMETRIC MATRIX **6 Hours**

Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS **11 Hours**

Leibnitz's equation – Bernoulli's equation – Equations of first order and higher degree - Clairauts form – Applications: Orthogonal trajectories.

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS **11 Hours**

Linear equations of second and higher order with constant coefficients – Euler's and Legendre's linear equations – Method of variation of parameters – First order Simultaneous linear equations with constant coefficients – Applications.

FUNCTIONS OF SEVERAL VARIABLES **11 Hours**

Total derivative – Taylor's series expansion – Maxima and minima of functions of two variables – Constrained maxima and minima: Lagrange's multiplier method with single constraints – Jacobians.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 41st Edition, 2011.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
3. Kreyzig E., "Advanced Engineering Mathematics", Tenth Edition, John Wiley and sons, 2011.
4. Veerarajan T., Engineering Mathematics (for First Year), Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2007
5. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics", S. Chand & Co., New Delhi, (Reprint) 2008
6. Venkataraman M.K., "Engineering Mathematics", The National Pub. Co., Chennai,2003
7. Weir, MD, Hass J, Giordano FR: Thomas' Calculus, Pearson education 12th Edition, 2015
8. P.Bali., Dr. Manish Goyal., Transforms and partial Differential equations, University Science Press, New Delhi, 2010
9. G.B.Thomas and R.L.Finney, Calculus and analytical geometry, 11th Edition, PearsonEducation, (2006)

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LAB COMPONENT CONTENTS **30 Hours**

List of MATLAB Programmes:

1. Introduction to MATLAB.
2. Matrix Operations - Addition, Multiplication, Transpose, Inverse
3. Rank of a matrix and solution of a system of linear equations
4. Characteristic equation of a Matrix and Cayley-Hamilton Theorem.
5. Eigenvalues and Eigenvectors of Higher Order Matrices
6. Curve tracing
7. Solving first order ordinary differential equations.
8. Solving second order ordinary differential equations.
9. Determining Maxima and Minima of a function of one variable.
10. Determining Maxima and Minima of a function of two variables.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U18ENI1201 FUNDAMENTALS OF COMMUNICATION-I
(Common to all Branches of I Semester B.E/B/Tech Programmes)

L	T	P	J	C
2	0	2	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Communicate in English with correct grammar
CO2: Communicate effectively (Oral and Written)
CO3: Use communication skills in the real world

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1										S		S	M	M	M
CO2		M		W		W			M	S		S	S	S	S
CO3		M		M		W			M	S		S	S	M	S

COURSE ASSESSMENT METHODS:

DIRECT
1. Continuous Assessment of Skills 2. Assignment 3. Written Test 4. End Semester Examination
INDIRECT
1. Course-end survey

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No	Topic	Hours
MODULE I - 12Hrs		
1.1	Parts of Speech	2
1.2	Subject Verb Agreement	2
1.3	Speak up (Self Introduction, JAM)	4
1.4	Writing sentences using 'Be-forms'	3
1.5	Test	1
MODULE II - 12Hrs		
2.1	Articles, Gerunds, Infinitives	2
2.2	Speak up (Greetings & Polite English)	4
2.3	Dialogue Writing	3
2.4	Skimming & Scanning	2
2.5	Listening Skills - I	1
MODULE III - 12Hrs		
3.1	Tenses & Voice	2
3.2	Sentences & its kinds	2
3.3	Speak up (Narration & Description)	4
3.4	Summarizing & Note-making	3
3.5	Listening Skills - II	1
MODULE IV - 12 Hrs		
4.1	Framing Questions – 4 types	2
4.2	Speak up (Role play)	4
4.3	Letter writing – Formal and Informal & Email Writing	3
4.4	Reading Comprehension & Cloze test	2
4.5	Listening Skills - III	1
MODULE V - 12 Hrs		
5.1	Degrees of Comparison	2
5.2	Clauses	2
5.3	Speak up (Power Point Presentation)	4
5.4	Writing (Picture perception)	3
5.5	Test	1
Total		**60**

REFERENCES

1. A Modern Approach to Non Verbal Reasoning (English, Paperback, Dr. R S Aggarwal)
2. The Power of Words(Bloomsbury, UK, 2012, Hyacinth Pink)
3. Word Power Made Easy: The Complete Handbook for Building a Superior Vocabulary (By Norman Lewis)
4. Effective Technical Communication Tata McGraw Hills Publications (Ashraf Rizvi)
5. English and Soft skills Orient Black Swan Publishers (S. P. Dhanavel)
6. Know Your Grammar: Trans.in Tamil & Malayalam –A Bilingual Approach (Bloomsbury, UK, 2012, Hyacinth Pink)

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U18PHI1201 ENGINEERING PHYSICS

(Common to All B.E., B .Tech.)

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Understand the principles of motion and rotation of a rigid body in the plane.

CO2: Enhance the fundamental knowledge in properties of matter and its applications relevant to various streams of Engineering and Technology.

CO3: Recognize the nature and role of the thermodynamic parameters.

CO4: Compute electrostatic field and electric potential due to point and distributed charges.

CO5: Use electrostatic & magneto static boundary conditions to relate fields in adjacent media.

CO6: Introduce and provide a broad view of the smart materials and Nano science to undergraduates.

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	M										M			
CO2	S	M			S							M			
CO3	S	M			S							M			
CO4	S	M			S							M			
CO5	S	M			S							M			
CO6	S	M					M					M	S		

COURSE ASSESSMENT METHODS:

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component) 3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) **5.** End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

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THEORY COMPONENT CONTENTS

KINEMATICS & RIGID BODY MOTION **9 Hours**

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples.

PROPERTIES OF MATTER AND MATERIALS TESTING **9 Hours**

Properties of matter: Hooke's Law Stress - Strain Diagram - Elastic moduli - Relation between elastic constants - Poisson's Ratio - Expression for bending moment and depression - Cantilever - Expression for Young's modulus by Non uniform bending and its experimental determination.

Materials testing: Mechanism of plastic deformation, slip and twinning – types of fracture – Vickers Hardness test - fatigue and creep test.

HEAT **9 Hours**

Specific heat capacity, thermal capacity. Temperature rise. Coefficient of linear thermal expansion. Methods of measurement of thermal expansion. Thermal stresses in composite structures due to non-homogeneous thermal expansion. Applications -The bimetallic strip. Expansion gaps and rollers in engineering structures. Thermal conductivity: differential equation of heat flow. Lee's disc apparatus for determination of thermal conductivity. Thermal Insulation. Convection and radiation. Applications to refrigeration and power electronic devices.

ELECTROSTATICS & MAGNETOSTATICS **10 Hours**

ELECTROSTATICS : Maxwell's equation for electrostatics – E due to straight conductors, circular loop, infinite sheet of current - electric field intensity (D) - Electric potential - dielectrics - dielectric polarization - internal field – Clasious - Mosotti equation - dielectric strength - applications.

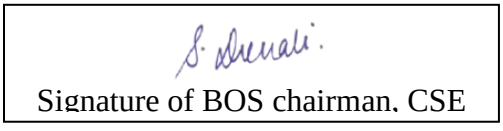
MAGNETOSTATICS: Maxwell's equation for magnetostatics - B in straight conductors, circular loop, infinite sheet of current - Lorentz force, magnetic field intensity (H) – Biot–Savart's Law – Ampere's Circuit Law –Magnetic flux density (B) – magnetic materials – Magnetization – Applications.

NEW ENGINEERING MATERIALS AND NANO TECHNOLOGY **8 Hours**

New Engineering Materials: Metallic glasses – preparation, properties and applications – Shape memory alloys (SMA) – characteristics, properties of NiTi alloy applications - advantages and disadvantages of SMA.

Nano Materials: synthesis - Ball milling - Sol-gel - Electro deposition — properties of nano particles and applications. – Carbon Nano Tubes – fabrication by Chemical Vapour Deposition - structure, properties & applications.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**



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REFERENCES

1. Elements of Properties of Matter, Mathur D.S., Shyamlal Charitable Trust, New Delhi, 1993.
2. Properties of matter, brijlal and Subharamaniam, S.Chand and Co, New Delhi, 2004.
3. Fundamentals of General Properties of Matter by Gulati H.R., R. Chand & Co., New Delhi, 1982.
4. Engineering Mechanics (2nd ed.), Harbola M. K., Cengage publications, New Delhi, 2009.
5. Introduction to Mechanics, Verma M. K. (CRC Press), University Press, 2000.
6. Thermodynamics: An Engineering Approach (SI Units), yunus a. cengel & michael a. boles 7th edition, mcgraw-hill companies 2014.
7. Engineering Electromagnetics, W. H. Hayt and John A. Buck, 6th Edition, Tata McGraw Hill, New Delhi, 2014.
8. Electromagnetic Field Theory, 5th Edition, Gangadhar K.A. and Ramanathan P.M., Khanna Publishers, New Delhi, 2013.
9. Problems and Solutions in Electromagnetics, 1st Edition, J.A. Buck and W. H. Hayt, Tata McGraw Hill, New Delhi, 2010.
10. Theory and Problems of Electromagnetic Schaum's Outline Series, 5th Edition, Joseph A. Edminister, Tata McGraw Hill Inc., New Delhi, 2010.
11. Engineering Physics, Rajendran V., Tata McGraw-Hill Education Pvt. Ltd., 2010
12. Nano – the Essentials, Pradeep T., McGraw-Hill Education, Pvt. Ltd., 2007.

LAB COMPONENT CONTENTS

LIST OF EXPERIMENTS

1. Determination of thermal conductivity of a bad conductor - Lee's disc
2. Determination of Acceleration due to Gravity – Compound Pendulum
3. Determination of wavelength of light, Numerical aperture and acceptance of optical fibre
4. Determination of band gap of a semiconductor
5. Determination of compressibility of a given liquid - Ultrasonic Interferometer
6. Determination of thickness of thin sheet – Air wedge
7. Determination of frequency of an electrically maintained turning fork – Melde's string
8. Determination of wavelength of mercury source using diffraction grating - Spectrometer
9. Determination of solar cell efficiency using Lux Meter
10. Determination of Young's Modulus – Non-uniform bending

S. Sumati.

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EXPERIMENTS FOR DEMONSTRATION:

1. Hall effect
2. Hardness Test
3. Four probe experiment
4. Hysteresis curve

Theory: 0	**Tutorial: 0**	**Practical: 30**	**Project:0**	**Total: 30 Hours**

REFERENCES

1. Laboratory Manual of Engineering Physics, Dr. Y. Aparna & Dr. K. Venkateswara Rao, V.G.S Publishers.
2. Practical Physics, G.L. Squires, Cambridge University Press, Cambridge, 1985.
3. Great Experiments in Physics, M.H. Shamos, Holt, Rinehart and Winston Inc., 1959.
4. Experiments in Modern Physics, A.C. Melissinos, Academic Press, N.Y., 1966.

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U18CSI1201 STRUCTURED PROGRAMMING USING C

(Common to CSE, ISE & IT)

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Acquire knowledge on different problem solving techniques.
CO2: Use appropriate data types and control structures for solving a given problem.
CO3: Execute different array and string operations.
CO4: Experiment with the usage of pointers and functions.
CO5: Organize data using structures and unions.
CO6: Demonstrate data persistency using files**.**

Pre-requisite :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M							L				S		
CO2	S	M							L	L				S	
CO3	S	L			L	L			L	L		L	M		
CO4	M	L	M	L	L	L			L	L		M	M		
CO5	M	L	M	L	L	L			L	L		M			M
CO6	L	L	M	L	L	L			L	L		L			M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory Component) 2. Assignment (Theory Component) 3. Group Presentation (Theory Component) 4. Pre/Post - experiment Test/Viva; Experimental Report for each experiment (lab component) 5. Model examination (lab component) 6. End Semester Examination (Theory and lab component)
INDIRECT
1. Course-end survey

S. Sheela.

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THEORY COMPONENT CONTENTS

STRUCTURED PROGRAMMING **7 Hours**

Algorithms, building blocks of algorithms (instructions/statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving.

ARRAYS AND STRINGS **11 Hours**

Introduction to C Programming – Operators and Expressions – Data Input and Output – Control Statements. Defining an array – Processing an array – Multidimensional Arrays Character Arithmetic – Defining a string – NULL character – Initialization of Strings – Reading and Writing Strings – Processing Strings –Searching and Sorting of Strings.

FUNCTIONS, STORAGE CLASSES **9 Hours**

Defining a function – Accessing a function – Function prototypes – Passing arguments to a function – Passing arrays to functions – Function with string - Recursion – Storage classes

POINTERS **9 Hours**

Pointer Fundamentals – Pointer Declaration – Passing Pointers to a Function – Pointers and one dimensional arrays – operations on pointers– Dynamic memory allocation

STRUCTURES, UNIONS AND FILES **9 Hours**

Structures and Unions: Defining a Structure – Processing a Structure – User defined data types (Typedef) – Unions

Files: Opening and Closing a Data File – Reading and writing a data file – Processing a data file – Unformatted data files – Concept of binary files – Accessing a file randomly using fseek

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Byron S Gottfried and Jitendar Kumar Chhabra, “Programming with C”, Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.
2. Pradip Dey and Manas Ghosh, “Programming in C”, Second Edition, Oxford University Press, 2011.
3. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
4. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.
5. Reema Thareja, “Programming in C”, Second Edition, Oxford University Press, 2011.

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LAB COMPONENT CONTENTS

LIST OF EXPERIMENTS 30 Hours

1. Writing algorithms, flowcharts and pseudo codes for simple problems.
2. Programs on expressions and conversions
3. Programs using if, if-else, switch and nested if statements
4. Programs using while, do-while, for loops
5. Programs on one dimensional arrays, passing arrays to functions and array operations
6. Programs using two dimensional arrays, passing 2D arrays to functions
7. Programs using String functions
8. Programs using function calls, recursion, call by value
9. Programs on pointer operators, call by reference, pointers with arrays
10. Programs using structures and unions.
11. Programs on file operations and modes.
12. Working with text files, random files and binary files

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

REFERENCES

1. Byron S Gottfried and Jitendar Kumar Chhabra, “Programming with C”, Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.
2. Pradip Dey and Manas Ghosh, “Programming in C”, Second Edition, Oxford University Press, 2011.
3. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
4. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.
5. Reema Thareja, “Programming in C”, Second Edition, Oxford University Press, 2011.

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U18EEI1201 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to CSE, IT, ISE)

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1	Acquire basic knowledge on DC and AC circuits.	K_2
CO2	Understand the construction, working principle and applications of DC machines	K_2
CO3	Understand the construction, working principle and applications of AC machines and transformers.	K_2
CO4	Acquire basic knowledge on logic gates, semiconductor devices and their applications.	K_2
CO5	Identify electronic components and use them to design simple circuits.	K_2

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO MAPPING**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	M	M										W			
CO2	M	M										W			
CO3	M	M										W			
CO4	M	M										W			
CO5	M	M										W			

COURSE ASSESSMENT METHODS:

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)

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INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

DC CIRCUITS **9 Hours**

Basic circuit elements and sources, Ohms law, Kirchhoff's laws, series and parallel connection of circuit elements, Node voltage analysis, Mesh current analysis.

AC CIRCUITS **9 Hours**

Alternating voltages and currents – Single Phase Series RL, RC, RLC Circuits, Power in AC circuits –Power Factor.

ELECTRICAL MACHINES **9 Hours**

Construction, Working Principle and applications of DC generators, DC Motors, single phase Transformers, three phase and single phase induction motors.

SEMICONDUCTOR DEVICES AND CIRCUITS **9 Hours**

PN junction diode – Zener Diode – Half wave and Full wave rectifier-voltage regulators – Bipolar Junction transistors, JFET, MOSFET – characteristics

DIGITAL SYSTEMS **9 Hours**

Binary Number System – Logic Gates – Boolean algebra – Half and Full Adders -sbutractor– Multiplexer – Demultiplexer-decoder-flip flops.

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

LAB COMPONENT CONTENTS

1. Measurement of electrical quantities–voltage, current, power & power factor in RL, RC and RLC circuits.
2. Verification of Kirchoff's Voltage and Current Laws.
3. Verification of Mesh and Nodal analysis.
4. Load test on DC shunt motor.
5. Load test on single phase transformer.
6. Load test on single phase induction motor.
7. Verification of truth tables of OR, AND, NOT, NAND, NOR, EX-OR, EXNOR gates.
8. Full wave rectifier with and without filter.
9. Input and output Characteristics of BJT – CE configuration.
10. Characteristics of PN junction diode and Zener diode.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

S. Murali.

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TEXT BOOKS

1. Mittle N., “Basic Electrical Engineering”, Tata McGraw Hill Edition, New Delhi, 1990.
2. Sedha R.S., “Applied Electronics”, S. Chand & Co., 2006.

REFERENCES

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, “Basic Electrical, Electronics and Computer Engineering”, Tata McGraw Hill, Second Edition, 2017.

2. Nagsarkar T K and Sukhija M S, “Basics of Electrical Engineering”, Oxford press 2005.

3. Mehta V K, “Principles of Electronics”, Third Edition, S.Chand & Company Ltd, 1994.

4. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series, McGraw Hill, 2002.

5. Premkumar N, “Basic Electrical Engineering”, Anuradha Publishers, 2003.

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U18INI1600 ENGINEERING CLINIC - I

L	T	P	J	C
0	0	4	2	3

COURSE OBJECTIVES

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1: Identify a practical problems and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	S	M	W		S			S	S		
CO2											S		S		
CO3										S					

COURSE ASSESSMENT METHODS:

DIRECT
1. Project reviews 50% 2. Workbook report10% 3. Demonstration & Viva – voce 40%
INDIRECT
1. Course-end survey

CONTENT:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course

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will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.
In the first semester, students will focus primarily on IOT with C programming using Arduino.

GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Theory: 0	**Tutorial: 0**	**Practical: 60**	**Project: 30**	**Total: 90 Hours**

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SEMESTER II

L	T	P	J	C

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U18MAI2201 **ADVANCED CALCULUS AND LAPLACE TRANSFORMS**
(Common to All branches)

3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Evaluate double and triple integrals in Cartesian coordinates and apply them to calculate area and volume.

CO2: Apply various integral theorems for solving engineering problems involving cubes and rectangular parallelepipeds.

CO3: Construct analytic functions of complex variables and transform functions from z-plane to w-plane and vice-versa, using conformal mappings.

CO4: Apply the techniques of complex integration to evaluate real and complex integrals over suitable closed paths or contours.

CO5: Solve linear differential equations using Laplace transform technique.

CO6: Determine multiple integrals, vector differentials, vector integrals and Laplace transforms using MATLAB.

Pre-requisite: U18MAI1201/Linear Algebra and Calculus

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO MAPPING**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S			M				M	M		M	M		M
CO2	S	S			M				M	M		M	M		M
CO3	S	S			M				M	M		M	M	M	M
CO4	S	S			M				M	M		M	M		M
CO5	S	S			M				M	M		M	M		M
CO6	S	S			M				M	M		M	M	M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - experiment Test/Viva; Experimental Report for each experiment (lab

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component) 4. Model examination (lab component) 5. End Semester Examination (Theory and lab component)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

MULTIPLE INTEGRALS **9 Hours**

Double integration – Cartesian coordinates – Change of order of integration - Triple integration in Cartesian coordinates – Applications: Area as double integral and Volume as triple integral.

VECTOR CALCULUS **9 Hours**

Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields - Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) – Verification of theorem and simple applications.

ANALYTIC FUNCTIONS **9 Hours**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy- Riemann equations in Cartesian coordinates and sufficient conditions (excluding proofs)– Properties of analytic function – Construction of analytic function by Milne Thomson method – Conformal mapping : $w = z + c$, cz , $1/z$ – Bilinear Transformation

COMPLEX INTEGRATION **9 Hours**

Cauchy's integral theorem – Cauchy's integral formula –Taylor's and Laurent's series – Singularities –Residues –Residue theorem –Application of residue theorem for evaluation of real integrals – Contour Integration (excluding poles on the real axis).

LAPLACE TRANSFORMS **9 Hours**

Definition - Properties: Superposition, Shift in t or Time Delay, Shift in s, Time Derivatives, Time Integral-Initial Value Theorem - Final Value Theorem - Transform of periodic functions - Inverse transforms - Convolution theorem – Applications: Solution of linear ordinary differential equations of second order with constant coefficients.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 41st Edition, 2011.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
3. Veerarajan T., Engineering Mathematics (for First Year), Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2007.

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4. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics", S. Chand & Co., New Delhi, (Reprint) 2008.
5. Kreyzig E., "Advanced Engineering Mathematics", Tenth Edition, John Wiley and sons, 2011.
6. Venkataraman M.K., "Engineering Mathematics", The National Pub. Co., Chennai, 2003.
7. Weir, MD, Hass J, Giordano FR: Thomas' Calculus Pearson education 12th ED, 2015.

LAB COMPONENT CONTENTS **30 Hours**

List of MATLAB Programmes:

1. Evaluating double integral with constant and variable limits.
2. Area as double integral
3. Evaluating triple integral with constant and variable limits
4. Volume as triple integral
5. Evaluating gradient, divergence and curl
6. Evaluating line integrals and work done
7. Verifying Green's theorem in the plane
8. Evaluating Laplace transforms and inverse Laplace transforms of functions including impulse.
9. Heaviside functions and applying convolution.
10. Applying the technique of Laplace transform to solve differential equations.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

S. Meenali.

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U18ENI2201 FUNDAMENTALS OF COMMUNICATION - II
(Common to all branches of II Semester B.E/B/Tech Programmes)

L	T	P	J	C
2	0	2	0	3

COURSE OUTCOMES:

AFTER THE COURSE THE STUDENT WILL BE ABLE TO:

CO1: Read, understand, and interpret material on technology.
CO2: Communicate knowledge and information through oral and written medium.
CO3: Compare, collate and present technical information according to the audience and purpose.

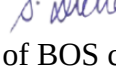
Pre requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		**W**		**S**					**S**	**S**		**S**	M	M	M
CO2				**S**					**S**	**S**		**W**	S	S	S
CO3				**M**					**S**	**S**		**S**	S	M	S

COURSE ASSESSMENT METHODS

Direct
1. Continuous Assessment of Skills 2. Assignment 3. Written Test 4. End Semester Examination
Indirect
1. Course-end survey

No	TOPIC	
	MODULE I	**12 Hrs**
1.1	Introduction to Technical Writing Technical Definitions	2
1.2	Writing Instructions / Instruction Manual	2
1.3	Writing Recommendations	2
1.4	Speaking Activity I	6
	MODULE II	**12 Hrs**
2.1	Process Writing	2
2.2	Review Writing I - Product	2



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2.3	Review Writing II – Article	2
2.4	Speaking Activity II	6
	MODULE III	**12 Hrs**
3.1	Interpreting and Transcoding Graphics	2
3.2	Types of Report / Writing a Report	2
3.3	Reading & Responding to texts	2
3.4	Speaking Activity III	6
	MODULE IV	**12 Hrs**
4.1	Drafting a project proposal	2
4.2	Listening to technical talks	2
4.3	Preparing a survey Questionnaire	2
4.4	Speaking Activity IV	6
	MODULE V	**12 Hrs**
5.1	Writing Memos, Circulars, Notices	2
5.2	Writing Agenda and Minutes	2
5.3	Inferential Reading	2
5.4	Speaking Activity V	6
	Total	**60**

REFERENCES

1. Technical English Workbook, VRB Publishers Pvt. Ltd (Prof. Jewelcy Jawahar, Dr.P.Ratna)
2. Effective Technical Communication, Tata McGraw Hills Publications (Ashraf Rizvi)
3. Technical Communication – English Skills for Engineers, Oxford Higher Education (Meenakshi Raman, Sangeeta Sharma)

S. Meenakshi.

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U18BTI2201 **COMPUTATIONAL BIOLOGY**

(Common to CSE, IT)

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Understand the fundamentals of evolution theory, and classify the type of organisms [K3].

CO2: Draw and differentiate the type of cell organelles using functional characteristics [K3, S2]

CO3: Analyze and appraise the functional impact of biological macromolecules [K5, S2]

CO4: Understand the structural and functional characteristics of nucleic acids, differentiate the impact of biological information process, and evaluate the derangement of information flow due to mutation [K5]

CO5: Apply the fundamental concepts of pattern matching methods and interpret the alignment of biological sequences [K5, S2]

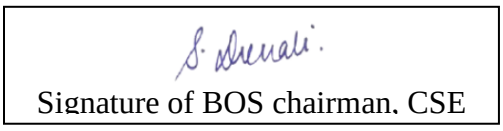
CO6: Understand, apply and evaluate the molecular phylogeny of biological sequences [K5, S2]

Pre-requisites :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S											M		
CO2	S	S										M	M		
CO3	S	S	M	M	M	S			S	S		S	S		
CO4	S	S				S						M	M		
CO5	S	S	M	S	S	M			S	S		S	S		
CO6	S	S		S	S	M			S	S		S	S		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component) 3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) **5.** End Semester Examination (Theory and lab components)
INDIRECT



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1. Course-end survey

THEORY COMPONENT CONTENTS

BASIS OF LIFE **9 Hours**

Origin of life–theory of evolution, Uniqueness of life on earth; Characteristics of living organisms,

Tree of life classification –archaea, prokaryotes,eukaryotes.

INTRODUCTION TO BIOMOLECULES AND CYTOLOGY **12 Hours**

Biomolecules (Carbohydrates, lipids and proteins, nucleic acids) – Functions; Cells and its organelles (plasma membrane, mitochondria, nucleus, Golgi apparatus) – structure and functions.

INFORMATION STORAGE AND TRANSFER **12 Hours**

Heredity and DNA; organization of DNA in cells; Genes and chromosomes; Central dogma of information transfer; transcription and Protein synthesis; Cell division and cell cycle. Mutation and cancer.

ANALYSIS OF DNA AND PROTEIN SEQUENCES **12 Hours**

Basics of Sequence analysis-Pairwise sequence alignment, Basic Local Alignment Search Tool,

Multiple sequence alignment, Molecular phylogeny and evolution; High throughput Gene expression analysis.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Satyanarayan, U.,&Chakrapani, U.(1999) Ed. June 2017. Textbook of Biochemistry.
2. Verma, P. S., Agarwal,V. K., &Verma, P. S. (2007). *Cell biology, genetics, molecular biology, evolution and ecology*. S. chand &Company Limited.
3. Taylor,D.J.,Green,N.P.,Stout,G.W.,&Soper,R.(1997).*Biologicalscience*(Vol.983). Cambridge,United Kingdom: Cambridge University Press.
4. Campbell, N. A., Mitchell,L. G., Reece, J. B.,& Taylor, M. R. (2000).*Biology: concepts& connections* (No. QH308. 2 C35 1996). Benjamin/Cummings.
5. Rastogi, S. C., Rastogi, P., &Mendiratta, N. (2008). *Bioinformatics Methods And Applications: Genomics Proteomics And Drug Discovery3RdEd*. PHI Learning Pvt. Ltd..
6. Fumento, M. (2003).Bioevolution: how biotechnology is changing our world.

LAB COMPONENT CONTENTS **30 Hours**

S. Sreenath.

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Wet Lab Experiments:

1. Isolation and Quantification of DNA byuv-vis method (MS-Excel: Calculation using simple regression equation and analysis of Karl pearson correlation coefficient values)
2. Quantification of protein by colorimetry/ Uv-vis method (MS-Excel: Calculation using simple regression equation and analysis of Karl pearson correlation coefficient values)
3. Qualitative analysis of carbohydrates (glucose, sucrose and starch)
4. Separation of cell organelles using centrifugation [DEMO]

***In silico* based Experiments:**

1. Retrieval of data from public biological databases
2. Sequence alignment using EMBOSS tool (Percent similarity finding method)
3. Sequence alignment using k-tuple method (BLAST or FASTA(Database search method using percent similarity).
4. Phylogenetic analysis using EMBOSS/ BLAST tool (Clustering sequence using percent similarity).
5. Development of a simple sequence analysis tool

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

S. Meenakshi.

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L	T	P	J	C
2	0	2	0	3

U18CSI2201 PYTHON PROGRAMMING

(Common to All Branches)

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1: Classify and make use of python programming elements to solve and debug simple logical problems.(K4,S3)

CO2: Experiment with the various control statements in Python.(K3,S2)

CO3: Develop Python programs using functions and strings.(K3,S2)

CO4: Analyze a problem and use appropriate data structures to solve it.(K4,S3)

CO5: Develop python programs to implement various file operations and exception handling.(K3,S2)

Pre-requisite :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO MAPPING		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		S			M					M		M			
CO2			M							M		M			
CO3			M							M		M		M	
CO4	S	S	M		M					M		M	M	M	
CO5			M							M		M			

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test, Assignment
3. Viva, Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

S. Sheela.

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BASICS OF PYTHON PROGRAMMING **6 Hours**

Introduction-Python Interpreter-Interactive and script mode -Values and types, operators, expressions, statements, precedence of operators, Multiple assignments, comments.

CONTROL STATEMENTS AND FUNCTIONS IN PYTHON **6 Hours**

Conditional (if), alternative (if-else), chained conditional (if-elif-else)-Iteration-while, for, break, continue, pass – Functions - Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Lambda functions.

DATA STRUCTURES: STRINGS,LISTS and SETS **7 Hours**

Strings-String slices, immutability, string methods and operations -Lists-creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions-list processing-list comprehension, searching and sorting, Sets-creating sets, set operations.

DATA STRUCTURES: TUPLES, DICTIONARIES **5 Hours**

Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value-Dictionaries-operations and methods, Nested Dictionaries.

FILES, MODULES, PACKAGES **6 Hours**

Files and Exception-Text files, reading and writing files, format Operator-Modules-Python Modules-Creating own Python Modules-packages, Introduction to exception handling.

Theory: 30	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 30 Hours**

REFERENCES

1. Ashok NamdevKamthane,Amit Ashok Kamthane, “Programming and Problem Solving with Python” , Mc-Graw Hill Education,2018.
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second edition, Updated for Python 3, Shroff / O’Reilly Publishers, 2016.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd,” Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.
6. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem Solving Focus”, Wiley India Edition, 2013.

E BOOKS AND ONLINE LEARNING MATERIALS

1. www.mhhe.com/kamthane/python
2. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Second edition, Updated for Python 3, Shroff / O’Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)

LAB COMPONENT CONTENTS **30 Hours**

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LIST OF EXPERIMENTS

1. Implement simple python programs using interactive and script mode.
2. Develop python programs using id() and type() functions
3. Implement range() function in python
4. Implement various control statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, Indexing.
6. Demonstrate string functions using python.
7. Implement user defined functions using python.
8. Develop python programs to perform operations on list
9. Implement dictionary and set in python
10. Develop programs to work with Tuples.
11. Create programs to solve problems using various data structures in python.
12. Implement python program to perform file operations.
13. Implement python programs using modules and packages.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

ONLINE COURSES AND VIDEO LECTURES:

http://nptel.ac.in
https://www.edx.org/course/introduction-to-python-fundamentals-1
https://www.edx.org/course/computing-in-python-ii-control-structures-0
https://www.edx.org/course?search_query=Computing+in+Python+III%3A+Data+Structures

S. Murali.
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U18CSI2202	DIGITAL LOGIC AND MICROPROCESSOR	L	T	P	J	C
		3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Demonstrate how the logic gates and minimization techniques work K3
CO2: Design a combinational circuit for performing arithmetic functions K5
CO3: Analyze and study a few sequential circuits K4
CO4: Develop programing code with 8086 for the basic problems K5, S1
CO5: Perform interfacing of 8086 with peripherals K3

Pre-requisite :

1. U18EEI1201/Basic Electrical and Electronics Engineering

CO/PO MAPPING (S/M/W indicates strength of correlation)S-Strong, M-Medium, W-Weak													CO/PSO		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M		M							M			
CO2	S												M		
CO3	S				M										
CO4	S	M										M			
CO5		M										M	M		

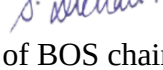
COURSE ASSESSMENT METHODS

Direct
1. Internal Tests 2. End Semester Exam 3. Assignments
Indirect
1. Course-end survey

THEORY COMPONENT CONTENTS

COMBINATIONAL CIRCUITS **10 Hours**

Logic gates: NAND, NOR gate as universal building blocks -Simplification of four-variable Boolean equations using Karnaugh maps - Half adder, Full adder, Half subtractor, Full subtractor - 4-bit parallel adder and subtractor - 3-bit binary decoder – Decimal to BCD encoder – 8-to-1 multiplexer, 1-to-8 Demultiplexer



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SEQENTIAL LOGIC CIRCUITS **11 Hours**

Flip-flops: SR flip-flop, Edge-triggered flip-flops (SR,D,JK and T), 4-bit binary asynchronous and synchronous counter - Decade counter (asynchronous and synchronous) -Shift registers (SISO,SIPO,PISO,PIPO) - Ring counter

D/A AND A/D CONVERTERS **6 Hours**

Ladder type D/A converter - Dual slope A/D converter - Successive approximation A/D converter- case study of DAC0800 and ADC0809 chips

8086 MICROPROCESSOR ARCHITECTURE AND INSTRUCTION SET **12 Hours**

Pin diagram - CPU architecture - Memory segmentation - Internal operations - Addressing modes -Instruction formats - Data transfer instructions, Arithmetic instructions, Logical instructions, Branch-and-loop instructions – Interrupts: Software and Hardware interrupts

PERIPHERAL CHIPS **6 Hours**

8254 (Timer), 8257 (DMA), 8259 (PIC), 8251 (USART), 8279 (Keyboard -Display Interface)

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. M. Morris Mano, Digital Logic and Computer Design, 5th Edition., Pearson Education, 2017
2. Douglas V. Hall, Microprocessors and Interfacing, TMH
3. Thomas L. Floyd, “Digital Fundamentals”, Pearson Education, Inc, New Delhi, 2013
4. Yu-Cheng Liu, Glenn A. Gibson, Microcomputer Systems: The 8086/8088 Family, PHI
5. Barry B. Brey, Microprocessors and Peripherals, CBS Publishers & Distributors, Delhi
6. R.K. Gaur, Digital Electronics and Microcomputers Thomas L Floyd, Digital Fundamentals, Universal Books, New Delhi

S. Murali.

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LAB COMPONENT CONTENTS:

30 Hours

List of Experiments

I. Digital Electronics

1. Study of Logic Gates
2. Implementation of Logic Circuits
3. Adder and Subtractor
4. Combinational Circuit Design
   a) Design of Decoder and Encoder
   b) Design of Code Converter
   c) Design of multiplexers and de multiplexers
5. Sequential Circuit Design
   a) Implementation of Shift registers, Serial Transfer
   b) 4-bit Binary Counter
   c) BCD Counter

II. Microprocessors

6. ALP Arithmetic programming
   a) Write an ALP to find out factorial of a given hexadecimal number using 8086 Data: OAH, OFH, 1OH
   b) Write an ALP to perform 16 bit arithmetic operations (ADD, SUB, MUL, DIV)
   c) Write an ALP to generate the sum of first 'N' natural numbers using 8086 MP
7. Sorting and Data Movement
   a) Write an ALP to order give set of hexadecimal numbers in ascending and descending order. Data: 0AH, 0FH, 0DH, 10H, 02H
   b) Write an ALP to move block of data from locations 1200H-1205H to 2200H – 2205H
   c) Write an ALP to reverse the given string of data: WELCOME

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

S. Sreenati.

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U18INI2600 ENGINEERING CLINIC - II

L	T	P	J	C
0	0	4	2	3

COURSE OBJECTIVES

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1: Identify a practical problems and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite: U18INI1600/Engineering Clinic-I

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	S	M	W		S			S	S		
CO2											S		S		
CO3										S					

COURSE ASSESSMENT METHODS:

DIRECT
1. Project reviews 50% 2. Workbook report10% 3. Demonstration & Viva – voce 40%
INDIRECT
1. Course-end survey

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CONTENT:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.
In the second semester, students will focus primarily on Raspberry pi based controllers with Python programming Arduino.

GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Theory: 0	**Tutorial: 0**	**Practical: 60**	**Project: 30**	**Total: 90 Hours**

S. Sharali.

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SEMESTER – III

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U18MAT3102 **DISCRETE MATHEMATICS**
(Common to CSE/IT/ ISE)

L	T	P	J	C
3	1	0	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Understand the concepts of set theory and apply them to situations involving inclusion and exclusion

CO2: Acquire the knowledge of relations, and analyse equivalence relations and their properties.

CO3: Understand and analyse the properties of different kinds of functions.

CO4: Apply mathematical induction to prove mathematical facts, analyse and use the concept of permutation and combination and solve recurrence relations.

CO5: Evaluate the validity of logical arguments and construct simple mathematical proofs.

CO6: Determine whether given graphs are isomorphic and apply Dijkstra's algorithm to find the shortest path.

Pre-requisite courses: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO MAPPING**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	M	M											M	M	M
CO2	M		S										M	M	
CO3	L												M	M	M
CO4	M		S										M	M	M
CO5	S	S	S									S	M	M	M
CO6	S	S	S									S	M	M	M

COURSE ASSESSMENT METHODS:

DIRECT
1. Continuous Assessment Test I, II 2. Written Assignment, Offline quiz, Written tests-2 **3.** End Semester Examination
INDIRECT
1. Course-end survey

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THEORY COMPONENTS CONTENTS

SET THEORY **9+3 Hours**

Algebra of sets – The power set – Ordered pairs and Cartesian product – principle of inclusion and exclusion.

Relations on sets –Types of relations and their properties - Equivalence relations –Relational matrix and the graph of relation – Operations on relations.

FUNCTIONS **7+2 Hours**

Functions –Type of functions – Injective, surjective and bijective functions –Composition of functions – Inverse functions –Permutation functions.

COMBINATORICS **9+3 Hours**

Mathematical induction- The basics of counting–Permutations and combinations-Recurrence relations-Solving linear recurrence relations

LOGIC **11+4 Hours**

Propositions- Logical operators- Normal forms –Rules of inference-Consistency and inconsistency-Propositional logic- Proofs-Predicates- Quantifiers- Universe of discourse – Logical equivalences and implications for quantified statements-Rules of specification and generalization – Validity of arguments.

GRAPH THEORY **9+3 Hours**

Graphs- Types of graphs- Matrix representation of graphs- Graph isomorphism- Walk - Path- Cycles- Eulerian graphs -Hamiltonian graphs- Planar graphs- Euler formula- Shortest path algorithm: Dijkstra's algorithm

Theory: 45 Hours Tutorials: 15 Hours Practical: 0 Hours Total Hours: 60 Hours

REFERENCES

1. Liu C.L, "Elements of Discrete Mathematics, Second Edition, McGraw Hill 1985.
2. Mott J.L, Kandel A. and Baker T.P.,"Discrete Mathematics for Computer Scientists and Mathematicians, Second Edition, Prentice Hall India, 1986.
3. J.P.Trembly, R. Manohar, Discrete Mathematical Structures with applications to Computer Science, TMH International Edition (Latest Edition).
4. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice – Hall, Engle Cliffs, N. J.
5. Harary F, Graph Theory, Narosa, 1969.
6. Thomas H.C., A Leiserson C.E., Rivest R.L, Stein C.A., "Introduction to a algorithms(2nd Edition),MIT press and McGraw-Hill.2001.

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U18CSI3201 **DATA STRUCTURES**

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1:	Develop applications using stack and queue data structures [K5, S2]
CO2:	Develop applications to retrieve records from database using hashing techniques [K5, S2]
CO3:	Compare efficiency of various searching techniques using different tree data structures. [K4, S2]
CO4:	Compare efficiency of various sorting techniques using different data structures. [K4, S2]

Pre-requisite :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S		M							M		M			
CO2	S		M							M		M			
CO3		S		M										S	
CO4		S		M										S	

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Assignment; Group Presentation, Project Demonstration etc (as applicable) (Theory component) 3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) **5.** End Semester Examination (Theory and lab components)
INDIRECT
1.Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **6 Hours**

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

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STACKS AND QUEUES **9 Hours**

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

LINKED LIST **9 Hours**

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis

TREES **12 Hours**

Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with Complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

SORTING AND HASHING **9 Hours**

Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
2. M.A.Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education Asia, 2013.
3. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

E BOOKS AND ONLINE LEARNING MATERIALS

1. http://users.cis.fiu.edu/~weiss/
2. http://nptel.ac.in/courses/10610206

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LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Implement the concepts of Stack, Simple Queue, Circular Queue and Priority Queue ADT using Arrays. [S2]
2. Implement Singly, Doubly and Circular Linked list. [S2]
3. Implement Stack and Queue ADT using Linked list. [S2]
4. Create program to perform tree traversals and other operations in a Binary Search Tree. [S1]
5. Create program to perform tree traversals and other operations in a Binary Search Tree. [S1]
6. Develop applications for Hashing. [S1]
7. Implement Sorting & Searching algorithms based on a given scenario. [S2]

Theory: 0	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 30 Hours**

S. Sumati.

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U18CSI3202 OBJECT ORIENTED PROGRAMMING

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1: Analyze a problem and identify classes, objects and the relationships among them.(K4,S3)

CO2: Develop applications using various types of Inheritance and Interfaces(K3,S2)

CO3: Develop applications or programs using exception handling and multithreading. (K3,S2)

CO4: Analyze an application and make use of object oriented concepts for its implementation. (K4,S3)

CO5: Develop programs using collections, files and streams in java.(K3,S2)

Pre-requisite:Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO MAPPING		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S	M							M		M	M	M	
CO2			W							M		M			
CO3		M								M		M			
CO4	S	S			M					M		M	M	M	
CO5			W							M		M			

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test, Assignment
3. Viva, Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION TO OBJECT ORIENTED PROGRAMMING AND JAVA7 Hours

Introduction to OOP– Java Fundamentals -Data Types, Variables, and Arrays - Operators-Control Statements – Classes – Methods –Constructors- Garbage Collection.

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INHERITANCE AND EXCEPTION HANDLING **10 Hours**

Inheritance –Packages and Interfaces - Exception Handling Fundamentals – Java's Built-in Exceptions-Creating new Exception subclasses.

POLYMORPHISM AND MULTITHREADING IN JAVA **10 Hours**

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

STRING HANDLING AND COLLECTION FRAMEWORK **11 Hours**

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

FILES AND STREAMS IN JAVA **7 Hours**

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

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Herbert Schildt, "Java the Complete Reference", Ninth edition Tata Mc Graw Hills, 2014.
2. Paul Deitel and Harvey Deitel, ―"Java How to Program (Early Objects)", Tenth Edition, Pearson Prentice Hall 2014.
3. Timothy Budd, ―"An Introduction to Object-Oriented Programming", Third Edition, Pearson Education, 2008.
4. E.Balaguruswamy,"Programming with Java", Second Edition, TMH, 2009

E BOOKS AND ONLINE LEARNING MATERIALS

1. Herbert Schildt, "Java the Complete Reference", Eighth edition Tata Mc Graw Hills, 2011.

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LAB COMPONENT CONTENTS 30 Hours

LIST OF EXPERIMENTS

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

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

ONLINE COURSES AND VIDEO LECTURES:

https://www.javatpoint.com/java-tutorial

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U18CST3003 COMPUTER ARCHITECTURE

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1 Identify the different addressing modes used in a processor (K3)

CO2 Apply the knowledge of arithmetic operations in the design of a fast adder (K3)

CO3 Classify the control units present in a processor. (K3)

CO4 Analyse the various performance enhancement techniques of Cache memories. (K4)

CO5 Point out how the pipeline processor improves performance of a computer. (K4)

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO MAPPING		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M										M			
CO2	S		M									M	M		
CO3	S									M					
CO4	S	S								M					
CO5		S	M							M			M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment, Group Presentation 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

BASIC STRUCTURE OF COMPUTERS **7 Hours**

Functional Units - Basic Operational Concepts - Bus Structures - Performance - Memory Locations

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and Addresses - Memory Operations - Instruction and Instruction Sequencing - Addressing Modes - Basic I/O Operations.

ARITHMETIC UNIT **11Hours**

Addition and Subtraction of Signed Numbers - Design of Fast Adders - Multiplication of Positive Numbers - Signed Operand Multiplication - Fast Multiplication - Integer Division - Floating Point Numbers and Operations.

BASIC PROCESSING UNIT **9 Hours**

Fundamental Concepts - Execution of a Complete Instruction - Multiple Bus Organization - Hardwired Control – Microprogrammed Control – Microinstructions- Microprogram Sequencing- Wide Branch Addressing

MEMORY SYSTEM **8 Hours**

Basic Concepts - Speed, Size and Cost - Cache Memories - Performance Considerations - Virtual Memories- memory management requirements

PIPELINING AND I/O ORGANIZATION **10 Hours**

Basic Concepts - Data Hazards - Instruction Hazards – Influence on instruction sets - Data path and control considerations - Superscalar operation – Accessing I/O devices- Interrupts – Enabling and disabling interrupts- Handling multiple devices - Direct Memory Access.
Case study - ARM interrupt structure

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, 5th Edition, McGraw-Hill, 2014.
2. William Stallings, “Computer Organization and Architecture - Designing for Performance”, 9th Edition, Prentice Hall, 2012.
3. David A.Patterson and John L.Hennessy, “Computer Organization and Design: The hardware / software interface”, 5th Edition, Morgan Kaufmann, 2014.
4. John P.Hayes, “Computer Architecture and Organization”, 3rd Edition, McGraw Hill, 2002.
5. https://onlinecourses.nptel.ac.in/noc18_cs29

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3	0	2	0	4

U18CSI3204 DATABASE MANAGEMENT SYSTEMS

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Construct ER Model for a given database application. [K3, S3]

CO2: Design relational schema using database design principles. [K3, S2]

CO3: Identify the Key Constraints for relations and devise queries using SQL. [K4, S3]

CO4: Apply indexing techniques to access and generate user reports for a database. [K3, S2]

CO5: Building Web Applications using PHP & MySQL. [K5, S3]

CO6: Illustrate the concepts for transaction processing and concurrency control for RDBMS. [K3, S2]

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO MAPPING**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	M								M				M	
CO2		M	W										M		
CO3		S	M		S									M	
CO4				S										M	
CO5			M		S				M		M		S		
CO6	S						S								

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc 3. End Semester Examination
INDIRECT
1. Course-end survey

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THEORY COMPONENT CONTENTS

INTRODUCTION TO DATABASE AND RELATIONAL MODEL 10 Hours

Introduction: Database applications, Purpose of database systems, Views of data, Database Development Life cycle, Architecture of DBMS. Overview of query processing.
Relational Databases: Relational model, Database schema, Keys, Formal Relational Query Languages

DATABASE DESIGN 13 Hours

Logical Database Design: Different approaches in Logical design, ER Modeling, ER notations, Steps in ER modeling. Physical database design: Converting ER Model to Relational Database Design, Normalization -Functional Dependency, 1NF,2NF,3NF (optional: multi-valued dependency and 4th Normal form).

STORAGE AND INDEXING 10 Hours

Storage and File structure: File Organization, RAID. Indexing: Concepts, Clustered and Non-Clustered Indices, B-tree and B+-tree. Basics of Hashing (Static, Dynamic).

TRANSACTION MANAGEMENT 12 Hours

Transactions: Concept and purpose, ACID properties and their necessity. Transaction Schedules: Conflicts and Aborts, Serializability, Recoverability. Concurrency Control: lock-based protocols, 2-phase locking, Timestamp based protocols. Deadlock handling.

Overview emerging database technologies and applications(Spatial databases, temporal, multimedia databases)**.** Case study: Open source Relational DBMS

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Abraham Silberschatz, Henry Korth, and S. Sudarshan, “Database System Concepts”, Sixth Edition, McGraw-Hill.2011.
2. R. Elmasri and S. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education, 2011.
3. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3nd Edition, McGraw Hill, 2003.
4. Thomas M. Connolly and Carolyn E. Begg, “Database Systems - A Practical Approach to Design, Implementation and Management”, Fifth edition, Pearson Education, 2010.
5. C.J.Date, A.Kannan and S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

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OTHER REFERENCES:

1. Infosys Foundation Program: Module 2
2. https://onlinecourses.nptel.ac.in/noc17_cs33/course
3. http://www.db-book.com
4. http://nptel.ac.in/courses/IIT-MADRAS/Intro_to_Database_Systems_Design
5. http://www.iitg.ernet.in/awekar/teaching/cs344fall11/
6. www.w3schools.com/sql/

LAB COMPONENT CONTENTS

DATABASE APPLICATION DEVELOPMENT

SQL: Database languages, Basic SQL query structure, specifying integrity constraints in SQL, SQL Built in functions, Set operations, Nested subqueries, Aggregation, Join expressions, Data base objects, Views. Functions, Procedures and Triggers.

Accessing Databases through programming language, Building Web Applications using PHP &MySQL.

LIST OF EXPERIMENTS: (Open Source RDBMS-MySQL/Maria DB/POSTGRES)

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Creating relational database to set various constraints
3. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
4. Creation of Views and Indexes.
5. Working on TCL,DCL commands
6. Creating relationship between the databases.
7. Building Web Applications using PHP & MySQL
8. Mini Project

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U18INI3600 ENGINEERING CLINIC - III

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COURSE OBJECTIVES

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1: Identify a practical problems and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite: U18INI2600/Engineering Clinic-II

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	S	M	W		S			S	S		
CO2											S		S		
CO3										S					

COURSE ASSESSMENT METHODS:

DIRECT
1. Project reviews 50% 2. Workbook report10% 3. Demonstration & Viva – voce 40%
INDIRECT
1. Course-end survey

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CONTENT:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the third semester, students will focus primarily on Design project combining concepts learnt in Engineering clinics I and II.

GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Theory: 0	**Tutorial: 0**	**Practical: 60**	**Project: 30**	**Total: 90 Hours**

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SEMESTER IV

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L	T	P	J	C
3	0	2	0	4

U18MAI4201 PROBABILITY AND STATISTICS
(Common to CSE, IT, ISE)

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Compute correlation between variables, and predict unknown values using regression.
CO2: Understand and apply the concept of probability and random variables and predict probabilities of events in models following normal distribution.
CO3 : Perform hypothesis testing and interpret the results.
CO4 : Understand the principles of design of experiments and perform analysis of variance.
CO5: Sketch control charts and comment on the process control.
CO6: Apply the above concepts to solve problems using R Studio.

Pre-requisites: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO MAPPING		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S							M	M		M		M	M
CO2	S	S							M	M		M		M	M
CO3	S	S							M	M		M		M	M
CO4	S	S							M	M		M		M	M
CO5	S	S							M	M		M		M	M
CO6	S	S							M	M		M		M	M

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)

INDIRECT

1. Course-end survey

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THEORY COMPONENT CONTENTS **6 Hours**

CORRELATION AND REGRESSION

Correlation – Karl Pearson's Correlation coefficient – Spearman's Rank Correlation – Regression lines.

PROBABILITY AND RANDOM VARIABLES **12 Hours**

Axioms of probability - Conditional probability – Total probability – Bayes' theorem - Random variable – Distribution function – properties – Probability mass function – Probability density function – moments- moment generating functions.

NORMAL DISTRIBUTION **5 Hours**

Normal distribution – Moments, Moment Generating functions and properties.

TESTING OF HYPOTHESIS **9 Hours**

Small samples tests based on t and F distributions (single mean, difference of means, paired *t*- test and variance ratio test) – Chi-square test for independence of attributes and goodness of fit

DESIGN OF EXPERIMENTS **8 Hours**

Analysis of Variance (ANOVA) – Completely Randomized Design (CRD) – Randomized Block Design (RBD) – Latin Square Design (LSD).

STATISTICAL QUALITY CONTROL **5 Hours**

Concept of process control - Control charts for variables: Mean and Range charts – Control charts for attributes: p, np, c – charts.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Veerarajan T., Probability, Statistics and Random Processes, Tata McGraw Hill,3rd edition, 2008.
2. Gupta S. P, "Statistical Methods", Sultan Chand & Sons Publishers, 2014.
3. Johnson R. A., Miller & Freund's "Probability and Statistics for Engineers", Sixth Edition, Pearson Education, Delhi, 2000.
4. Gupta.S.C and Kapoor.V.K, Fundamentals of Mathematical Statistics, 11th extensively revised edition, Sultan Chand & Sons, 2007.
5. Walpole R. E., Myers S.L. & Keying Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education Inc, 9th edition, 2012.
6. Gupta S.C, and KapurV.K "Fundamentals of Applied Statistics", Sultan Chand, New Delhi, 4th Edition, 2014.
7. Charles Henry Brase and Corrinne Pellillo Brase "Understandable Statistics", D.C. Heath and Company, Toronto, 9th edition, 2007.

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LAB COMPONENT CONTENTS : Using R Studio **30 Hours**

1. Introduction to R programming
2. Application of descriptive statistics – Mean, Median, Mode and standard deviation
3. Applications of Correlation and Regression
4. Application of Normal distribution
5. Application of Student – t test
6. Application of F test
7. Application of Chi-square test
8. ANOVA – one way classification
9. ANOVA - two way classification
10. Control charts for variables (mean and range chart)

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U18CST4001 **DESIGN AND ANALYSIS OF ALGORITHMS**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Compare various graph traversal techniques(K4,S2)
CO2: Apply algorithm analysis techniques for a given algorithms(K3)
CO3: Examine algorithm design techniques for a given application(K4,S3)
CO4: Analyse different algorithms for solving a given problem (K4,S2)
CO5: Develop application using chosen algorithm technique (K5,S2)

Pre-requisites : U18CSI3201/Data Structures

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO MAPPING		
Cos	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	M													
CO2	S	w													
CO3	S	S	M	M						M		M			
CO4		S		M						M			M		
CO5	S	S	M							M		M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II
2. Assignment, Group Presentation
3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

GRAPH AND TREE ALGORITHMS **9 Hours**

Introduction to graph – types of graphs - Graph representations - Traversal algorithms- Depth First Search (DFS) and Breadth First Search (BFS) - Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting.

ALGORITHM ANALYSIS TECHNIQUES **8 Hours**

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Fundamentals of algorithmic problem solving – Important problem types – Analysis framework - Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem – Algorithm visualization.

BRUTE FORCE AND DIVIDE AND CONQUER TECHNIQUES 9 Hours

Brute-Force: Sequential Search- Brute-Force string matching.

Divide and Conquer Method: Multiplication of large integers-Strassen's Matrix Multiplication.

GREEDY AND DYNAMIC PROGRAMMING TECHNIQUES 9 Hours

Greedy Technique: Job sequencing with deadlines - Knapsack problem,

Dynamic Programming: Traveling Salesman Problem - Optimal Binary Search Tree

BACKTRACKING AND BRANCH AND BOUND TECHNIQUES 10 Hours

Backtracking: N-Queen's Problem -Graph colouring.

Branch and Bound: Assignment Problem - Traveling Salesman Problem.

Computability classes – P, NP, NP-complete and NP-hard.

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education Asia, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Second Edition, Universities Press, Hyderabad, 2008.
3. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, Prentice Hall of India,New Delhi, 2007
4. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", Pearson Education Asia, 2003.
5. A.V.Aho, J.E. Hopcroft and J.D.Ullman, "The Design and Analysis of Computer Algorithms",Pearson Education Asia, 2003.

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L	T	P	J	C
3	0	2	0	4

U18CSI4202 OPERATING SYSTEMS

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Apply the concepts of CPU scheduling and Process synchronization (K3,S2)
CO2: Experiment creation of different virtual machines in a hypervisor (K5, S3)
CO3: Simulate the principles of memory management (K3,S2)
CO4: Identify appropriate file system and disk organizations for a variety of computing scenario (K3)
CO5: Examine the features of various open source operating systems. (K4)

Pre-requisite:U18CST3003/Computer Architecture

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M							M		M			M
CO2	S	S			S				M	M		M			M
CO3	S	M								M					
CO4	S	M								M					
CO5	S	S			M				M	M		M	M		

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)

INDIRECT

1. Course-end survey

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THEORY COMPONENT CONTENTS

INTRODUCTION AND PROCESS CONCEPT **9 Hours**

Operating System Structure – Operating System Operations – Process Management – Memory Management – Storage Management – Protection and Security – System Structures: Operating System Services – User and Operating System Interface – System Calls – Types of System Calls – System Programs. Process Scheduling – Operations on Processes – Inter-process Communication.

Case Study: Kernel data structures for various open source operating systems.

MULTITHREADED PROGRAMMING AND PROCESS SCHEDULING **9 Hours**

Overview of threads – Multicore programming-Multithreading Models – Threading Issues

Basic Concepts of process scheduling – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Synchronization – The Critical-Section Problem – Peterson's Solution Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors.

Case Study: Linux Scheduling.

DEADLOCK AND MEMORY MANAGEMENT STRATEGIES **9 Hours**

System Model – Deadlock Characterization – Methods for Handling Deadlock – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.

Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table-Segmentation.

VIRTUAL MEMORY MANAGEMENT AND FILE SYSTEM **9 Hours**

Demand Paging – Copy on Write – Page Replacement – Allocation of Frames – Thrashing

File Concept – Access Methods – Directory Structure – File Sharing – Protection.

IMPLEMENTING FILE SYSTEMS AND SECONDARY STORAGE STRUCTURE **9 Hours**

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management.

Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management.

Case Study: Linux File system

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

S. Murali.

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REFERENCES

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition, 2016.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Third Edition Prentice Hall of India Pvt. Ltd, 2010.
3. Harvey M. Deitel, "Operating Systems", Pearson Education Pvt. Ltd, Second Edition, 2002.
4. William Stallings, "Operating System", Pearson Education, Sixth Edition, 2012.

ONLINE COURSES AND VIDEO LECTURES:

1. http://nptel.ac.in

LAB COMPONENT CONTENTS — 30 Hours

LIST OF EXPERIMENTS

1. Develop programs for process creation and communication.
   To write simple shell programs.
   Creation of process and child process
   Demonstration of inter-process communication
   Creation of Zombie and Orphan process
   Creation of threads
2. Demonstration of shared memory concept
3. Simulation of the CPU scheduling algorithms
4. Demonstration of Semaphores
5. Implementation of Producer-Consumer problem
6. Simulation of Bankers algorithm for deadlock avoidance
7. Creation of virtual machine in a hypervisor

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U18CST4003 THEORY OF COMPUTATION

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Design or convert an automaton for any given problem and experiment and document using JFLAP tool (K5).

CO2: List the various closure properties of languages in Chomsky hierarchy (K4).

CO3: Construct Context Free Grammars to generate strings from a context free language and convert them into normal forms (K3).

CO4: Identify the hierarchy of formal languages, grammars and machines.(K3)

CO5: Distinguish between computability and non-computability; decidability and undecidability (K4)

Pre-requisite :U18MAT3102/Discrete Mathematics

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO MAPPING**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S	S		S							M	M		
CO2	S				M							M	M		
CO3	S		M									M	M		
CO4	S	M										M	M		
CO5	S											M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment; Simulation using tool 3. End Semester Examination
INDIRECT
1. Course-end survey

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THEORY COMPONENT CONTENTS

AUTOMATA **9 Hours**

Introduction: Alphabets, languages, Chomsky hierarchy of languages.

Basic Machines Finite Automata(FA)-Deterministic Finite Automata(DFA)-Non-Deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions- Equivalence of DFA and NFA- NFA to DFA conversion-Applications of finite automata

REGULAR EXPRESSIONS AND LANGUAGES **9 Hours**

Regular Expression (RE) - Converting Regular Expression to FA- Converting FA to Regular Expression - Closure and Decision properties of Regular Expression - Equivalence and minimization of Automata.

CONTEXT-FREE GRAMMAR AND LANGUAGES **11 Hours**

Context-Free Grammar (CFG) - Parse Trees - Ambiguity in grammars and languages - Definition of the Pushdown automata - Languages of a Pushdown Automata - Equivalence of Pushdown automata and CFG, Deterministic Pushdown Automata-Normal forms for CFG – Chomsky Normal Form (CNF) – Greibach Normal Form (GNF)- Closure Properties of CFL.

TURING MACHINES **9 Hours**

The basic model for Turing machines (TM), Techniques for Turing machine construction, Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages, variants of Turing machines, unrestricted grammars

UNDECIDABILITY **7 Hours**

Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice's theorem, undecidable problems about languages-PCP.

Case Study: Realization of the automaton using JFLAP tool.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Third Edition, Pearson Education, 2011
2. John C.Martin, "Introduction to Languages and the Theory of Computation", Fourth Edition, Tata McGraw Hill, 2010.
3. Kavi Mahesh, "Theory of Computation, A Problem-solving Approach" Wiley India Pvt, Ltd, 2012.
4. H.R.Lewis and C.H.Papadimitriou, "Elements of The theory of Computation", Second Edition, Pearson Education/PHI, 2003.
5. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole,1997

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U18CSI4204 SOFTWARE ENGINEERING

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WILL BE ABLE TO:

CO1	Design a application using UML modeling.	[K4,S2]
CO2	Test the given application with various test case using a testing tool	[K4,S2]
CO3	Create a application with all the stages of software engineering lifecycle	[K5,S3]
CO4	Apply project management and change management	K3

Pre-requisite: U18CSI3202 - Object Oriented Programming

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO MAPPING**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	M	S				M				M			M		
CO2	M	M	S						M	M		M	M		
CO3	M		M						M	M	M	M	M		
CO4	M										S	M			

COURSE ASSESSMENT METHODS:

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component) 3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) **5.** End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

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THEORY COMPONENT CONTENTS

INTRODUCTION TO SOFTWARE ENGINEERING AND UML **9 Hours**

The Nature of Software -Software Engineering Failures- Software Engineering - Software Process Structure - Software Lifecycle Models - Agile Development - Scrum - Prototyping- Modeling with UML -Modeling Concepts

PROJECT MANAGEMENT AND REQUIREMENTS ANALYSIS **9 Hours**

Project Organization Concepts - Project Communication Concepts - UML Activity Diagram- Requirements Elicitation - Usability - Requirement Analysis - UML Use Case Diagram - UML Analysis Object Class Diagram

DESIGN **9 Hours**

System Design Concepts-System Design Activities: From Objects to Subsystems- Patterns - Architectural Patterns - UML Component and Deployment Diagram - Object Design - Design Patterns - UML Class and Communication Diagram

MAPPING MODELS TO CODE & TESTING **9 Hours**

Mapping Models to Code- Overview of Mapping - Mapping Concepts- Mapping Activities - Managing Implementation-Testing- Overview of Testing- Testing Concepts-Faults, Erroneous States, Failures-Test Cases- Test Stubs and Drivers- Corrections-Testing Activities- Component Inspection – Usability Testing-Unit Testing-Integration Testing-System Testing-Managing Testing-Planning Testing-Documenting Testing-Assigning Responsibilities-Regression Testing-Automating testing

MANAGING CHANGE **9 Hours**

Rationale Management- Overview of Rationale - Rationale Concepts- Rationale Activities: from Issues To Decisions-Managing Rationale- Configuration Management Concepts- Configuration Management Activities - Managing Configuration Management

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Bernd Bruegge & Allen H. Dutoit, “Object-Oriented Software Engineering”, Third Edition, 2014.

2. R.S. Pressman, “Software Engineering – A Practitioner‟s Approach”, Eighth Edition, McGraw Hill International Edition, 2015

3. Ivar Jacobson, “Object-Oriented Software Engineering”, Pearson Education, Revised Edition 2009.

4. Stephen R.Schach, “Object-Oriented Classical Software Engineering”, Mcgraw Hill, Eighth Edition 2010.

5. S. Thangasamy, “Essentials of Software Engineering”, Wiley India, First Edition, 2012.

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6. Yogesh Singh, “Object-Oriented Software Engineering”, 2012.

7. M. Blaha and J. Rumbaugh, “Object Oriented Modeling and Design with UML”, Second Edition, Prentice-Hall India, 2007.

LAB COMPONENT CONTENTS

To choose a real use case-based software development project, design, develop and test the software system with following milestones.

Milestones

1 Identify a application and model it using UML Use-Case Diagrams.(Star UML/ArgoUML/..)
2 Software Requirement Specification & UML Analysis Object Design Diagram
3 Module Description, Design & UML Component Diagram
4 Detailed Design & UML Deployment Diagram
5 Implementation & UML Object Design Class Diagram
6 Testing (Selenium tool/SonarQube/…)

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U18INI4600 ENGINEERING CLINIC - IV

L	T	P	J	C
0	0	4	2	3

COURSE OBJECTIVES

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1: Identify a practical problems and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite: U18INI3600/Engineering Clinic-III

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	S	M	W		S			S	S		
CO2											S		S		
CO3										S					

COURSE ASSESSMENT METHODS:

DIRECT
1. Project reviews 50% 2. Workbook report10% 3. Demonstration & Viva – voce 40%
INDIRECT
1. Course-end survey

CONTENT:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

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In the fourth semester, students will focus primarily on Reverse engineering project to improve performance of a product.

GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Theory: 0	**Tutorial: 0**	**Practical: 60**	**Project: 30**	**Total: 90 Hours**

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U18CHT4000 **ENVIRONMENTAL SCIENCE AND ENGINEERING**
(Common to All branches) (Mandatory Course)

L	T	P	J	C
3	0	0	0	0

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WOULD BE ABLE TO

CO 1: Analyze the impact of engineering solutions in a global and societal context.
CO 2: Discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems.
CO 3: Highlight the importance of ecosystem and biodiversity.
CO 4: Consider issues of environment and sustainable development in his/her personal and professional undertakings.
CO 5: Paraphrase the importance of conservation of resources.
CO 6: Play an important role in transferring a healthy environment for future generations.

Pre-requisite : Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes (POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1		M					S		M			
CO 2						M				M		
CO 3							M					
CO 4						M	S					
CO 5							S					
CO 6			W				S					M

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Assignment
3. Group presentation

INDIRECT

1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **14 Hours**

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies – Timber extraction, mining, dams and their effects on forests and tribal people.
Water resources: Use and overutilization of surface and ground water, conflicts over water, dams – benefits and problems – Water conservation, rain water harvesting, watershed management.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral

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resources, case studies.
Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, case studies.
Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, case studies.
Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification, Wasteland reclamation – Role of an individual in conservation of natural resources.

ECOSYSTEMS AND BIODIVERSITY **9 Hours**

ECOSYSTEM: Concept of an ecosystem – Structure and function of an ecosystem: Producers, consumers and decomposers, Food chain, Food web, Energy flow in the ecosystem and Ecological pyramids – Ecological succession – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).
BIODIVERSITY: Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity – Bio geographical classification of India – Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic values – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

ENVIRONMENTAL POLLUTION **8 Hours**

Definition – Causes, effects and control measures of: (a) Air pollution – Organic and inorganic pollution – cyclone separator, electrostatic precipitator (b) Water pollution (c) Heavy metal pollution (d) Noise pollution (e) Thermal pollution (f) Nuclear hazards – Role of an individual in prevention of pollution – Pollution case studies – Solid waste and hazardous Management: Causes, effects and control measures from factories, small scale and large scale industries – Waste minimization – Disaster management: floods, earthquake, cyclone and landslides.

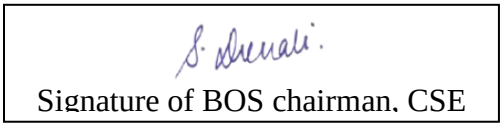
SOCIAL ISSUES AND THE ENVIRONMENT **7 Hours**

From Unsustainable to Sustainable development – Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns, case studies – Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion – Environment Production 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 – Human Rights.

HUMAN POPULATION AND THE ENVIRONMENT **7 Hours**

Population growth and explosion – Welfare Program – Environment and human health – Communicable disease – Role of Information Technology in Environment and human health – Case studies.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**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REFERENCES

1. G. Tyler Miller and Scott Spoolman, 'Environmental Science', Fourteenth Edition, Brooks Cole, 2012.
2. Gilbert M. Masters and Wendell P. Ela, 'Introduction to Environmental Engineering and Science', Third Edition, Pearson Education, 2013.
3. Bharucha Erach, 'The Biodiversity of India', Mapin Publishing Pvt. Ltd., Ahmedabad, 2002.
4. Trivedi R.K and P.K.Goel, 'Introduction to Air Pollution', Techno-Science Publications, 2003.
5. Trivedi R.K., 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media, 1996.
6. Cunningham, W.P.Cooper and T.H.Gorhani, 'Environmental Encyclopedia', Jaico Publication House, Mumbai, 2001.
7. Wager K.D., 'Environmental Management', W.B. Saunders Co., Philadelphia, USA, 1998.
8. Colin R. Townsend, Michael Begon and John L. Harper, 'Essentials of Ecology', Third Edition, Blackwell Publishing, 2008.

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SEMESTER - V

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U18CSI5201 COMPUTER NETWORKS

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Summarize the functionality and protocols operating in each layer of OSI reference model. [K3]
CO2: Compare network topology, devices and transmission medium. [K4]
CO3: Analyze error control, flow control and routing protocols. [K3][S2]
CO4: Analyze IP, TCP and UDP header formats. [K4] [S2]
CO5: Analyze Network traffic characteristics and congestion control mechanism. [K5][S3]

Pre-requisite :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S									M					
CO2	S	S	M	S						M		M			
CO3	S	M	M	M	M				M	M		M			M
CO4	S	S		S	M					M		M		M	
CO5	S	S		S	S			M	M	M		M			M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component) 3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) **5.** End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

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THEORY COMPONENT CONTENTS

DATA COMMUNICATIONS **8 Hours**

Data Communication – The OSI Model – TCP/IP Protocol Suite – Addressing – Transmission Media – Networking devices – Network Topologies.

DATA LINK LAYER **8 Hours**

Encoding - Error Detection – Reliable Transmission – MAC protocols – CSMA/CD – CSMA/CA.

NETWORK LAYER **11 Hours**

Circuit Switching – Packet Switching – Bridges and LAN Switches: Spanning Tree algorithm – Internetworking – IPv4 - Subnetting – IPv6 – Routing Techniques: Distance vector (RIP) – Link state (OSPF) — Interdomain Routing (BGP).

TRANSPORT LAYER **11 Hours**

UDP – TCP – Congestion Control and Resource Allocation: TCP Congestion Control – Congestion Avoidance Mechanisms – Quality of Service: Integrated Services – Differentiated Services – Network Traffic Analysis.

APPLICATION LAYER **7 Hours**

Domain Name System – Electronic Mail (SMTP, MIME, IMAP) – File Transfer (FTP) – WWW (HTTP).

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth edition, Morgan Kaufmann Publishers Inc., 2011.
2. William Stallings, "Data and Computer Communications", Tenth edition, Pearson Education, 2013.
3. Behrouz A Forouzan, "Data Communications and Networking", Fifth edition, Tata McGraw–Hill, New Delhi, 2013.
4. James F. Kurose, Keith W. Ross, "Computer Networking, A Top–Down Approach Featuring the Internet", Sixth edition, Pearson Education, 2012.

ONLINE COURSES AND VIDEO LECTURES:

https://www.coursera.org/specializations/computer-communications#courses
https://nptel.ac.in/courses/106105080/
https://nptel.ac.in/courses/106105081/

S. Murali.

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LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Develop client server based TCP applications using UNIX socket programming functions.
2. Develop client server based UDP applications using UNIX socket programming functions.
3. Simulation of data link and network layer protocols.
4. Performance analysis of TCP and UDP protocol using simulation tool.
5. Performance analysis of routing protocols using simulation tool.
6. Demonstrate the working of network tools such as Ping, TCPDump, Traceroute, Netstat, IPconfig.
7. Analyze the network traffic using Wireshark tool/Packet tracer tool.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U18CST5002 AGILE SOFTWARE DEVELOPMENT

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Apply design principles and refactoring to achieve Agility [K3]
CO2: Analyze automated build tools, version control and continuous integration [K4]
CO3: Perform testing activities within an Agile project [K4, S2]
CO4: Finding initial product backlog items as user stories, order your product backlog.[K4]
CO5: Choose the size of the backlog items and perform sprint planning [K5]

Pre-requisite :U18CSI4204/Software Engineering

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S											M			
CO2	M				M				M			M			
CO3					M							M	M		
CO4	S				M				S	M		M	S		M
CO5	S				S				S	M		M			

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment; Group Presentation 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

FUNDAMENTALS OF AGILE **9 Hours**

The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools

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AGILE SCRUM FRAMEWORK **9 Hours**

Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management.

AGILE TESTING **9 Hours**

The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), Unit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester

AGILE SOFTWARE DESIGN AND DEVELOPMENT **9 Hours**

Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control

AGILE INDUSTRY TRENDS **9 Hours**

Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.
3. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004.
4. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.

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OTHER REFERENCES

1. Agile Software Development with Scrum By Ken Schawber, Mike Beedle Publisher: Pearson
2. Agile Testing: A Practical Guide for Testers and Agile Teams By Lisa Crispin, Janet Gregory Publisher: Addison Wesley
3. Agile Software Development, Principles, Patterns and Practices By Robert C. Martin Publisher: Prentice Hall
4. Agile Software Development: The Cooperative Game By Alistair Cockburn Publisher: Addison Wesley
5. User Stories Applied: For Agile Software By Mike Cohn Publisher: Addison Wesley

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U18CSI5203 NOSQL DATABASES

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Outline fundamental concepts in the context of a number of different NOSQL products.[K3]
CO2: Construct refined logical database model with consideration of data semantics and dependency.[K4]
CO3: Build a database system and demonstrate competence with the fundamental tasks involved with its modeling, designing, and implementation.[K4, S2]
CO4: Examine MongoDB tools to develop and deploy various applications.[K5,S3]

Pre-requisite:U18CSI3204/Data Base Management System

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S									M		M		M	
CO2		M		M						M		M		M	
CO3		M		M	M					M				M	
CO4		S		S	M					M				M	

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

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THEORY COMPONENT CONTENTS

INTRODUCTION TO NOSQL **9 Hours**

Definition of NOSQL, History of NOSQL and Different NOSQL products, Exploring MondoDB Java/Ruby/Python, Interfacing and Interacting with NOSQL

NOSQL BASICS **9 Hours**

NOSQL Storage Architecture, CRUD operations with MongoDB, Querying

NOSQL MANAGEMENT **9 Hours**

Modifying and Managing NOSQL Data stores, Indexing and ordering datasets(MongoDB/CouchDB/Cassandra)

WORKING WITH NOSQL **9 Hours**

Surveying Database Internals, migrating from RDBMS to NOSQL, Web Frameworks and NOSQL, using MySQL as a NOSQL

DEVELOPING WEB APPLICATION WITH NOSQL AND NOSQL ADMINISTRATION **9 Hours**

Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP, NOSQL Database Administration

Theory: 45 Hours	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. "Professional NOSQL" by Shashank Tiwari, 2011, WROX Press (Chapter 1,2,3,4,5,6,7, 8, 9,10.11.12.13.15)
2. The Definitive guide to MongoDB, The NoSQL Database for Cloud and Desktop Computing, Apress 2010 (Chapter 6,7,8,9).
3. David Hows, "The definitive guide to MongoDB", 2nd edition,Apress Publication, 2009, 8132230485.
4. Shakuntala Gupta Edward, "Practical Mongo DB ", Second edition,Apress Publications, 2016, ISBN 1484206487
5. Daniel Perkins, "Mongo DB, Third Edition, CreateSpace Independent Publishing Platform, 2016, ISBN 152396300
6. Steve Hoberman, "Data Modelling for Mongo DB", First Edition, Technics Publication, 2014, ISBN 9781935504702

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LAB COMPONENT CONTENTS **30 Hours**

1. Implement database with suitable example using MongoDB and implement all basic operations and administration commands using two tier architecture.
2. Use MongoDB to process semi structured and unstructured data collections such as Rfid, images, blogs use python/Java MongoDB interface.
3. Implement python/Java application using MongoDB to maintain the blog for composing the blog consists of text columns, images and videos also calculate the hit or users visited by drawing 2D graphs.
4. Implement using MongoDB to compose a web news-letter consisting of videos, images, text use python MongoDB interface.
5. Aggregation with suitable example using MongoDB.
6. Indexing with suitable example using MongoDB.
7. Querying with MongoDB using suitable example.
8. Aggregation and indexing with suitable example using RdfID based employees' attendance system
9. Connectivity with MongoDB using any Java application.
10. Using MongoDB create a database of employee performance, employee attendance on the workstation.

Theory: 0	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 30 Hours**

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U18CST5004 **SOCIAL MEDIA MARKETING**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Identify and describe the different social media services, tools, and platforms.[K3]
CO2: Demonstrate understanding and evaluate new tools and social media platforms[K3]
CO3: Develop skills in using the predominant social media tools for business marketing.[K5]
CO4: Discover innovative uses for social media in a variety of business areas and processes [K4]
CO5: Develop a strategic plan for identifying opportunities for using social media.[K5]

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S									M		M			
CO2	S	S			S					M		M			
CO3	S		S							M		M			
CO4	S									M		M			
CO5	S	S	S		S	S			M	M	S	M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment 3. Mini Project 4. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

UNDERSTANDING FACEBOOK AND LEVERAGING FACEBOOK FOR MARKETING **8 Hours**

Introduction to basic FB terminologies-Creating a powerful personal profile for business-Marketing applications of Face book- Fundamentals of creating and maintaining fan pages-Creating groups for marketing-Face book marketing checklist-Basics of Sentimental analysis

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INTRODUCTION TO TWITTER AS A MARKETING TOOL 10 Hours

Setting up a Twitter profile- Fundamental of Twitter: Tweet, direct messages, replies and Trending topics-Managing your Twitter experience- Fundamentals of Tweet Deck-Managing multiple Twitter accounts- Tweet management- Twitter Grader- Twitter Counter-Tweet burner-Twitter marketing checklist- Tree induction techniques.

FUNDAMENTALS OF YOUTUBE FOR CREATING COMPELLING ONLINE PRESENCE 10 Hours

Fundamentals of video marketing- Creating a YouTube channel- Creating your own Internet TV channel for marketing

USING LINKEDIN FOR MARKETING 8 Hours

LinkedIn for B2b marketing- creating a profile in LinkedIn Powerful corporate searches and connections - Recommendations and testimonials.

UNDERSTANDING CONTENT MARKETING AND USING BLOGS TO BUILD AND ENGAGE AUDIENCE 9 Hours

Basics of inbound marketing-Webinars and tele- seminars-Podcasting basics- creating blogs and building a following White papers and info graphics- Fundamentals of content curation

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Liana Li Evans, “Social Media Marketing :Strategies for Engaging in Facebook, Twitter & Other Social Media”, Que Press; Ed 2010
2. Andrew Macarthy,” 500 Social Media Marketing Tips: Essential Advice, Hints and Strategy for Business: Facebook, Twitter, Pinterest, Google+, YouTube, Instagram, LinkedIn, and More!” ,Springer 2017
3. Ann Handley, “Content Rules: How to Create Killer Blogs, Podcasts, Videos, Ebooks, Webinars (and More) That Engage Customers and Ignite Your Business “,Johnwiley and sons,2012
4. Barker, “Social Media Marketing: A Strategic Approach” ,Cengage; 1 edition 2013

Other References:

https://learndigital.withgoogle.com/digitalunlocked
http://www.digitalvidya.com/blog/best-social-media-marketing-books-2016-top-10/

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U18CSI5205 MOBILE APPLICATION DEVELOPMENT USING ANDROID

L	T	P	J	C
2	0	2	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Explain mobile application development and android development environment
CO2: Design app user interface
CO3: Describe Mobile Databases
CO4: Explain programming with different sensors.
CO5: Explain different wireless network programming in android.
CO6: Explain testing and distribution of mobile applications.

Pre-requisite:U18CSI3202/ Object Oriented Programming

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M				M				L				M		
CO2	M		M						L				M		
CO3	M				M				M	M			M		
CO4	M								M	M			M		
CO5	M								M	M			M		
CO6	M				M			M	L				M		

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)

INDIRECT

1. Course-end survey

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THEORY COMPONENT CONTENTS

GETTING STARTED WITH MOBILITY **9 Hours**

Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, a case study on Mobile app development. App user interface designing – mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity- states and life cycle, interaction amongst activities.

BUILDING BLOCKS OF MOBILE APPS **6 Hours**

App user interface designing – mobile UI resources (Layout, UI elements, draw-able, Menu), Activity- states and life cycle, interaction amongst activities. App functionality beyond user interface - Threads, Async task, Services – states and lifecycle, Notifications, Broadcast receivers, Telephony and SMS APIs

MOBILE DATABASES AND SENSORS **6 Hours**

Native data handling – on-device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet). Location awareness, sensor programming- accelerometer and proximity sensor.

NETWORK PROGRAMMING **4 Hours**

Managing Wi-Fi- Monitoring Wi-Fi connectivity and Active Wi-Fi connection details, Scanning Hotspots, Managing and creating Wi-Fi Configurations.

TAKING APPS TO MARKET **5 Hours**

Android Testing Framework -JUnit- Creating a Test Case, The Test Case Base Class- Introducing Robotium. Versioning-signing and packaging mobile apps- distributing apps on mobile marketplace.

Theory: 30 Hours	Tutorial: 0	Practical: 0	Project: 0	Total: 30 Hours

References:

1. Anubhav Pradhan, Anil V. Deshpande, “Composing Mobile Apps: Learn. Explore. Apply. Using Android”, Wiley publication, 2014.
2. Reto Meier, "Professional Android 4 Application Development", Wiley Publication, 2012
3. Paul Blundell, Diego Torres Milano, “Learning Android Application Testing”, PACKT Publishing, 2015
4. Barry Burd, “Android Application Development All in one for Dummies”, John Wiley & Sons publication,2011.

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LAB COMPONENT CONTENTS **30 Hours**

List of Experiments:

1. Setting up Android Platform and Android Studio

2. Activity & Intents
   a) Creating activities
   b) Starting another activity and message passing using intents

3. UI Design- Layouts and Input Controls
   a) Layouts- Linear, Relative, List View and Grid View
   b) Widgets- Text Fields, Buttons, Radio Buttons, Spinners and Pickers

4. Input Events
   a) Event Listeners
   b) Event Handlers

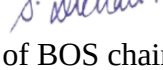
5. User Notifications & Broadcast Receiver
   a) Creating and Managing Notification
   b) Register Receiver and send Broadcast

6. Threads and Async Tasks
   a) Creating threads
   b) perform background operations and publish results on the UI thread using Async

7. Location and Maps
   a) Getting the last known location and displaying a location Address
   b) Add maps to app and customize the map

8. SQLite databases
   a) Creating a database
   b) Put information into database
   c) Read Information from database

Theory: 0	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 30 Hours**



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U18INT5000 **CONSTITUTION OF INDIA**
(Mandatory course)

L	T	P	J	C
2	0	0	0	0

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WILL BE ABLE TO:

CO 1: Gain Knowledge about the Constitutional Law of India
CO 2: Understand the Fundamental Rights and Duties of a citizen
CO 3: Apply the concept of Federal structure of Indian Government
CO 4: Analyze the Amendments and Emergency provisions in the Constitution
CO 5: Develop a holistic approach in their life as a Citizen of India

Pre-requisites : NIL

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M			W			S
CO2						S		S				M
CO3									M	S		W
CO4								W	M			M
CO5						M		M				S
CO6												

COURSE ASSESSMENT METHODS

Direct
1. Group Activity / Quiz/ Debate / Case studies 2. Class test / Assignment
Indirect
1. Course End Survey

THEORY COMPONENT CONTENTS:

Module.1: Introduction to Indian Constitution **4 Hours**

Meaning of the constitution law and constitutionalism - Historical perspective of the Constituti and characteristics of the Constitution of India

Module.2: Fundamental Rights **8 Hours**

Scheme of the fundamental rights - Right to Equality - Fundamental Right under Article 19 - Scope of the Right to Life and Liberty - Fundamental Duties and its legal status - Directive Principles of State Policy – Its importance and implementation

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Module.3: Federal Structure **8 Hours**

Federal structure and distribution of legislative and financial powers between the Union and the States - Parliamentary Form of Government in India - The constitutional powers and status of the President of India

Module.4: Amendment to Constitution **6 Hours**

Amendment of the Constitutional Powers and Procedure - The historical perspectives of the constitutional amendments in India

Module.5: Emergency Provisions **4 Hours**

National Emergency, President Rule, Financial Emergency Local Self Government – Constitutional Scheme in India

REFERENCES

1. Constitution of India - Ministry of Law & Justice – PDF format
awmin.nic.in/coi/coiason29july08.pdf
2. Introduction to the Constitution of India by Durgadas Basu
3. The Constitution of India – Google free material -
www.constitution.org/cons/india/const.html
4. Parliament of India – PDF format
download.nos.org/srsec317newE/317EL11.pdf
5. The Role of the President of India – By Prof.Balkrishna
6. Local Government in India – E Book - Pradeep Sachdeva
https://books.google.com/books/.../Local_Government_in_In...

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SEMESTER -VI

L	T	P	J	C

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U18CSI6201 INTERNET AND WEB PROGRAMMING

3	0	2	0	4

COURSE OUTCOMES:

AFTER SUCCESSFUL COMPLETION OF THIS COURSE THE STUDENTS SHOULD BE ABLE TO,

CO1: Design a Website using HTML (K5, S3)
CO2: Apply Cascading Style Sheet to design a HTML Webpage (K3, S2)
CO3: Develop a HTML form and validate it using Java Script (K5, S2)
CO4: Develop web application using JSP, Servlet (K5, S3)
CO5: Develop an XML document and validate it using SCHEMA (K5, S2)

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1					S				S	S		M	M		
CO2					M				S	S					
CO3			S						S	S					
CO4			S		S										
CO5			S											M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test, Assignment, Mini Project and Group Presentation, Project Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

XHTML AND CSS **9 Hours**

HTML Introduction- Basic XHTML syntax and Semantics- HTML Elements & Attributes - Lists- Tables-Frames-Forms-Defining XHTML Abstract Syntax-Creating HTML Documents;

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CSS -Features- Syntax- Cascading and Inheritance- Text Properties-Box Model- Flow-Other style Properties.

JAVASCRIPT **9 Hours**

JavaScript introduction-Basic Elements-Variable-Data Types- Operators and Literals-Functions-Objects-Arrays-Built-in- Object. JavaScript Debuggers-Event Handling-Validation.

SERVLETS **9 Hours**

Java Servlets: Architecture- Overview-Servlet Generating Dynamic Content-Life Cycle-Parameter Data-Sessions-Cookies.

JSP **9 Hours**

JSP Overview- Basic JSP: Architecture- Lifecycle- Directives-Actions-Implicit Objects-JavaBeans Classes and JSP- MVO Paradigm.

XML AND WEB SERVICES **9 Hours**

Xml: Namespaces- XML Processing- -XML Documents- XSL — XSLT, Web services: WSDL-XML Schema —Introduction to SOAP.

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Jeffrey C.Jackson, "Web Technologies—A Computer Science Perspective", Person Education, 2013.
2. DeitalDeital Nieto, "Internet & World Wide Web How To Program", 5th ed., 2012.
3. Thomas A.Powell, "The Complete Reference HTML & CSS", 5th ed., 2010.
4. Steve Suehring, "JavaScript-Step by Step",PHI,2nd ed., 2010.
5. Frank. P. Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2013.
6. https://tutorialspoint.com/jsp

LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Develop a webpage using HTML.
2. Apply style specification in HTML page using CSS.
3. Develop a HTML form and validate it using Java script.
4. Demonstrate exception handling using Java Script.
5. Develop a JSP form to collect user registration details.
6. Develop a JSP login form with cookies.
7. Apply JavaBean class to print information about a student class.
8. Develop a servlet program to add two numbers.
9. Develop an XML document and validate it using SCHEMA.
10. Develop an XML document and transform it into HTML using XSLT.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U18CST6002 WIRELESS NETWORKS AND MOBILE SYSTEMS

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Compare various wireless transmission and media access techniques. K3
CO2: Identify and Interpret fields in GSM and GPRS frame structures. K3
CO3: Analyse physical, link and network layer characteristics of wireless networks K4
CO4: Compare Mechanisms for Improving TCP Performance over Wireless Links. K3
CO5: Understand 4G features and technologies K2

Pre-requisite:U18CSI5201 - Computer Networks

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	M										M			
CO2	S	M													
CO3	S	S			M					M		M			
CO4	M	M								M		M	M		
CO5	M	M										M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment, Journal paper review, Group Presentation 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

MOBILE NETWORKS **9 Hours**

Telecommunication Systems -– modulation – multiple access techniques - Wireless LAN – IEEE 802.11 Standards – GSM – Architecture – Protocols – Localization and calling – Handover – security - GPRS - Broadcast Systems – DAB - DVB

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WIRELESS NETWORKS **8 Hours**

Wireless LANs and PANs– IEEE 802.11 Standard – Architecture – Physical and MAC layer- MAC management– HiperLAN – Bluetooth- Wi-Fi – WiMAX.

ROUTING **9 Hours**

Mobile IP – DHCP – MANET: Routing – Classification – Table driven routing- On-Demand routing- Hybrid routing- Hierarchical state routing- Power-aware routing- Operations of Multicast routing

TRANSPORT AND APPLICATION LAYERS **8 Hours**

Traditional TCP– WWW -WAP – Architecture – WDP – WTLS – WTP – WSP – WAE – WML– WML Scripts- WTA Architecture.

4G & INTERWORKING **7 Hours**

4G features and challenges, 4G Technologies, Overview of LTE, Advanced LTE, Interworking Objectives and requirements, Schemes to connect WLANs and 3G Networks, Session Mobility, Interworking Architectures for WLAN and GPRS.

SIMULATION **4 Hours**

Simulation of MANET - media access protocols – routing protocols using OMNeT++ or NS3

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Jochen Schiller, “Mobile Communications”, PHI, Second Edition, 2011.
2. C.Siva Ram Murthy and B.S.Manoj, “Adhoc Wireless Networks: Architectures and Protocols”, Prentice Hall PTR, 2004
3. Vijay. K. Garg, ―Wireless Communication and Networking‖, Morgan Kaufmann Publishers, 2007.
4. Jochen Burkhardt, “Pervasive Computing: Technology and Architecture of Mobile Internet Applications”, Addison-Wesley Professional; Third Edition, 2007
5. Frank Adelstein, Sandeep KS Gupta, Golden Richard, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill, 2005.
6. William Stallings, ―Wireless Communications and Networks‖, Pearson Education, 2009.
7. Stefano Basagni , et al, “Mobile Ad hoc Networking”, Wiley –IEEE press,2004

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U18CSI6203 DATA WAREHOUSING AND DATA MINING

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Demonstrate data warehouse schema and process of data retrieval for real time applications. [K3]

CO2: Identify necessity of data pre-processing and apply the appropriate procedure. [K4, S2]

CO3: Design and deploy appropriate Classification/ Clustering techniques for various problems with high dimensional data using modern tools. [K5, S2]

CO4: Apply the association rules for real life mining applications. [K4, S2]

CO5: Synthesize various mining techniques and work in teams to develop project on complex data objects. [K5, S3]

Pre-requisite: U18CSI5203/No SQL Databases

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S		M		S		S		M	S	M		M	
CO2	S	M		S	M					M		M		M	
CO3	S	S	M	S	S		S		M	M	S	M		M	
CO4	S	M			M					M		M		M	
CO5		S		S	S			S	S	M	S	M	M	M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Case Study, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

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THEORY COMPONENT CONTENTS

DATA MINING INTRODUCTION AND PREPROCESSING 9 Hours

KDD Process – Kinds of data can be mined – Kind of data can be mined – Technologies used – Kinds of Applications targeted – Issues in data mining - Data Objects and Attribute Types - Data preprocessing overview – Data Cleaning – Data Integration – Data Reduction – Data Transformation and Discretization.

DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING 9 Hours

Data warehouse – Basic Concepts –Modeling - Data cube and OLAP – Data warehouse Design and Usage – Implementation - Data Generalization by Attribute Oriented Induction.

ASSOCIATION AND CLASSIFICATION 10 Hours

Frequent Pattern Mining – Basic Concepts – Frequent Itemset Mining methods - Classification Basic Concepts – Decision Tree Induction – Bayesian Classification – Rule Based Classification – Model Evaluation and Selection - Support Vector Machine - Lazy Learners – Other classification methods.

CLUSTERING AND OUTLER ANALYSIS 8 Hours

Cluster Analysis – Partitioning Methods - Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of Clustering - Outlier Analysis – Outlier detection Methods.

MINING COMPLEX DATA TYPES 9 Hours

Business Intelligence in the Era of Big Data and Cognitive Business - Time Series and Sequence Mining – Mining graphs and networks – Web Mining – Spatial Mining – Text Mining – Multimedia Mining – Data Mining Applications.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Jiawei Han, Micheline Kamber, Jain Pei “Data Mining: Concepts and Techniques”, Third edition, Elsevier, Morgan Kaufmann Publishers, 2012.
2. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw– Hill Edition, Tenth Reprint 2007.
3. Steve Williams, “Business Intelligence Strategy and Big Data Analytics”, First Edition, Elsevier, Morgan Kaufmann Publishers, 2016.
4. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”,Easter Economy Edition, Prentice Hall of India, 2006.
5. Hand.D, Mannila H, Smyth.P, “Principles of Data Mining”, MIT press, USA,2001.
6. Dunham M, "Data Mining: Introductory and Advanced Topics”, Prentice Hall, New Delhi, 2002.

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E BOOKS AND ONLINE LEARNING MATERIALS

1. www.db.standford.edu/`ullman/mining/mining.html
2. ocw.mit.edu/ocwweb/slon-School-ofmanagement/15-062DataMiningSpring2003/course home/index.htm
3. https://cs.nyu.edu/courses/spring03/G22.3033-015/
4. https://www.cs.purdue.edu/homes/clifton/cs490d/
5. https://freevideolectures.com/course/3609/data-warehousing
6. https://www.elsevier.com/books/business-intelligence-strategy-and-big-data-analytics/williams/978-0-12-809198-2
7. https://www.sciencedirect.com/science/article/pii/B9780128091982000026

LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Data Migration(Informatica)
2. Identification and Retrieval of dataset. (Kaggle/UCI Repository)
3. Statistical Descriptions of Data (R/Python)
4. Pre-processing of datasets using data mining tools. (Weka)
5. Implementation of Classification Algorithms (Python)
6. Implementation of Clustering Algorithms (Python)
7. Exercise on Discovering Association Rules (Python)
8. Comparison of classifiers model, evaluating and improving accuracy of models using data mining tool. (Weka/R)
9. Evaluation of various clustering methods using data mining tool. (Weka/R)
10. Build prediction/recommender data mining applications for real time problems.

Theory: 0	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 30 Hours**

ONLINE COURSES AND VIDEO LECTURES:

1. https://www.edx.org/learn/data-mining
2. https://www.class-central.com/subject/data-mining\
3. https://www.edx.org/course/introduction-to-r-for-data-science
4. https://www.coursera.org/learn/data-mining-project
5. https://www.futurelearn.com/courses/data-mining-with-weka
6. https://www.datacamp.com/courses/intro-to-python-for-data-science

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U18CST6004 **SOFTWARE TESTING**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Apply software testing fundamentals and testing design strategies to enhance software quality. K4

CO2: Design test cases for unit test, integration test, system test, regression and acceptance test K3

CO3: Discover how work test plan components, test measurements and reviews K3

CO4: Perform Testing in software with various testing tools K4

CO5: Develop and validate a test plan. K4

Pre-requisite: U18CST5002/Agile Software Development

CO/PO/PSO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	S					M	M			M	M	S
CO2	S	M													
CO3	M		M							M				S	
CO4	S		S						M						
CO5	S	M								M				S	S

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignments / Mini Projects / Group Presentations/ Case Studies, involving analysis of security of any information system / domain, and using security mechanisms to deliver security services 3. End Semester Examination
INDIRECT
1. Course-end survey

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THEORY COMPONENT CONTENTS

INTRODUCTION 8 Hours

Testing as an Engineering Activity - Role of Process in Software Quality - Testing as a Process- The six essentials of software testing - Basic Definitions: Software Testing Principles - The role of a software tester - Origins of defects- Defect classes the defect repository. Analysis of defect for a project

TEST CASE DESIGN STRATEGIES 9 Hours

Introduction to Testing Design Strategies - Black Box testing - Random Testing - Equivalence Class Partitioning - Boundary Value Analysis - Cause and error graphing and state transition testing -White-Box testing - Test Adequacy Criteria - Coverage and Control Flow Graphs- Covering Code Logic Paths - White-box Based Test design. Case study: Additional White box testing approaches.

LEVELS OF TESTING 10 Hours

The Need for Levels of Testing- Unit Test - Unit Test Planning- Designing the Unit Tests - Integration tests- Designing Integration Tests - system testing - Regression Testing. Alpha -Beta and Acceptance Test- Usability and Accessibility testing – Configuration testing –Compatibility testing – Testing the documentation – Website testing.

TEST MANAGEMENT: 9 Hours

People and organizational issues in testing – Organization structures for testing teams – testing services -Testing and Debugging Goals and Policies - Test Planning - Test Plan Components - Test Plan Attachments - Locating Test Items - Reporting Test Results - The role of three groups in Test Planning and Policy Development - Process and the Engineering Disciplines.

TEST AUTOMATION AND MEASUREMENTS REVIEW: 9 Hours

Software test automation – skills needed for automation – scope of automation – design and architecture for automation -- Measurements and Milestones for Controlling and Monitoring - Status Meetings -Reports and Control Issues - Criteria for Test Completion - SCM - Types of reviews - developing a review program - Components of Review Plans - Reporting review results.

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

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1. S Limaye, Software Testing Principles, Techniques and Tools, McGraw Hill, 2009.
2. Boris Beiser, Software Testing Techniques, Dreamtech press, New Delhi, 2009.
3. Srinivasan Desikan and Gopalaswamy Ramesh, ―Software Testing – Principles and Practices, Pearson Education, 2006.
4. Ron Patton, ―Software Testing, Second Edition, Sams Publishing, Pearson Education, 2007. AU Library.com
5. Introduction to Software Testing, Paul Ammann and Jeff Offutt, Cambridge University Press, 2nd edition, 2016.

Online Courses

1. http://www.tcs.com/SiteCollectionDocuments/WhitePapers/AFrameworkforAutomatingTesti ngofNetworkingEquipment.pdf
2. https://onlinecourses.nptel.ac.in/noc17_cs32/preview
3. https://www.coursera.org/learn/ruanjian-ceshi
4. https://www.coursera.org/learn/software-processes

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SEMESTER - VII

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U18CSI7201 CLOUD COMPUTING

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Demonstrate server virtualization concept and create virtual servers [K3,CO2]
CO2: Apply network virtualization and create virtual private cloud [K3,S2]
CO3: Design Web Application in public cloud environment. [K5,S3]
CO4: Build databases in public cloud [K5,S3]

Pre-requisite: U17CSI5201/Computer Networks

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S	S		S				M			M			S
CO2		M	M		M				M			M			S
CO3		M	M		M				M		M	M		M	S
CO4		M	M		M				M		M	M	M		S

COURSE ASSESSMENT METHODS:

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Case Study, Prototype or Product Demonstration etc (as applicable) (Theory component) 3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) **5.** End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

THEORY COMPONENTS CONTENTS

INTRODUCTION **7 Hours**

Brief history and evolution - History of Cloud Computing, Evolution of Cloud Computing, Traditional vs. Cloud Computing. Why Cloud Computing, Cloud service models (IaaS, PaaS

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& SaaS). Cloud deployment models (Public, Private, Hybrid and Community Cloud), Benefits and Challenges of Cloud Computing. Introduction to AWS Public Cloud Vendor.

CLOUD VIRTUALIZATION **7 Hours**

Basics of virtualization, Server virtualization, VM migration techniques, Role of virtualization in Cloud Computing.

PRIVATE AND PUBLIC CLOUD **14 Hours**

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

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

CLOUD SECURITY **10 Hours**

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

FUTURE DIRECTIONS IN CLOUD COMPUTING **7 Hours**

When and not to migrate to Cloud, Migration paths for cloud, Selection criteria for cloud deployment, Issues/risks in cloud computing, Future technology trends in Cloud Computing.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES:

1. Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, Cloud Computing: Principles and paradigms, 2011
2. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, Cloud Computing for dummies, 2009.
3. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, 2008.
4. Anthony T. Velte, Toby J. Velte, and Robert Elsen peter, Cloud Computing: A Practical Approach, McGraw Hill, 2010.
5. Borko Furht, Handbook of Cloud Computing, Armando Escalante (Editors), Springer, 2010.
6. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Morgan Kaufmann Publishers, 2012.

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7. Rittinghouse John W, Ransome James F, Cloud Computing-Implementation, Management and Security, CRC Press, Taylor and Francis Group, 2012.

OTHER REFERENCES:

1. http://www.buyya.com/papers/CloudSim2010.pdf
2. http://thecloudtutorial.com/
3. http://www.top-windows-tutorials.com/cloud
4. https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ebs-attaching-volume.html

LAB COMPONENTS CONTENTS

1. Creating a virtual server in AWS public cloud**.**
2. Attaching AWS EBS volume to Amazon EC2.
3. Attaching additional virtual servers with existing application
4. Create and configure a Virtual Private cloud using Amazon VPC
5. Developing and hosting web applications in cloud (google App engine Heroku cloud application platform)
6. Hosting a static web page in Amazon S3
7. Creating MySQL instances in Amazon.
8. Create and carryout Read and Write operations on DynamoDB.

Theory: 45	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U18CST7002 MACHINE LEARNING TECHNIQUES

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Differentiate the implementation of mathematical model to various machine learning methods. (K4)

CO2: Illustrate graphical models and multiple learners. (K4)

CO3: Develop projects using appropriate machine learning approaches for real life problems. (K5, S3)

Pre-requisite:U18CSI6203/Data Warehousing and Data Mining

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S			S	S	S	S		M		M		M	
CO2	S	M	M	S		M	M			M		M		M	
CO3	S	S	S			S	S			M	S	M	M	M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION AND SUPERVISED LEARNING 9 Hours

Introduction to Machine Learning – basic concepts in machine learning - Examples of machine learning applications -Supervised Learning: Learning a Class from Examples–Noise–Learning Multiple Classes–Regression–Model Selection and Generalization. Bayesian Decision Theory: Classification–Losses and Risks– Discriminant Functions–Association rules.

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PARAMETRIC METHODS **9 Hours**

Parametric Classification–Regression–Tuning Model Complexity–Model Selection Procedures. Multivariate Methods: Data–Parameter Estimation–Estimation of Missing Values–Multivariate Normal Distribution–Multivariate Classification and Regression.

SEMI PARAMETRIC METHODS AND LINEAR MODEL **9 Hours**

Semi parametric method: Clustering k–Means Clustering–Expectation–Maximization Algorithm–Latent Variable Models–Hierarchical Clustering. Linear Model: Generalizing linear model-Geometry of linear Discriminant-Pairwise Separations-Gradient Descent.

NON-PARAMETRIC METHODS **9 Hours**

Nonparametric Methods: Nonparametric Density Estimation and Classification-Generalization to Multivariate Data–Condensed Nearest Neighbor–Smoothing Models. Decision Trees: Univariate Trees–Pruning–Rule Extraction–Learning Rules–Multivariate Trees.

GRAPHICAL MODEL AND MULTIPLE LEARNERS **9 Hours**

Graphical Model- canonical cases for conditional Independence – example graphical models. Combining Multiple Learners: Voting–Error–Correcting Output Codes–Bagging–Boosting–Stacked Generalization–Cascading – Case Studies using machine learning tools.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Ethem Alpaydin, “Introduction to Machine Learning”, Second Edition, MIT Press, 2013
2. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013
3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
4. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, “Learning from Data”, AML Book Publishers, 2012
5. K. P. Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, 2012.
6. M. Mohri, A. Rostamizadeh, and A. Talwalkar, “Foundations of Machine Learning”, MIT Press, 2012.

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U18CSP7703 PROJECT PHASE-I

L	T	P	J	C
0	0	0	6	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WILL BE ABLE TO :

CO1	Describe the problem statement	K 2
CO2	Prepare the software requirement specification	K3
CO3	Identify the appropriate problem solving methodology	K4
CO4	Analyze and process the experimental information	K5
CO5	Evaluate the experimental results	K5
CO6	Develop a project report	K3

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S	S	M	M	M	M	S	S	S	S	M	M	M	M
CO2	S	M	M	M					M	M			M	M	M
CO3	L	M	L	L	M			M	S		M		M	M	M
CO4	S	M		M				S				L	M	M	M
CO5	L		M	S				M	L				M	M	M
CO6	L							M	M	M	M		M	M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Project reviews 2. End semester viva voce
INDIRECT
1. Course-end survey

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SEMESTER - VIII

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U18CSP8701 PROJECT PHASE-II

L	T	P	J	C
0	0	0	24	12

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WILL BE ABLE TO :

CO1	Plan an experimental design to solve Engineering problems	**K2**
CO2	Prepare the software requirement specification.	**K2**
CO3	Develop an attitude of team work and independent working on real time problems	**K3**
CO4	Analyze and process the experimental information	**K5**
CO5	Evaluate, interpret and justify the experimental results	**K4**
CO6	Develop a dissertation report	**K3**

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	S	S	M	M	M	M	S	S	S	S	M	S	S	S
CO2	S	M	M	M					M	M			S	S	S
CO3	L	M	L	L	M			M	S		M		S	S	S
CO4	S	M		M				S				M	S	S	S
CO5	S		M	S				S	M				S	S	S
CO6	L							M	M	M	M		S	S	S

COURSE ASSESSMENT METHODS

DIRECT
1. Project reviews 2. End semester viva voce
INDIRECT
1. Course-end survey

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PROGRAMME ELECTIVES

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DATA ANALYTICS

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U18CSE0001 BIG DATA TECHNOLOGIES

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Identify the components of Hadoop Distributed File System for big data processing [K4,S3]

CO2: Develop Big Data Solutions using Hadoop Eco System[K3,S3]

CO3: Examine various framework in Big data Processing [K4,S2]

CO4: Illustrate the big data security issues with Hadoop and the need of AWS for Hadoop environment.[K3]

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO MAPPING		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		S	M										M		
CO2					M				M	M				S	
CO3					M				M	M				S	
CO4		M			W				M	M					
CO5															

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product Demonstration etc (as applicable) (Theory component) 3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) 5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

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THEORY COMPONENT CONTENTS

INTRODUCTION TO BIG DATA **8 Hours**

Classification of digital data – Characteristics of data – Challenges – Five Vs- Typical Hadoop environment- Classification of analytics- Data science – Terminologies used in big data environments- Parallel Vs Distributed Environment-Big data applications

INTRODUCTION TO HADOOP ECO SYSTEM **10 Hours**

Introduction to Hadoop Eco system- Hadoop core components- Hadoop distributions- HDFS- Common Hadoop Shell commands- Processing data with Hadoop- Name Node- Secondary Name Node, and Data Node - Hadoop Map Reduce paradigm- Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

HADOOP ECOSYSTEM COMPONENTS **9 Hours**

Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators, Hive : Hive Shell, Hive Services, Hive Metastore, HiveQL, Tables, Querying Data and User Defined Functions. Base: HBase Concepts, Clients, Example, Zookeeper - Building applications with Zookeeper, Oozie-Workflows of Oozie

RECOMMENDATION SYSTEM **9 Hours**

Collaborative Recommendation- Content Based Recommendation – Knowledge Based Recommendation- Hybrid Recommendation Approaches.

HADOOP SECURITY AND AWS **9 Hours**

Security challenges – Authentication – Authorization – Network encryption – Security enhancement – Introduction to AWS- Running Hadoop on AWS – EMR Hadoop relationship – AWS S3

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Seema Acharya, Subhashini Chellappan, " Big Data and Analytics" Wiley, First Edition, 2015.\
2. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
3. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.
4. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012.
5. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
6. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press,2014.

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7. Jy Liebowitz, “Big Data and Business analytics”,CRC press, 2013.
8. EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015.
9. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley Publishers, 2015.
10. Dietmar Jannach and Markus Zanker, “Recommender Systems: An Introduction”, Cambridge University Press, 2010.
11. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
12. David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/Elsevier Publishers, 2013.

E BOOKS AND ONLINE LEARNING MATERIALS

1. https://intellipaat.com/tutorial/hadoop-tutorial/big-data-overview/
2. https://www.guru99.com/learn-oozie-in-5-minutes.html
3. https://www.youtube.com/watch?v=R26Gvoa-Hbc
4. https://www.youtube.com/watch?v=DpgGXN5ubk0
5. https://opensource.com/life/14/8/intro-apache-hadoop-big-data
6. https://www.guru99.com/hive-tutorials.html
7. http://www.bigdatauniversity.com/

ONLINE COURSES AND VIDEO LECTURES

1. http://www.coreservlets.com/hadoop-tutorial/
2. https://oozie.apache.org/docs/3.1.3-incubating/DG_Examples.html
3. https://oozie.apache.org/docs/4.2.0/AG_Install.html
4. https://www.ukdataservice.ac.uk/media/604456/hiveworkshoppractical.pdf
5. https://aws.amazon.com/blogs/big-data/submitting-user-applications-with-spark-submit/

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U18CSE0002 **DATA VISUALIZATION**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES:

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1 Outline the theoretical foundations of information visualization and use it for better understanding of data [K3]

CO2 Interpret the information available with network visualization, web based visual displays and maps using appropriate tools [K4, S2]

CO3 Examine methods to acquire knowledge to visualize Big data content[K5, S3]

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S				M				M	M		M		M	
CO2		M		S	M				M	M				M	
CO3		M		S	M				M	M				M	

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment; Group Presentation 3. End Semester Examination
INDIRECT
4. Course-end survey

INTRODUCTION TO INFORMATION VISUALIZATION **9 Hours**

Information visualization – Theoretical foundations – Information visualization types – Design principles - A framework for producing data visualization

STATIC DATA VISUALIZATION – tools – working with various data formats

DYNAMIC DATA DISPLAYS **9 Hours**

Introduction to web based visual displays – deep visualization – collecting sensor data – visualization – D3 framework - Introduction to Many eyes and bubble charts

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MAPS **9 Hours**

Introduction to building choropleth maps – Normalization – Classification

TREES **9 Hours**

Network visualizations – Displaying behaviour through network graphs

BIG DATA VISUALIZATION **9 Hours**

Visualizations to present and explore big data – visualization of text data and Protein sequences

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Colin Ware and Kaufman M,, Visual thinking for design‖, Morgan Kaufmann Publishers, 2008.
2. Chakrabarti, S, ―Mining the web: Discovering knowledge from hypertext data ―,Morgan Kaufman Publishers, 2003.
3. Fry, Visualizing data, Sebastopo‖,O'Reily, 2007.

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U18CSE0003 ARTIFICIAL INTELLIGENCE

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Develop solutions for problems using various Artificial Intelligence concepts. K5,S3
CO2: Design applications using PROLOG for making inferences. K4,S2
CO3: Demonstrate usage of planning and decision making. K3
CO4: Apply the concepts of learning using Tensor Flow and any other programming language. K4,S2

Pre-requisites :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M		S	S			S	M		M	M	M	M
CO2	S	S	S		M				M	M		M		M	
CO3	S	M								M		M		M	

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc a. (as applicable) 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION AND PROBLEM SOLVING **9 Hours**

Definitions of AI - Intelligent Agents. Problem solving by searching: Problem-solving agents- Example problems – Search for solutions Uninformed search strategies – Informed search strategies – Heuristic functions.

LOGIC **9 Hours**

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Logical agents: Knowledge-based agents – The Wumpus world. Logic – Propositional logic: A very simple logic-Propositional theorem proving.
First order logic: Representation – Syntax and semantics of first order logic – Using first order logic-PROLOG basics
Inference in first order logic: Propositional versus first order inference– Unification and lifting – Forward chaining – Backward chaining – Resolution.

PLANNING AND DECISION MAKING **9 Hours**

Classical Planning: Definition – Algorithms for planning as state-space search-Planning graphs – Other classical planning approaches.
Making simple Decisions-Combining beliefs and desires under Uncertainty-Utility theory-Utility functions-Multi attribute utility functions-Decision networks- The value of information-Decision theoretic expert systems.

LEARNING **9 Hours**

Quantifying uncertainty: Acting under uncertainty - Probability basics – Bayes' Rule and its use. Probabilistic reasoning: Representing knowledge in uncertain domain- The semantics of Bayesian networks. Forms of learning - Supervised learning - Learning decision trees. Reinforcement Learning: Passive Learning – Active Learning – Learning an Action-Value function using Q Learning.

ANN AND DEEP LEARNING **9 Hours**

Introduction to artificial neural networks, Perceptrons, Multi-layer feed forward network, Application of ANN - Deep feed forward networks – Convolution Neural networks – Applications-Use of Tensorflow.

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education / Prentice Hall of India, 2015.
2. Elaine Rich, Kevin Knight, Shivashankar.B.Nair, "Artificial Intelligence", Tata Mc Graw Hill, Third Edition , 2009
3. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000
4. George F. Luger, "Artificial Intelligence-Structures and Strategies For Complex Problem Solving", Pearson Education / PHI, 2002
5. David L. Poole, Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.
6. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", An MIT Press Book, 2016.
7. Li Deng , Dong Yu, "Deep Learning: Methods and Applications", Now Publishers, 2014.

OTHER REFERENCES

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1. http://aima.cs.berkeley.edu
2. http://www-formal.stanford.edu/jmc/whatisai/
3. http://nptel.ac.in/courses/106106126/4
4. https://www.coursera.org/specializations/deep-learning#courses
5. https://www.coursera.org/specializations/machine-learning-tensorflow-gcp
6. https://www.deeplearningbook.org/
7. https://medium.freecodecamp.org/an-introduction-to-q-learning-reinforcement-learning-14ac0b4493cc

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NETWORKING

L	T	P	J	C

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U18CSE0004 IOT ARCHITECTURE AND PROTOCOLS

3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Categorize M2M communication and IoT Technology. [K4]
CO2: Examine IoT Reference Architecture and Real World Design Constraints. [K4]
CO3: Make use of appropriate IoT protocols for various applications. [K3]
CO4: Build applications of IoT in real time scenario. [K3]
CO5: Identify the challenges in developing industrial applications. [K3, S2]

Pre-requisite :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S									M		M			
CO2	S									M		M			
CO3		M								M		M	M		
CO4			M							M		M			M
CO5	S									M		M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) 3. End Semester Examination
INDIRECT
4. Course-end survey

THEORY COMPONENT CONTENTS

OVERVIEW **9 Hours**

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

REFERENCE ARCHITECTURE **9 Hours**

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IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT Reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

PHYSICAL AND MAC LAYER PROTOCOLS **9 Hours**

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN

NETWORK AND APPLICATION LAYER PROTOCOLS **9 Hours**

Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

CASE STUDIES / INDUSTRIAL APPLICATIONS **9 Hours**

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
2. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
4. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
5. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
6. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

ONLINE COURSES AND VIDEO LECTURES

1. https://www.coursera.org/learn/internet-of-things-communication
2. https://www.edx.org/course/iot-networks-and-protocols

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U18CSE0005 ADHOC AND SENSOR NETWORKS

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Analyze mobility impact on MAC and routing protocols. [K5][S3]
CO2: Compare and analyze ad hoc network protocol performance.[K5][S3]
CO3: Identify various security threats to ad hoc networks and examine various security solutions. [K3]
CO4: Illustrate the sensor network characteristics, sensor databases and query processing mechanisms. [K3]

Pre-requisite : U18CSI5201/Computer Networks

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
Cos	PROGRAMME OUTCOMES (Pos)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S			S				M	M		M			M
CO2	S	S		S	S				M	M		M		M	
CO3	S	M		M						M		M		M	
CO4	S									M		M			

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Case study report, Project Presentation & Report, Assignment; Group Presentation, Poster preparation, etc (as applicable) 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **9 Hours**

Characteristics of wireless channel - Wireless local loop - IEEE 802.16 standard – HIPERACCESS -Ad hoc wireless networks: Introduction and issues - MAC protocols: Design issues - Goals and classification - MACAW: A media access protocol for wireless

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LANsDistributed packet reservation multiple access protocol-Distributed priority scheduling and Medium access in Ad hoc networks.

ROUTING PROTOCOLS **10 Hours**

Design issues – Classification – Wireless routing protocol - Location aided routing- Zone routing protocol - Hierarchical state routing protocol - Power aware routing protocol – Operation of multicast routing protocols - Classification of multicast routing protocols – Application-Dependent multicast routing.

SECURITY IN AD HOC NETWORKS **9 Hours**

Security in ad hoc wireless networks – Network security requirements - Issues and challenges in security provisioning – Network security attacks – key management – secure routing in Ad hoc networks.

WIRELESS SENSOR NETWORKS **7 Hours**

Sensors and Actuators -Types of sensors- Multimedia sensors -Architecture - Data dissemination - Date gathering - MAC protocols - Location discovery - Quality of sensor networks - Case study

SENSOR NETWORK DATABASE **10 Hours**

Sensor database challenges – Querying the physical environment – Query interfaces - High level database organization – In-Network aggregation – Temporal data – Emerging Applications

Case Study of Ad Hoc and sensor network applications:

Proficiently analyze ad hoc and sensor network protocols using simulation tool (NS3/SUMO/OPNET..).

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Siva Ram Murthy. C and Manoj B.S, “Ad hoc Wireless Networks: Architectures And Protocols”, Prentice Hall PTR, 2004
2. Toh C.K., “Ad hoc Mobile Wireless Networks: Protocols And Systems”, Prentice Hall PTR, First edition 2001.
3. Mohammad Ilyas, “The Handbook Of Ad hoc Wireless Networks”, CRC press, 2002
4. Charles E. Perkins, “Ad hoc Networking, Addison”, Wesley,2000
5. Stefano Basagni , et al, “Mobile Ad hoc Networking”, Wiley –IEEE press,2004
6. Zhao, Guibas “Wireless Sensor Networks”, ,Morgan Kaufmann Publications,2004

ONLINE COURSES AND VIDEO LECTURES:

1. https://nptel.ac.in/courses/106105160/

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U18CSE0006 SOFTWARE DEFINED NETWORKS

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Categorize SDN Controllers and the evolution of SDN. [K4]
CO2: Choose the relevant data center for SDN. [K3].
CO3: Make use of SDN solutions in networking scenarios. [K3]
CO4: Experiment with SDN Programming. [K3]
CO5: Develop various applications of SDN. [K3]

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S									M		M			
CO2	S	M								M		M			
CO3		M	M							M		M			M
CO4		M								M		M			
CO5			M							M		M	M		M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION 9 Hours

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes

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OPEN FLOW AND SDN CONTROLLERS **9 Hours**

Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts.

DATA CENTRES **9 Hours**

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE

SDN PROGRAMMING **9 Hours**

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications

SDN **9 Hours**

Juniper SDN Framework - IETF SDN Framework - Open Daylight Controller - Floodlight Controller - Bandwidth Calendaring - Data Centre Orchestration.

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Paul Goransson and Chuck Black, ―Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
2. Thomas D. Nadeau, Ken Gray, ―SDN: Software Defined Networks, O'Reilly Media, 2013.
3. Siamak Azodolmolky, ―Software Defined Networking with Open Flow, Packet Publishing, 2013
4. Vivek Tiwari, ―SDN and Open Flow for Beginners‖, Amazon Digital Services, Inc., 2013
5. Fei Hu, Editor, ―Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

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U18CSE0007 CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Analyze various security attacks and select appropriate security mechanisms for designing various security services K4
CO2: Construct cryptographic algorithms from hard problems in mathematics K3
CO3: Identify appropriate algorithms for assuring message integrity and authentication K3
CO4: Discover how cryptographic algorithms are used to build network security protocols K4
CO5: Identify appropriate mechanisms for providing system security K3

Pre-requisite: U18CSI5201-Computer Networks

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	S					M	M			M	M	S
CO2	S	M													
CO3	S													S	
CO4	S		M												
CO5	S	M							M	M				S	S

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II
2. Assignments / Mini Projects / Group Presentations/ Case Studies, involving analysis of security of any information system / domain, and using security mechanisms to deliver security services
3. End Semester Examination

INDIRECT

1. Course-end survey

CONTENTS

INTRODUCTION **10 Hours**

Security Attacks, Mechanisms and Services, Classical Encryption Techniques – Block Ciphers, DES, Finite Fields and AES, Block Cipher Operation, Stream Cipher – RC4.

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PUBLIC KEY CRYPTOGRAPHY **9 Hours**

Introduction to Number Theory, Factorization problem and RSA, Discrete Log problem and Diffie Hellman Key Exchange, Elliptic curve cryptography

HASH FUNCTION AND MESSAGE AUTHENTICATION **9 Hours**

Requirements and Security of Cryptographic Hash Functions, SHA, Message Authentication Requirements – Message Authentication Functions – Requirements and Security of Message Authentication Codes–HMAC, Digital Signatures – NIST Digital Signature Algorithm, Key Management and Distribution

NETWORK SECURITY **9 Hours**

Remote User Authentication Principles, Kerberos –Electronic Mail Security–PGP–S/MIME-IP Security–Transport Layer Security, 802.11 wireless security

SYSTEM LEVEL SECURITY **8 Hours**

Intruders, Intrusion Detection, Password Management, Malicious Software: Types, Viruses and Worms, Countermeasures for Viruses and Worms, DDoS Attacks, Firewalls: Needs, Characteristics, Types, Basing, Location and Configuration of Firewalls

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. William Stallings, "Network Security Essentials: Applications and Standards", Pearson Education India; 4 edition (2011)
2. William Stallings, "Cryptography and Network Security – Principles and Practices", Pearson Education; Seventh edition, 2017
3. AtulKahate, "Cryptography and Network Security", 2nd Edition, Tata McGraw Hill, 2008
4. Bruce Schneier, "Applied Cryptography", JohnWiley& Sons Inc, 2001.
5. Charles P fleeger and Shari Lawrence P fleeger, "Security in Computing", Fourth edition, PearsonEducation,2015.

Online Courses

1. Cryptography I – Stanford University Course by Dan Boneh available at Coursera Link: https://www.coursera.org/learn/crypto or at Stanford Online: https://online.stanford.edu/courses/soe-y0001-cryptography-i
2. Applied Cryptography – Udacity Course by Dave Evans available at: https://in.udacity.com/course/applied-cryptography--cs387
3. Cryptography and Network Security – NPTEL Course by Prof. S. Mukhopadhyay available at https://onlinecourses.nptel.ac.in/noc18_cs07/preview

S. Sreenath.

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U18CSE0012 **BLOCKCHAIN TECHNOLOGY AND APPLICATIONS**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1:	Understand emerging abstract models for Blockchain Technology (K2)
CO2:	Discover the secure and efficient transactions with crypto-currencies (K4)
CO3:	Experiment with cryptocurrency trading and crypto exchanges (K3)
CO4:	Develop private blockchain environment and develop a smart contract on ethereum (K3,S2)
CO5:	Build the hyperledger architecture and the consensus mechanism applied in the hyperledger (K5,S2)

Pre-requisite : Nil

CO/PO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M		M						M		M			
CO2	S					M				M		M	M		
CO3	S	M	M		M	M				M		M	M		M
CO4	M	S	S		M							M			
CO5	M	S	S		M							M			

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment, Project 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

BLOCKCHAIN REVOLUTION AND DESIGN PRINCIPLES (10 hours)

Blockchain- An Introduction, Distinction between databases and blockchain, Centralized Registries vs. Distributed Ledgers, Public vs. Private Ledgers, Bitcoin & Blockchain, Blockchain Structure and operations, Consensus Algorithms & Types- Proof of work, proof of stake, Byzantine Fault Tolerance. Distributed networks- Distributed Applications (DApps) – Web 3.0 - DApps Ecosystems. Working - Permissioned and permission-less Blockchain – Cross Chain

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Technologies. – IOT & Blockchain - Digital Disruption in Industries – Banking, Insurance, Supply Chain, Governments, IP rights, Creation of trustless Ecosystems – Block chain as a Service – Open Source Block chains

CRYPTO AND CRYPTOCURRENCIES (8 HOURS)

Crypto Currencies - Anonymity and Pseudonymity in Cryptocurrencies , Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, Centralization vs. Decentralization, Distributed Consensus, Consensus without Identity, Incentives and Proof of work, Regulations on Crypto Currencies & exchanges – Downside of non-regulated currencies – crypto Scams – Exchange hacks

BITCOIN (9 HOURS)

Bitcoin blockchain, the challenges, and solutions, Bitcoin Scripts, Applications of Bitcoin Scripts, Bitcoin Blocks, The Bitcoin Network, Limitations & Improvements, How to Store and Use Bitcoins, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets

ETHEREUM (9 hours)

The Ethereum ecosystem, Smart Contract Basics, Processing and deploying smart contracts in Remix IDE, Solidity: contract classes, Data Types & Statements , operators, Data structures, functions, Inheritance, functions, abstract contracts, libraries, Types & optimization of Ether-Global variables- Debugging, Viewing Information about blocks in Blockchain- Developing smart contract on private Blockchain.

HYPERLEDGER (9 HOURS)

Hyperledger fabric, components of Hyperledger Fabric Technology, Develop Hyperledger Blockchain Applications using Composer Framework, Model the Blockchain Applications using Composer modeling language, Intro: Alternative Decentralized Solutions, Interplanetary File System, Hashgraph.

Theory: 45	Tutorial: 0	Practical: 0	Project: 0	Total: 45 Hours

REFERENCES

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas M Antonopoulos 2018
2. Ethereum: Blockchains, Digital Assets, Smart Contracts, Decentralized Autonomous Organizations-2016
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

E BOOKS AND ONLINE LEARNING MATERIALS

1. https://www.coursera.org/learn/blockchain-basics#syllabus
2. https://www.coursera.org/learn/cryptocurrency#syllabus
3. https://www.coursera.org/learn/smarter-contracts#syllabus
4. https://www.udemy.com/course/hyperledger
5. https://www.coursera.org/learn/blockchain-platforms
6. https://bitcoinbook.cs.princeton.edu/

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GENERAL ELECTIVES

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U18CSE0008 PRINCIPLES OF COMPILER DESIGN

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Interpret the different phases of the compiler and experiment the scanner using Lex tool (K3).

CO2: Construct various parser and execute the same using tools. (K5).

CO3: Break down the given expression into intermediate code (K4).

CO4: Translate given intermediate code to target code.(K3)

CO5: Identify various types of optimizations that can be applied to an intermediate code (K3)

Pre-requisite:U18CST4003/Theory of Computation

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												CO/PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**											**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S		S		S							M	M		
CO2	M	M										M	M		
CO3	S	S										M	M		
CO4												M	M		
CO5	S	S										M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment; Group Presentation 3. End Semester Examination
INDIRECT
1. Course-end survey

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THEORY COMPONENT CONTENTS

INTRODUCTION **9 Hours**

Introduction: Language Processors- The Structure of a Compiler

Lexical Analysis: The Role of the Lexical Analyzer- Input Buffering- Specification of Tokens- Recognition of Tokens- The Lexical-Analyzer Generator: LEX

SYNTAX ANALYZER **9 Hours**

The Role of the Parser- Error-Recovery Strategies- Top Down Parsing- Bottom-Up Parsing: SLR, CLR, LALR- The Parser Generator YACC

INTERMEDIATE CODE GENERATION **9 Hours**

Variants of syntax trees- Three address codes – Types and Declarations – Translation of expression- Type checking - Control flow-Back patching-Switch statements-Intermediate code for procedures

CODE GENERATION **9 Hours**

Issues in the design of code generation – Target language-Addresses in target code- Basic Blocks and Flow Graphs- Optimization of Basic Blocks – A simple Code generator – Peephole optimization

CODE OPTIMIZATION AND RUN-TIME ENVIRONMENTS **9 Hours**

Machine-Independent Optimizations: The Principal Sources of Optimization - Loops in Flow Graphs

Run-Time Environments: Storage organization- Stack allocation space- Access to non-local data on the stack-Heap management

Optimizing for Parallelism-Basic Concepts.

Simple exercises using LEX and YACC tools

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Alfred V. Aho et al “Compilers Principles, Techniques and Tools”, Second Edition, Pearson Education, 2007.
2. Allen I. Holub, “Compiler Design in C”, Prentice Hall of India, 2003.
3. Fischer C.N. and LeBlanc R.J. “Crafting a Compiler with C”, Benjamin Cummings, 2003.
4. Bennet J.P. “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill, 2003.
5. HenkAlblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001.
6. Kenneth C. Louden, “Compiler Construction: Principles and Practice”, Thompson Learning, 2003.

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U18CSE0009 **GRAPHICS AND MULTIMEDIA**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Illustrate graphics input and output primitives.[K3]
CO2: Construct 2D and 3D geometric transformations on objects.[K5]
CO3: Summarize the graphics modeling process.[K3]
CO4: Apply the techniques of multimedia, compression, communication and authoring.[K3]
CO5: Design a simple application with animation.[K5]

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S									M		M			
CO2	S	S								M		M			
CO3	S									M		M			
CO4	S									M		M			
CO5	S	S			S	S			M	M	S	M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment 3. Mini Project 4. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

2D PRIMITIVES **9 Hours**

Elements of pictures created in Computer Graphics – Graphics input primitives and devices – Output Primitives – Line, Circle and Ellipse drawing Algorithms – Attributes of output primitives

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2D GEOMETRIC TRANSFORMATIONS **9 Hours**

Two Dimensional Geometric Transformations – 2D Viewing – Window-Viewport Transformations – Line, Polygon, Curve and Text Clipping algorithms – 2D Geometric Transformations-Case study

3D CONCEPTS **9 Hours**

Three Dimensional Object Representation – Polygons, Curved Lines, Splines, Quadric Surfaces - 3D affine transformations - Parallel and perspective projections – Visualization of data sets – Viewing – Visible Surface Identification - Color Models- Case study

MULTIMEDIA BASICS AND 3D MODELLING **9 Hours**

Introduction and Definitions – Applications – Elements – Animations –Definition of Modelling - Surface Modelling- Object cloning-Object Editing-3D Procedural Modelling- Modelling with Polygons-Building Simple scenes-Building complex scenes- Modelling with NURBS

MULTIMEDIA APPLICATION DESIGN **9 Hours**

Types of Multimedia systems - Virtual Reality Design - Components of Multimedia system - Distributed Application Design Issues - Multimedia Authoring and User Interface - Hypermedia Messaging - Distributed Multimedia Systems

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45Hours**

REFERENCES

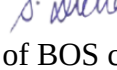
1. Donald Hearn, M. Pauline Baker, “Computer Graphics”, Prentice Hall, 1998
2. Donald Hearn, M. Pauline Baker, “Computer Graphics(C version)” Second edition , Prentice Hall ,2002
3. Donald Hearn, M. Pauline Baker and Warren Caritthers, “Computer Graphics with OpenGL”, Fourth edition, Prentice Hall, 2010.
4. Ze-Nian Li and Mark S. Drew, “Fundamentals of Multimedia”, First Edition, Pearson Education, 2004.
5. PrabhatK.Andleigh, KiranThakrar ,”Multimedia Systems Design”, PHI, 2013.
6. Ralf Steinmetz and Klara, “Multimedia Computing, Communications and Applications”, Pearson Education, 2012.
7. F.S. Hill, “Computer Graphics using OpenGL”, Third Edition, Pearson Education, 2006.

Tools:

https://en.wikibooks.org/wiki/GIMP
https://docs.gimp.org/2.8/en/gimp-tools.html
https://www-uxsup.csx.cam.ac.uk/pub/doc/suse/suse9.0/userguide-9.0/ch23s02.html
https://en.wikipedia.org/wiki/Hypermedia#Development_tools

Other References:

1. http://ocw.mit.edu/courses/electrical-engineering-and-computerscience/6-837-computer-graphics-fall-2003/
2. https://nptel.ac.in/courses/106106090/



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U18CSE0010 INFORMATION SECURITY

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Select the appropriate security techniques to prevent and detect security breaches (K3)
CO2: Analyze the threats, attacks and understand legal professional and ethical issues (K4)
CO3: Utilize the Big data security analytics tools to detect security breaches (K3,S2)
CO4: Select the appropriate security technology for risk control (K5)
CO5: Choose the appropriate operational security technologies to prevent security breach (K5)

Pre-requisite: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													CO/PSO Mapping		
COs	PROGRAMME OUTCOMES (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M		M								M	M		
CO2	S		M			M				M		M			
CO3	S	M								M		M		M	M
CO4	M	S										M			
CO5	M	S	S		S	M						M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment, Project 3. End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

SECURITY REQUIREMENTS AND SECURE SDLC **9 Hours**

History - What is Information Security? - CIA requirements- security model - Components of an information system - Securing the components - Balancing security and access - The SDLC - Security in SDLC.

THREATS, ATTACKS AND ISSUES **9 Hours**

Need for security - Business needs - Threats – Attacks – Legal - Ethical and professional issues.

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RISK MANAGEMENT BASED SECURITY **9 Hours**

Planning for Security, Risk management: Identifying and assessing risk - Assessing and controlling risk.

SECURITY TECHNOLOGIES **9 Hours**

Security Technology: Access Control, Firewalls, and VPNs, Intrusion Detection and Prevention Systems, Honeypots, Honeynets and Padded Cell Systems, Scanning and Analysis Tools, Introduction to Big Data Security Analytics and Security Breaches

PHYSICAL, PERSONNEL AND OPERATIONAL SECURITY **9 Hours**

Physical Security: Physical Access Controls, Fire Security and Safety, Failure of Supporting Utilities and and Structural Collapse, Interception of Data, Securing Mobile and Portable Systems, Special Considerations, - Security and personnel – Information Security Maintenance- Real time case studies.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Sixth Edition, Cengage Learning, 2017.
2. Micki Krause, Harold F. Tipton, “Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2004.
3. Stuart McClure, et al., “Hacking Exposed”, Tata McGraw- Hill, Sixth edition2009. 4. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2002.

E BOOKS AND ONLINE LEARNING MATERIALS

1. https://www.lovemytool.com/files/vulnerabilities-threats-and-attacks-chapter-one-7.pdf
2. https://www.nisc.go.jp/security-site/campaign/files/aj-sec/handbook-all_eng.pdf

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U18CSE0011 **DECLARATIVE DEVELOPMENT OF CUSTOMIZED APPLICATIONS**

L	T	P	J	C
2	0	0	2	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1:	Design and manage the correct data model based on business requirements.
CO2:	Define business logic and configure application security.
CO3:	Visualize the process automation declaratively.
CO4:	Define and Design an appropriate deployment plan.
CO5:	Develop customized applications using Lightning Components.

Pre-requisites : U18CSI3204/Database Management Systems

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO MAPPING**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	M		M											M	
CO2		M	M												
CO3					S										
CO4			M		S									M	
CO5			M		M								M		

COURSE ASSESSMENT METHODS

DIRECT
1. Online Assessment 2. Quiz
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION TO DATA MODEL

6+3 Hours

Introduction to Salesforce- Salesforce Architecture-Declarative vs. Programmatic Customizations - Salesforce CRM-Data Modeling-Custom and Standard Objects- Object Relationships- Data Management-Determining an Appropriate Data Model - Building Data Model

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BUSINESS LOGIC AND APPLICATION SECURITY **6+3 Hours**

Constructing business logic – Salesforce Social Features-Lightning Vs Classic UI- - UI Design Best Practices.-Customization Options- Custom Buttons, Links, and Actions- List Views- Record Types- - Constructing business logic - Formula Fields - Roll-up Summary Fields - Validation Rules - Restricting and Extending Object, Record, and Field Access

AUTOMATING BUSINESS PROCESSES **6+3Hours**

Business Value of Process Builder-Workflow Vs Process Builder-Converting Workflow into Process Best Practices-Lightning Process Builder- Workflows and Approvals- Automating Business Processes- Custom Lightning Components

DEPLOYING YOUR APP **6+3Hours**

Application Lifecycle Management-Change Management Process- Sandboxes-Application Lifecycle Models- Change Sets - Unmanaged and Managed Packages - Determining an Appropriate Deployment Plan

DESIGNING ADVANCED USER INTERFACE COMPONENTS **6+3 Hours**

Declarative Customizations- Limits of Declarative tools - Creating Reports – Report Types – Dashboards – Declarative Options for Incorporating Lightning Components – AppExchange Apps

Theory: 30	**Tutorial: 0**	**Practical: 0**	**Project: 15**	**Total: 60 Hours**
Completion of Project : 15 Hours				

REFERENCES

1. https://www.edureka.co/blog/what-is-salesforce/
2. https://www.j2interactive.com/blog/brief-history-salesforce/
3. https://www.salesforce.com/blog/2017/08/salesforce-forbes-most-innovative-2017.html
4. https://trailhead.salesforce.com/en/academy/classes/dex402-build-platform-apps-using-declarative-development-in-lightning-experience/
5. https://trailhead.salesforce.com/en/users/strailhead/trailmixes/prepare-for-your-salesforce-platform-app-builder-credential
6. https://trailhead.salesforce.com/en/users/dnadimi/trailmixes/dex-402-kick-off
7. https://trailhead.salesforce.com/content/learn/trails/platform-app-builder-certification-prep
8. https://trailhead.salesforce.com/modules/data_security
9. https://trailhead.salesforce.com/modules/reports_dashboards
10. https://trailhead.salesforce.com/modules/lex_customization

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U18CSE0013 PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

L	T	P	J	C
0	0	6	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1:	Upskill in emerging technologies and apply to real industry-level use cases.	K3, S2
CO2:	Understand agile development process.	K2
CO3:	Develop career readiness competencies, Team Skills / Leadership qualities	K2
CO4:	Develop Time management, Project management skills and Communication Skills.	K2
CO5:	Use Critical Thinking for Innovative Problem Solving	K4, S2
CO6:	Develop entrepreneurship skills to independently work on products.	K2

Pre-requisites :Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												**CO/PSO Mapping**		
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	M	S	S	S				M			M	S		
CO2	S		M										M		
CO3									S			M			
CO4									M	S	S	S			
CO5	M	M	S	S									S		
CO6			M			S	M	M	S				M		

COURSE ASSESSMENT METHODS

DIRECT
Continuous Project Based Assessment
INDIRECT
Course-end survey

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TABLE 1: ACTIVITIES

Activity Name	Activity Description	Time (weeks)
Choosing a Project	Selecting a project from the list of projects categorized various technologies & business domains	2
Team Formation	Students shall form a team of 4 Members before enrolling to a project. Team members shall distribute the project activities among themselves.	1
Hands on Training	Students will be provided with hands-on training on selected technology in which they are going to develop the project.	2
Project Development	Project shall be developed in agile mode. The status of the project shall be updated to the mentors via appropriate platform	6
Code submission, Project Doc and Demo	Project deliverables must include the working code, project document and demonstration video. All the project deliverables are to be uploaded to cloud-based repository such as GitHub.	3
Mentor Review and Approval	Mentor will be reviewing the project deliverables as per the milestone schedule and the feedback will be provided to the team.	1
Evaluation and scoring	Evaluators will be assigned to the team to evaluate the project deliverables, and the scoring will be provided based on the evaluation metrics	1
TOTAL		**16 WEEKS**

Essentially, it involves 15 weeks of learning and doing, and one week for evaluation. The evaluation will be carried out to assess technical and soft skills as given in Table 2.

TABLE 2: EVALUATION SCHEMA

PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP			
Technical Skills		**Soft Skills**	
Criteria	**Weightage**	**Criteria**	**Weightage**
Project Design using Design Thinking	10	Teamwork	5

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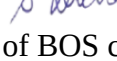
Innovation & Problem Solving	10	Time Management	10
Requirements Analysis using Critical Thinking	10	Attendance and Punctuality	5
Project Planning using Agile Methodologies	5	Project Documentation	5
Technology Stack (APIs, tools, Platforms)	5	Project Demonstration	5
Coding & Solutioning	15		
User Acceptance Testing	5		
Performance of Product / Application	5		
Technical Training & Assignments	5		
Total	**70**	**Total**	**30**
Total Weightage			**100**
Passing Requirement			**50**
Continuous Assessment Only			

Theory: 0	**Tutorial: 0**	**Practical: 100**	**Project: 0**	**Total: 100 Hours**



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One Credit Courses

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U18CSIN001 **CYBER FORENSICS**

L	T	P	C
1	0	0	1

Course Outcomes:
After successful completion of this course, the students should be able to

CO1 Classify Cybercrime, cyber forensics and identify the digital evidence.

CO2 Analysis and report digital evidence.

Pre-requisite: Nil

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													**CO/PSO Mapping**		
COs	**Programme Outcomes (POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	S	S			M				M	M		M	**S**		S
CO2	S	S			M				M	M		M	S		S

Course Assessment methods:

Direct
• Objective Type Assessment Test (Theory component) • Project Type assessment (Lab component)

COURSE CONTENTS

Overview of Cybercrime and Cyber Forensics	**3 Hours**
Classifications of Cyber Crimes against individuals, property and nation, need for Digital forensics and steps in digital forensics (scientific methods), Incident handling with forensic triage.	
Identifying Digital Evidences	**3 Hours**
Locard's exchange principle and digital forensic investigation models, Types: artifacts, identifying forensic file formats, recovery of hidden, deleted and corrupt data, standard file	

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formats with their headers and forensic file carving.

Acquisition and Analysis of Digital Evidences	**3 Hours**

Rules of collecting Digital Evidence, Standard collection procedures: seizure, write blockers, bit-stream imaging, hashing, Chain of Custody (COC), evidence bags and SOP.

Admissibility and Reporting of Digital Evidences	**3 Hours**

Forensic laboratory requirements: setting up of lab, backup and recovery plans, generating forensically sound reports, IPR and Cyber Laws and analyzing sample forensic reports.

Hands-On Digital Forensics	**3 Hours**

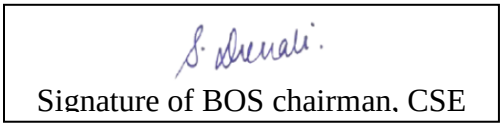
Validating and gathering evidence using DOS Commands and Unix/Linux Commands, Forensic imaging using DD commands, Software tools – Autopsy (with TSK), FTK Imager, Hex Editor, Parrot OS and Wireshark.

Theory: 12	**Tutorial: 0**	**Practical: 3**	**Project: 0**	**Total: 15 Hours**

REFERENCES

1) Brian Carrier, File System Forensic Analysis, Pearson, 2006.

2) Marjie T. Britz, Computer Forensics and Cyber Crime, Pearson, 2012.



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U18CSIN002 **AUGMENTED REALITY**

L	T	P	C
1	0	0	1

Course Outcomes:
After successful completion of this course, the students should be able to

CO1 Understand the concept of AR and basics of AR app development.

CO2 Develop AR Application using Unity.

Pre-requisite: Nil

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												CO/PSO Mapping		
COs	**Programme Outcomes (POs)**											**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	S	S			M				M	M		M	S		
CO2	S	S			M				M	M		M	S	M	

Course Assessment methods:

Direct
• Objective Type Assessment Test (Theory component) • Project Type assessment (Lab component)

COURSE CONTENTS

Introduction and Working with Unity front end tools	**4 Hours**
Introduction to Augmented Reality - Exploring Unity environments such as Hierarchy, Inspector, Scene view, Game view - Using basic 3D objects in Unity - Working with Animation - Using Custom 3D models in Unity	
Working with C#	**3 Hours**
How C# works with Unity - Classes, Variables and functions in C# - Creating functions to	

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move/animate/Update an object in Unity.				
User Interface Design				**2 Hours**
UI elements in Unity - Working with UI elements such as Buttons, Dropdown, Sliders.				
Building AR apps using ARCore				**3 Hours**
Introduction to ARCORE - Developing an AR app using ARCORE - Packaging an app to run on android devices - Plugins for AR apps				
Building AR apps using Vuforia and Unity				**3 Hours**
Introduction to Vuforia - Using Vuforia Database with Unity - Developing Image scanning AR app using Vuforia and Unity.				
Theory: 12	**Tutorial: 0**	**Practical: 3**	**Project: 0**	**Total: 15 Hours**

REFERENCES

1. Dieter Schmalstieg &Tobias Hollerer, Augmented Reality: Principles and Practice, Pearson, 2016.
2. Stephen Cawood & Mark Fiala Augmented Reality: A Practical Guide s, Pragmatic Bookshelf, 2007.

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U18CSIN003	WEB APPLICATION DEVELOPMENT USING NODEJS	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

After successful completion of this course, the students should be able to

CO1	Analyze the usage of NodeJS in MEAN stack.[K4,S2]
CO2	Design and develop an application in NodeJS concepts. [K5, S3]

Pre-requisites : Nil

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

Course Assessment Methods

Direct
1. Objective type questions – 20 marks 2. Application development – 80 marks

INTRODUCTION TO MEAN STACK — 7 Hours

MEAN Stack –Uses and Features of MEAN- MongoDB – ExpressJS – Node.js – AngularJS-Node in MEAN stack – Installation and Sample Application in node

INTRODUCTION TO NODE.JS — 8 Hours

Introduction to Node.js - Asynchronous/Non-blocking – Node Package Manager - Need For Packages - Packages – Callback -Blocking Code Example-Non-Blocking Code Example-Events - Callback Vs. Events – Streams - Readable Streams - Writable Streams – Pipes - Prompt

Theory: 3	Tutorial: 0	Practical: 12	Project: 12	Total: 15 Hours

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MINOR SPECIALIZATION

INTERNET OF THINGS

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U18CSR3001 IOT FUNDAMENTALS AND APPLICATIONS

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Understand the characteristics and working of IOT components. [K2]
CO2: Outline the Architectural Overview of IoT. [K2]
CO3: Illustrate the working principles of various sensors and actuators. [K3]
CO4: Identify and analyze IOT applications in various domains. [K2]

Pre-requisite: Nil

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										
CO2	M	M	S	S			M					
CO3	S	S	S		S							
CO4	M	S	S	S	S		M	M	M	M		M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II **2.** Assignment **3.** End Semester Examination
INDIRECT
Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION 10 Hours

Review of Basic Networking concepts (Components, Data Flow, types of Networks, Addressing) – Characteristics of IOT – Physical Design of IOT - Logical Design of IoT – Enabling Technologies – IOT Components

IOT ARCHITECTURE 8 Hours

M2M – M2M and IOT – one M2M IoT Architecture – IoTWF Architecture – Simplified IoT Architecture.

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SENSORS AND ACTUATORS **12 Hours**

Introduction to Sensor, Transducer, Actuator - Physical Principles of Sensing (Resistance, Capacitance, Inductance) – Classification of Sensors and Actuators – General requirements for interfacing – working principle of Temperature Sensors, DHT11, Light Sensors, Level Sensors, Motion Detectors, Proximity Sensor, Ultrasonic Sensor, Soil Moisture Sensor, Accelerometer, Gyroscope – Actuators: Linear Actuator, Motors (Servo motor, DC motor, Stepper motor), Relay, Solenoid – Static and Dynamic Characteristics of Sensors

IOT DESIGN AND DEPLOYMENT **7 Hours**

Design Principles – Methodology – Deployment – Introduction to CISCO Packet Tracer.

CASE STUDIES AND APPLICATIONS **8 Hours**

Domain Specific IoT – Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry - Healthcare.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Vijay Madisetti , Arshdeep Bahga, Adrian McEwen, Hakim Cassimally, “Internet of Things A Hands-on-Approach” Arshdeep Bahga & Vijay Madisetti, 2014.
2. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.
3. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner, “Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model”, Springer Open, 2016.
4. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, “From Machine to Machine to Internet of Things”, Elsevier Publications, 2014

Online Courses

1. https://www.coursera.org/learn/internet-of-things-sensing-actuation/home/welcome
2. https://onlinecourses.nptel.ac.in/noc21_ee32/previe

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U18CSR4202 **IOT PROTOCOLS AND PROGRAMMING**

L	T	P	J	C
2	0	2	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Understand and Identify IoT protocols for real time applications [K2]
CO2: Design and develop IoT prototypes using Arduino /Raspberry Pi [K3]
CO3: Identify the challenges and security issues in developing IoT applications. [K2]

Pre-requisite: U18CSR3001 - IoT Fundamentals and Applications

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M				M					
CO2	S	S	S	S	S			M	M	M	M	M
CO3	M					M		M				M

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory Component)
2. Assignment, Mini Project (Theory Component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (Lab Component)
4. Model Examination (Lab component)
5. End Semester Examination (Theory and Lab component)

INDIRECT

Course-end survey

THEORY COMPONENT CONTENTS

IOT ACCESS AND NETWORK PROTOCOLS **8 Hours**

Protocol Standardization for IoT – IEEE 802.15.4 – Zigbee- Z-Wave – LORaWAN - LPWAN- SigFox - NB IOT – WiFi - Bluetooth - Optimizing IP for IoT

IOT APPLICATION PROTOCOLS **5 Hours**

MQTT – CoAP – HTTP – DDS - SCADA

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IOT PROTOTYPING **12 Hours**

Arduino: Getting started with Arduino Uno, Arduino IDE, Fundamentals of Arduino Programming - Connecting Sensor & Actuators with Arduino – NodeMCU board layout – Connecting NodeMCU to cloud platform

RaspberryPi: Introduction to RaspberryPi - Hardware Layout - Configuring RaspberryPi - Programming RaspberryPi with Python

IOT CHALLENGES AND SECURITY **5 Hours**

Challenges: Connectivity, Compatibility and Longevity, Regulatory Standards - Security, Privacy and Trust in IoT

Theory: 30	Tutorial: 0	Practical: 0	Project: 0	Total: 30 Hours

LAB COMPONENT CONTENTS

1. Arduino Programming

a. Basic Arduino Programming
b. Working with sensors and actuators
c. Serial Port Programming
d. Interfacing Arduino with modules and Shields

2. ESP8266 Programming

a. Configuring WiFi
b. Connecting to ThingSpeak API
c. Interfacing with Web services

3. Raspberry Pi Programming

a. Python Programming in Raspberry Pi
b. Working with sensors and actuators
c. Interfacing with Camera/ SMTP/HTTP

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

REFERENCES

1. Olivier Hersent, David Boswarthick and OmarElloumi, “The Internet of Things: Key Applications and Protocols”, John Wiley & Sons Ltd., UK, 2012.
2. David Hanes, Gonzalo Salgueiro , Gonzalo Salgueiro , Robert Barton , Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, Cisco Systems, Inc.,2017
3. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, John Wiley & Sons Ltd., UK, 2014.

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4. Yashavant Kanetkar, Shrirang Korde, “21 IoT Experiments: Learn IoT, the Programmer’s way”,2019
5. Simon Monk, “Programming the Raspberry Pi, Second Edition: Getting Started with Python”, second edition, McGraw-Hill Education, 2015

ONLINE COURSES

1. https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2. https://www.udemy.com/course/iot_using_nodemcu_micropython/
3. https://www.udemy.com/course/introduction-to-internet-of-things-iot-using-arduino/
4. https://www.udemy.com/course/from-0-to-1-raspberry-pi/

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U18CSR5203 **IOT ANALYTICS**

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Realize the need of Data analytics, types of data generated by IOT devices and data analytics tools. [K3]
CO2: Determine the appropriate data pre-processing and analysis strategy for IoT Data analytics. [K4]
CO3: Discover the benefits of IoT core services and create IoT resources.[K3]

Pre-requisite: U18CSR4202/IoT Protocols and Programming

CO/PO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M		M						
CO2		S	S		S		M					
CO3		S	S	S	S			M	M	M		M

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory Component)
2. Assignment, Mini Project (Theory Component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (Lab Component)
4. Model Examination (Lab component)
5. End Semester Examination (Theory and Lab component)

INDIRECT

Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **9 Hours**

Introduction to Data Analytics for IOT data, Data analysis Vs Data analytics, Need of IoT Analytics, Types of Data generated by IoT devices, Classification- Data analytics, Application of Data Analytics in IOT, Data Analytics Tools & Platforms for IOT.

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PYTHON FOR DATA ANALYSIS **9 Hours**

Basic operations, Data Analytics with numpy, Pandas. Data Visualization -Exploring Various Data plotting schemes, Time series Data handling

DATA PRE-PROCESSING **9 Hours**

Monitor and Collect Data from IOT Sensors, handling missing data, Data imputation, outlier detection, Encoding categorical data, Feature Scaling.

DATA ANALYSIS **9 Hours**

Statistical analysis, Z score analysis, Model selection- Machine learning techniques - Regression/Classification.

CASE STUDY **9 Hours**

IoT on AWS, AWS IoT Core services Device gateway, Device management, Device registry, shadows, AWS IoT green grass

LAB COMPONENT CONTENTS

1. Accessing and processing data using numpy ,pandas etc
2. Data pre-processing to handle missing values, outliers, Data imputation etc
3. Feature Engineering
4. Visualizing IoT Data
5. Data analysis
6. Implementation of regression techniques for prediction
7. Apply classification techniques

Theory: 45	Tutorial: 0	Practical: 30	Project: 0	Total: 75 Hours

REFERENCES

1. An Introduction to IoT Analytics, by Harry G. Perros
2. Analytics for the Internet of Things (IoT), by Andrew Minteer, Released July 2017,Publisher(s): Packt Publishing, ISBN: 9781787120730
3. Programming The Internet Of Things: An Introduction To Building Integrated, Device-To-Cloud IoT Solutions,Andy King,Oreilly publications

ONLINE COURSE

1. Online Course-Coursera : AWS IoT: Developing and Deploying an Internet of Things

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U18CSR6004 INDUSTRIAL IOT

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Understand business models and reference architectures for IIOT [K2]
CO2: Illustrate the importance of key enablers of industrial IIOT [K2]
CO3: Describe the importance of Digital Twin and its benefits [K2]

Pre-requisite: U18CSR3001/IoT Fundamentals and Applications

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S	M	M		M				M	M		
CO3	S		W						M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment; Group Presentation 3. End Semester Examination
INDIRECT
Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION 9 Hours

Basics of Industrial IoT: Introduction, Challenges in IIOT, Applications of IIOT, IIOT benefits, **Industrial Internet Systems:** key elements – advantages and applications.
Industrial Sensing & Actuation: industrial sensors – smart sensor – utility – sensor calibration-SCADA system – WSAN – advantages , Industrial Processes : industrial revaluation – industry sector growth.

BUSINESS MODELS AND REFERENCE ARCHITECTURE FOR IIOT 9 Hours

Business Models: Introduction – Building blocks – new business model for IoT-business opportunities in IIoT- IIoT business models – Challenges.
Reference Architecture: Industrial Internet Reference Architecture (IIRA) – IIRA framework - Three tier architecture – Gateway-Mediated Edge architecture – Layered Databus pattern.

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KEY ENABLERS OF INDUSTRIAL IOT **9 Hours**

Sensing: Benefits of sensor usage in industry – sensing for manufacturing process in IIOT – Block diagram – case study: Air quality monitoring and alert systems.

Connectivity: Industry Communications – Communication types – profinet – interbus – CC-link – Device net – Communication infrastructures – DSL – Tactile

internet - Design challenges. Case study: Industrial environment monitoring.

Processing: Data characteristics – challenges – types – middleware – analytics – case study: form beats, SWAMP, iRobot- factory. Industrial control System: PLC, DCS, SCADA.

INDUSTRIAL IOT APPLICATIONS **9 Hours**

Inventory Management & Quality Control , Plant Security and Safety, Facility Management, Oil, Chemical and Pharmaceutical Industry, UAVs in Industries.

Case Studies for Industry 4.0 & IIoT: Milk Processing and Packaging Industries, Manufacturing Industries.

DIGITAL TWIN **9 Hours**

Introduction - digital twin in industry 4.0 – concepts – features – digital thread and digital shadow - Building block – Types – Characteristics of Digital Twin platform – Middleware – Product lifecycle of digit twin – use cases.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Gilchrist, A. (2016). Industry 4.0: the industrial internet of things. Apress.
2. Mahmood, Z. (2019). The Internet of Things in the Industrial Sector. Springer International Publishing.
3. Rawat, D. B., Brecher, C., Song, H., & Jeschke, S. (2017). Industrial Internet of Things: Cyber manufacturing Systems. Cham, Switzerland: Springer.
4. Butun, I. (2020). Industrial IoT. Springer International Publishing.
5. Mahmood, N. H., Marchenko, N., Gidlund, M., & Popovski, P. (Eds.). (2020). Wireless Networks and Industrial IoT: Applications, Challenges and Enablers. Springer Nature.
6. Saranya, V., Belinda, M. C. M., & Kanagachidambaresan, G. R. (2020). An evolution of innovations protocols and recent technology in industrial IoT. In Internet of Things for Industry 4.0 (pp. 161-175). Springer, Cham.
7. Hands-On Industrial Internet of Things: Create a powerful Industrial IoT by Giacomo Veneri, Antonio Capasso, Packt, 2018.

Online Courses:

1. https://nptel.ac.in/courses/106/105/106105195
2. https://www.udemy.com/course/digital-twin-a-comprehensive-overview

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U18CSR7705 **CAPSTONE PROJECT**

L	T	P	J	C
0	0	0	4	2

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WILL BE ABLE TO,

CO1: Identify issues and design challenges in IoT applications. [K3]

CO2: Analyse various real time problems and design IOT solutions to address it. [K3]

CO3: Develop IOT prototype by analysing various technology choices, and implementation issues. [K3]

Pre-requisite: - Nil

CO/PO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										M
CO2	M	M	M			M					M	M
CO3	M	M	S		S	M	M		S	M	M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Three project reviews 2. End semester viva voce
INDIRECT
Course-end survey

Open ended problem: Students are required to work on IOT based project using a Microcontroller or a Raspberry Pi and connecting various sensors and actuators. The data for the same should be displayed via a web application using various clous platforms. Finally, the students are required to submit a project report.

Sample areas: Home automation, Agriculture, Education, Surveillance, Medical Science, Sports, Energy Conservation, Environment and society

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CYBER SECURITY

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U18CSR3011 INTRODUCTION TO CYBER SECURITY

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Understand the basics of information security, threats and attacks.
CO2: Apply the scientific method for security assessment.

CO3: Apply methods for authentication, access control, intrusion detection and prevention
CO4: Explore network security analysis tools

Pre-requisite: Nil

CO/PO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M						S				M
CO2	S	M			M			S		M		
CO3	S	M										
CO4	M	M			M					M		M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II **2.** Assignment **3.** End Semester Examination
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

FUNDAMENTALS **9 Hours**

An Overview of Information Security: Security, CNSS Security model, Components of an Information system, Balancing Information security and access, Threats, Cybercrime and Information security, Classification of Cybercrimes, The legal perspectives- Indian perspective, Global perspective, Categories of Cybercrime, Types of Attacks, a Social Engineering, Cyber stalking, Cloud Computing and Cybercrime.

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ATTACKS, MALICIOUS LOGIC AND COUNTERMEASURES 9 Hours

Phishing, Password Cracking, Key-loggers and Spywares, Types of Virus, Worms, DoS and DDoS, SQL injection, Buffer Overflow, Spyware, Adware and Ransom ware. Antivirus and other security measures

ISSUES IN SECURITY MANAGEMENT AND CYBER LAWS 11 Hours

Overview, Risk identification, Risk Assessment, Risk Control Strategies, Quantitative vs. Qualitative Risk Control Practices. Risk Management. Laws and Ethics in Information Security, Codes of Ethics, Protecting programs and data

SECURITY TECHNOLOGIES 9 Hours

Security Technology: Access Control, Firewalls, and VPNs, Intrusion Detection and Prevention Systems, Honeypots, Honeynets and Padded Cell Systems, Scanning and Analysis Tools

NETWORK SECURITY ANALYSIS 7 Hours

Information Gathering (Social Engineering, Foot Printing & Scanning). Open Source/ Free/ Trial Tools: Nmap- Zen map Port Scanners, Network scanners
Network Session Analysis, System Integrity Validation. Tools: Wireshark / Cain & abel
Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment. Tools: Zap proxy (OWASP), burp suite.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Nina Godbole, Sunit Belapure , “Cyber Security- Understanding Cyber Crimes”, Computer Forensics and Legal Perspectives, Wiely India Pvt.Ltd, ISBN- 978-81-265-2179-1
2. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Sixth Edition, Cengage Learning, 2017.

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U18CSR4012 **NETWORK SECURITY AND CRYPTOGRAPHY**

L	T	P	J	C
3	0	0	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Analyze and select appropriate security mechanisms for designing various security services.
CO2: Construct cryptographic algorithms from hard problems in mathematics.

CO3: Identify appropriate algorithms for assuring message integrity and authentication
CO4: Discover how cryptographic algorithms are used to build network security protocols
CO5: Identify appropriate mechanisms for providing system security

Pre-requisite: U18CSR3011/Introduction to Cyber Security

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S					M	M		
CO2	S	M										
CO3	S											
CO4	S		M									
CO5	S	M							M	M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II **2.** Assignment **3.** End Semester Examination
INDIRECT
Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **10 Hours**

Security Mechanisms and Services, Classical Encryption Techniques – Block Ciphers, DES, Finite Fields and AES, Block Cipher Operation, Stream Cipher

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PUBLIC KEY CRYPTOGRAPHY **9 Hours**

Primes – Primality Testing –Factorization – Euler‘s totient function, Fermat‘s and Euler‘s Theorem – Chinese Remainder Theorem – Exponentiation and logarithm – Factorization problem and RSA, Discrete Log problem and Diffie Hellman Key Exchange, Elliptic curve cryptography

HASH FUNCTION AND MESSAGE AUTHENTICATION **9 Hours**

Requirements and Security of Cryptographic Hash Functions, SHA, Message Authentication Requirements – Message Authentication Functions – Requirements and Security of Message Authentication Codes–HMAC, Digital Signatures – NIST Digital Signature Algorithm, Key Management and Distribution

NETWORK SECURITY **9 Hours**

Remote User Authentication Principles, Kerberos –Electronic Mail Security–PGP–S/MIME-IP Security–Transport Layer Security, 802.11 wireless security

SYSTEM LEVEL SECURITY **8 Hours**

Intruders, Intrusion Detection, Password Management, Malicious Software: Types, Viruses and Worms, Countermeasures for Viruses and Worms, DDoS Attacks, Firewalls: Needs, Characteristics, Types, Basing, Location and Configuration of Firewalls

.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. William Stallings, “Network Security Essentials: Applications and Standards”, Pearson Education India; 4 edition (2011)
2. William Stallings, “Cryptography and Network Security – Principles and Practices”, Pearson Education; Seventh edition, 2017
3. AtulKahate, “Cryptography and Network Security”, 2nd Edition, Tata McGraw Hill, 2008
4. Bruce Schneier, “Applied Cryptography”, JohnWiley& Sons Inc, 2001.
5. Charles P fleeger and Shari Lawrence P fleeger, “Security in Computing”, Fourth edition, PearsonEducation,2015.

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U18CSR5213 ETHICAL HACKING AND NETWORK DEFENSE

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Describe the legal and ethical requirements related to ethical hacking.
CO2: Understand the vulnerabilities, mechanisms to identify vulnerabilities/threats/attacks
CO3: Perform penetration & security testing
CO4: Examine the different tools and techniques that ethical hackers employ

Pre-requisite: U18CSR4012/Network Security and Cryptography

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										M
CO2	S	M			M	M	M					M
CO3	S	M			M	M	M	M				M
CO4	S	M			M							M

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory Component)
2. Assignment, Mini Project (Theory Component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (Lab Component)
4. Model Examination (Lab component)
5. End Semester Examination (Theory and Lab component)

INDIRECT

Course-end survey

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THEORY COMPONENT CONTENTS

ETHICAL HACKING OVERVIEW & VULNERABILITIES 9 Hours

Understanding the importance of security, Concept of ethical hacking and essential Terminologies-Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking.

FOOTPRINTING & PORT SCANNING 9 Hours

Footprinting - Introduction to foot printing, Understanding the information gathering methodology of the hackers, tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting enumeration-Introduction, enumerating windows OS & Linux OS

SYSTEM HACKING 9 Hours

Aspect of remote password guessing, Role of eavesdropping, Various methods of password cracking, Keystroke Loggers, Understanding Sniffers, Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing

HACKING WEB SERVICES & SESSION HIJACKING 9 Hours

Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools.

HACKING WIRELESS NETWORKS 9 Hours

Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks

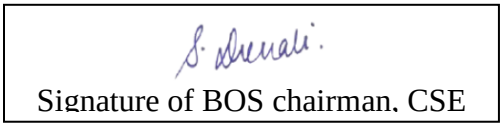
LAB COMPONENT CONTENTS

1. Working with Trojans, Backdoors and sniffer for monitoring network communication
2. Foot Printing & port scanning
3. Password guessing and Password Cracking.
4. Understanding Data Packet Sniffers
5. Denial of Service and Session Hijacking using Tear Drop, DDOS attack.
6. Wireless and mobile hacking and security

Theory: 45	Tutorial: 0	Practical: 30	Project: 0	Total: 75 Hours

REFERENCES

1. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010
3. Rajat Khare, "Network Seuciryt and Ethical Hacking", Luniver Press, 2006
4. Ramachandran V, BackTrack 5 Wireless Penetration Testing Beginner's Guide (3rd ed.). Packt Publishing, 2011
5. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003



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U18CSR6214 **CYBER FORENSICS**

L	T	P	J	C
2	0	2	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Apply security principles in the application layer
CO2: Explain computer forensics
CO3: Use forensics tools
CO4: Analyze and validate forensics data

Pre- requisite- Nil

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M							M				M
CO2	M				M			M				M
CO3	M	M	M		S							M
CO4	M	M	M		S							M

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory Component)
2. Assignment, Mini Project (Theory Component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (Lab Component)
4. Model Examination (Lab component)
5. End Semester Examination (Theory and Lab component)

INDIRECT

Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION TO COMPUTER FORENSICS **8 Hours**

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR:

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Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

EVIDENCE COLLECTION AND FORENSICS TOOLS 8 Hours

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools

ANALYSIS AND VALIDATION 7 Hours

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

CELL PHONE AND MOBILE DEVICE FORENSICS 7 Hours

Understanding mobile device forensics- Mobile phone basics- inside mobile devices- inside PDAs- Understanding acquisition procedures for cell phones and mobile devices- Mobile forensics equipment

LAB COMPONENT CONTENTS

1. Introduction to Cyber Forensics and its tools usage
2. Offenses and Penalties case studies
3. Cyber Forensics investigation methods
4. Regulatory Framework of IT ACT 2000
5. Demonstration of Data Recovery Tools, Process, and Ethics
6. Cyber Forensics Investigations.

REFERENCES

1. Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms and Protocols”, Wiley Publications, 2003.
2. Nelson, Phillips, Enfinger, Steuart, “Computer Forensics and Investigations”, Cengage Learning, India Edition, 2008.
3. John R.Vacca, “Computer Forensics”, Cengage Learning, 2005
4. Richard E.Smith, “Internet Cryptography”, 3 rd Edition Pearson Education, 2008.
5. Marjie T.Britz, “Computer Forensics and Cyber Crime”: An Introduction”, 3 rd Edition, Prentice Hall, 2013.
6. Bill Nelson,Amelia Phillips,Christopher Steuart,”Guide to Computer Forensics and
7. Investigations”, Fourth Edition,Course Technology.
8. Angus M.Marshall, “Digital forensics: Digital evidence in criminal investigation”, John –
9. Wiley and Sons, 2008.

Theory: 30	Tutorial: 0	Practical: 30	Project: 0	Total: 60 Hours

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U18CSR7715 MINI PROJECT WORK

L	T	P	J	C
0	0	0	2	1

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WILL BE ABLE TO,

CO1: Integrate the knowledge acquired in these courses to develop security measures [K3]

CO2: Analyse real time network security issues and design utilities to address it. [K3]

CO3: Deploy, Test and fine tune the developed security application. [K3]

Pre-requisite: Nil

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M			S	M		M				M
CO2	M	M			S			M			M	M
CO3	M	M			S	M	M	M	S	M	M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Three project reviews 2. End semester viva voce
INDIRECT
Course-end survey

Open ended problem: Students are required to work on network security based projects enabling them to apply the fundamental and advanced tools. Finally, the students are required to submit a project report.

Sample areas: Reconnaissance, Pen testing, Vulnerability assessment of organization network and an web application. Cyber forensics, Sniffing tools, security monitoring tools.

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ENTERPRISE NETWORKING AND NETWORK PROGRAMMING

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U18CSR3221	CCNA - INTRODUCTION TO NETWORKS	L	T	P	J	C
		2	0	2	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO 1: Understand architecture, reference models, protocols, networking elements and various transmission media .
CO 2: Understand the addressing schemes and LAN protocol.
CO 3: Ability to build simple networks and implement addressing scheme.
CO 4: Understand the fundamental network security concepts.
CO 5: Ability to configure basic features in a router and switch.

Pre–requisite : Nil

CO/PO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							M				M	M
CO2	S	S	M									
CO3							M					W
CO4	W					M						
CO5		M			M							

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory Component) 2. Assignment, Mini Project (Theory Component) 3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (Lab Component) 4. Model Examination (Lab component) 5. End Semester Examination (Theory and Lab component)
INDIRECT
Course-end survey

THEORY COMPONENT CONTENTS 6 Hours

INTRODUCTION

Introduction –Enterprise networks, Intermediate and end devices, topology diagram, classification of networks, Internet connectivity, basics of network security, device configuration, network architectural models.

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PHYSICAL AND DATA LINK LAYER **6 Hours**

Physical layer protocols, properties, purpose, services, Transmission media, Types, Device physical connectivity, Number system and conversions.

Data link layer Protocols, Network topology, Framing, MAC Address, Arbitration Mechanisms, Types of Ethernet, Bridging and Switching.

NETWORK LAYER **6 Hours**

Network Layer features, IPv4 and IPv6 addressing, Subnetting, IPV4 and IPV6 headers, Path determination and Routing table, ARP, ICMP, Device discovery protocols, Layer 2 & 3 device configuration, Network commands and utilities.

UPPER LAYERS **6 Hours**

Transport, Session, Presentation and Application Layer features, Port numbers, Reliability and flow control, SNMP, POP3, HTTP, DNS, DHCP, File Sharing

NETWORK IMPLEMENTATION AND SECURITY **6 Hours**

LAN Implementation and Verification, Scaling, IOS, Device configuration, Trouble shooting. Introduction to information and network security, terminologies, attacks, configuring security features in layer 2 & 3 devices, verification and troubleshooting.

LAB COMPONENT COMPONENTS

1. Network Representation
2. Cable making and cabling devices
3. Network Commands
4. Basic Layer 2 device configuration and addressing
5. Basic Layer 3 device configuration and addressing
6. Subnetting and VLSM
7. Implement an enterprise network
8. Detail study of network traffic
9. Working with Sniffing tool
10. Troubleshooting connectivity issues

Theory: 30	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 60 Hours**

REFERENCES

1. Cisco Networking Academy, “Introduction to Networks Companion Guide (CCNAv7)”, Cisco Press, 2020.
2. Allan Johnson, “Introduction to Networks Labs and Study Guide (CCNAv7)”, Cisco Press, 2020.
3. Behrouz A. Forouzan, “Data Communication and Networking”, 5th Edition, Tata McGraw Hill, 2013.

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4. Andrew S.Tanenbaum, “Computer Networks”, 5th Edition, Prentice Hall, 2011.
5. Larry L. Peterson & Bruce S. Davie, “Computer Networks: A Systems Approach”, 5th Edition, Morgan Kaufmann Publishers, 2014.
6. James F. Kurose & Keith W. Ross “Computer Networking: A Top-Down Approach”, 6th Edition. Pearson, 2013.

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U18CSR4222	CCNA – SWITCHING, ROUTING & WIRELESS ESSENTIALS	L	T	P	J	C
		2	0	2	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO 1: Understand key switching and routing concepts.
CO 2: Ability to perform basic network configuration and troubleshooting.
CO 3: Ability to identify and mitigate LAN security threats.
CO 4: Understand the WLAN functionality.
CO 5: Ability to configure basic WLAN security.

Pre–requisite : U18CSR3221 – CCNA - Introduction to Networks

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M					M	
CO2	S		M	S								
CO3								M				W
CO4		W				M						
CO5	M				M							

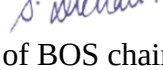
COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory Component) 2. Assignment, Mini Project (Theory Component) 3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (Lab Component) 4. Model Examination (Lab component) 5. End Semester Examination (Theory and Lab component)
INDIRECT
1.Course-end survey

THEORY COMPONENT CONTENTS

SWITCHING AND VLAN **6 Hours**

Introduction – Switching, Domains, Forwarding Methods, basic switch configuration, port configuration, remote access configuration, VLAN basics, multi-switch VLAN, VLAN trunks, Dynamic trunking protocol, Inter-VLAN routing



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6 Hours

SPANNING TREE PROTOCOL AND ETHERCHANNNEL

Spanning tree protocol and its uses, generations of STP, STP operation, EtherChannel and its operations, Configure EtherChannel, verify and troubleshoot

DHCPV4 AND LAN SECURITY **6 Hours**

Purpose of DHCP, DHCPv4 operations, various scenarios, DHCPv4 server and client configuration, SLAAC and DCHPv6, DHCPv6 server, End point security, Access Control, Layer 2 Security Threats, MAC Table attacks, LAN Attacks, Switch Security Configuration

WLAN **6 Hours**

Introduction to wireless, components of WLAN, WLAN operation, CAPWAP operation, WLAN threats, Secure WLANs, WLAN configuration, Basic WLC, Configure WPA2 Enterprise on WLC

ROUTING AND STATIC ROUTES **6 Hours**

Introduction to routing, Path determination and packet forwarding, Basic router configuration, IP routing table, types of routing, static routing, configuring static route, floating static route, packet processing with static routes

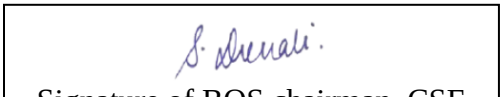
LAB COMPONENT CONTENTS

1. Basic Switch Configuration
2. Basic Router Configuration
3. Configure and Implement VLAN
4. Configure and Implement Inter-VLAN routing
5. Basic Layer 2 device configuration and addressing
6. Basic Layer 3 device configuration and addressing
7. Implement Etherchannel
8. Implement DHCP V4
9. WLAN configuration
10. Static route configuration

Theory: 30	Tutorial: 0	Practical: 30	Project: 0	Total: 60 Hours

REFERENCES

1. Cisco Networking Academy, "Switching, Routing, and Wireless Essentials Companion Guide (CCNAv7)", Cisco Press, 2020.
2. Allan Johnson, "Switching, Routing, and Wireless Essentials Labs and Study Guide (CCNAv7)", Cisco Press, 2020.
3. Behrouz A. Forouzan, "Data Communication and Networking", 5th Edition, Tata McGraw Hill, 2013.
4. Andrew S.Tanenbaum, "Computer Networks", 5th Edition, Prentice Hall, 2011.
5. Larry L. Peterson & Bruce S. Davie, "Computer Networks: A Systems Approach", 5th Edition, Morgan Kaufmann Publishers, 2014.
6. James F. Kurose & Keith W. Ross "Computer Networking: A Top-Down Approach", 6th Edition. Pearson, 2017.



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U18CSR5223	CCNA – ENTERPRISE NETWORKING, SECURITY & AUTOMATION	L	T	P	J	C
		2	0	2	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO 1: Understand and configure dynamic routing protocol
CO 2: Understand wide area networks and quality of service concepts.
CO 3: Understand software defined networks, virtualization and automation concepts
CO 4: Ability to configure and troubleshoot enterprise networks.
CO 5: Ability to protect against cyber security threats.

Pre–requisite : U18CSR4222 – CCNA - Switching, Routing & Wireless Essentials

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					M							M
CO2	S		M					M				
CO3				S								
CO4		W				M						W
CO5		M			M							

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory Component) 2. Assignment, Mini Project (Theory Component) 3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (Lab Component) 4. Model Examination (Lab component) 5. End Semester Examination (Theory and Lab component)
INDIRECT
1.Course-end survey

THEORY COMPONENT CONTENTS

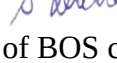
DYNAMIC ROUTING **6 Hours**

Introduction – Dynamic routing, Single area OSPF features, traffic and performance, configuration, modification and verification, Default root propagation.

6 Hours

NETWORK SECURITY

Introduction, Network security concepts, Threats and Threat actors, Attacks, Vulnerabilities, Best practices, Cryptography, Access Control List, Purpose and types, Configure and modify ACLs



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NAT AND WAN **6 Hours**

Network Address Translation concept, characteristics and Advantages, Types, Configuring static and dynamic NAT and PAT. Purpose of WAN, operations, traditional and modern WAN conectivity

6 Hours

VPN AND IPsec

Introduction, VPN technology, types, IPsec, QoS, Network Transmission Quality, Traffic Characteristics, Queuing Algorithm, QoS Models, CDP, LLDP, NTP, SNMP, IOS file management

6 Hours

NETWORK DESIGN VIRTUALIZATION AND AUTOMATION

Network documentation, trouble shooting, Network virtualization, Software defined networking, controllers, Automation, APIs, REST, Configuration Management

LAB COMPONENT COMPONENTS

1. Single Area OSPFv2 Configuration
2. Standard ACL Configuration
3. Extended ACL Configuration
4. Configure static and dynamic NAT for IPv4
5. Password recovery procedure
6. CDP configuration
7. LLDP and NDP configuration
8. Router and Switch file maintenance
9. IOS image management

Theory: 30	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 60 Hours**

REFERENCES

1. Cisco Networking Academy, "Enterprise Networking, Security, and Automation Companion Guide (CCNAv7)", Cisco Press, 2020.
2. Allan Johnson, "Enterprise Networking, Security, and Automation Labs and Study Guide (CCNAv7)", Cisco Press, 2020.
3. William Stallings "Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud", Addison-Wesley Professional, October 2015.
4. Andrew S.Tanenbaum, "Computer Networks", 5th Edition, Prentice Hall, 2011.
5. Larry L. Peterson & Bruce S. Davie, "Computer Networks: A Systems Approach", 5th Edition, Morgan Kaufmann Publishers, 2014.
6. James F. Kurose & Keith W. Ross "Computer Networking: A Top-Down Approach", 6th Edition. Pearson, 2017.

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U18CSR6224	TCP/IP SOCKET PROGRAMMING USING PYTHON	L	T	P	J	C
		3	0	2	0	4

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO 1: Ability to gain knowledge on TCP and UDP sockets
CO 2: Understand and use networking features available in Python
CO 3: Understand and implement fundamental network programming using API.
CO 4: Ability to gain knowledge on socket and socket programming.
CO 5: Understand and implement the advanced network programming concepts.

Pre–requisite : U18CSI2201 /Python Programming

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M					M	M
CO2	S		M									
CO3		S					M					W
CO4	W						M					
CO5		M		M								

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory Component)
2. Assignment, Mini Project (Theory Component)
3. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (Lab Component)
4. Model Examination (Lab component)
5. End Semester Examination (Theory and Lab component)

INDIRECT

Course-end survey

THERORY COMPONENT CONTENTS

INTRODUCTION **6 Hours**

Overview of TCP/IP – Client/Server Paradigm – Program Interface to Protocols–Socket Abstraction and Address Structure – Construction of messages–Byte ordering and Address

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conversion functions – Client software design – Issues in Server Design – I/O Multiplexing – Select and Poll functions – TCP and UDP Sockets

PYTHON NETWORKING **6 Hours**

Introduction, Socket methods, Handling TCP and UDP sockets, Handling received data, Blocking and Non-blocking sockets, securing sockets.

SOCKETS PROGRAMING **9 Hours**

Python Socket Module; socket, bind, listen, accept, connect, read, write, close, Basic example: TCP echo server and TCP echo client, UDP echo server, UDP echo client, Python Chat server and Chat client, Handling multiple clients at once; the select module, python Threading module.

ADVANCED NETWORK PROGRAMMING **9 Hours**

Python and the web, CGI, Twisted (networking framework for Python), some popular python modules: smtplib, httplib, poplib, Programming for the Web; Retrieving web pages with http, Parsing HTML data, XML and XMLRPC, Electronic mail; sending mail, Developing Network server program.

LAB COMPONENT CONTENTS

1. Object oriented programing in Python (concept of class and object).
2. Simple echo-server and echo-client implementing both TCP and UDP socket.
3. Write a program to obtain the Local & Remote Socket Address.
4. Write a program to implement A Telnet Client.
5. Write a program to implement A FTP Client
6. Implement basic chat server and client.
7. Write a program to Obtain The Information About The (A) Host (B) Network (C) Protocols (D) Domains
8. Chat server and client with select and threading module.
9. Design TCP client and server application to transfer file.
10. Design a RPC application to add and subtract a given pair of integers
11. Implement the web server in python.
12. Build a simple peer-to-peer file transfer application.

Theory: 45	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 75 Hours**

REFERENCES

1. W. Richard Stevens, “Unix Network Programming – Vol I”, Third Edition, Pearson Education, 2017
2. John Goerzen, Tim Bower, Brandon Rhodes, “Foundations of Python Network Programming”, Apress,2018

S. Murali.

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U18CSR7725 **MINI PROJECT WORK**

L	T	P	J	C
0	0	0	2	1

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS WILL BE ABLE TO,

CO1: Integrate the knowledge acquired in this course to develop applications. [K3]

CO2: Analyse real time network operation and design utilities to address it. [K3]

CO3: Deploy, Test and fine tune the developed application. [K3]

Pre-requisite: Nil

CO/PO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M				M						M
CO2	M	M	M								M	M
CO3	M	M	S		S	M	M		S	M	M	M

COURSE ASSESSMENT METHODS

DIRECT
1. Three project reviews 2. End semester viva voce
INDIRECT
Course-end survey

Open ended problem: Students are required to work on networking based projects enabling them to apply the fundamental and advanced networking concepts using Python. Finally, the students are required to submit a project report.

Sample areas: Network Utilities, Network Applications, Network Monitoring and Management, Web based applications, Routing, Switching, Sniffing tools.

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BRIDGE COURSE

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U18CST0101 BASICS OF COMPUTING

L	T	P	J	C
2	0	0	0	0

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Design solutions for the given problem using suitable methods

CO2: Solve problems using basic programming concepts

Pre-requisite : NIL

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II 2. Assignment 3. End Semester Examination
INDIRECT
Course-end survey

THEORY COMPONENT CONTENTS

INTRODUCTION **10 Hours**

Introduction to Computers – Need for Logical Thinking –Simple problem solving Techniques. Problem Formulation and Development of Simple Programs - Pseudo Code - Flow Chart and Algorithms.

C PROGRAMMING BASICS **10 Hours**

Introduction to C programming – Fundamentals – Structure of a C program – Compilation and Linking Processes - Constants, Variables – Data Types – Expressions - Operators –Decision Making and Branching – Solving Simple Scientific and Statistical Problems.

Theory: 20	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 20 Hours**

REFERENCES

1. Pradip Dey and Manas Ghosh, “Programming in C”, Second Edition, Oxford University Press, 2011.
2. Byron S Gottfried and Jitendar Kumar Chhabra, “Programming with C”, Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.

S. Sheela.

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