Dr. Mahalingam College of Engineering and Technology

(An Autonomous Institution)

Pollachi - 642 003

Curriculum and Syllabi

B.Tech. Information Technology

Semesters I to VIII

REGULATIONS 2019

DR MAHALINGAM MCET

COLLEGE OF ENGINEERING AND TECHNOLOGY

Enlightening Technical Minds

Department of Information Technology

Vision:

To become a Centre of Excellence in education and research in the field of Information Technology, to meet global challenges in computing industries

Mission:

- To impart world-class knowledge in the field of Information Technology
- To promote industry-institute interactions to empower the faculty members and students
- To support and facilitate research and development activities
- To develop all round personality by inculcating the values and skills needed for students to upgrade themselves as IT professionals

Dr. Mahalingam College of Engineering and Technology, Pollachi – 642003.
(An autonomous institution approved by AICTE and affiliated to Anna University)

Programme: B.Tech. Information Technology

Programme Educational Objectives (PEOs) - Regulation 2019

B.Tech. Information Technology graduates will:

PEO 1. Technical Expertise: Have high level of technical competency to identify problems and to generate innovative solutions, which would conform to the needs of IT industry

PEO 2. Lifelong learning: Successfully adapt to changes in roles and responsibilities, through lifelong learning, for collaborating professionally with various stakeholders

PEO 3. Ethical Knowledge: Ethically apply their computing knowledge and skills considering societal, economic and environmental factors

Programme Outcomes (POs) - Regulations 2019

On successful completion of B.Tech. Information Technology programme, graduating students/graduates will be able to:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2. 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

PO3. 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

PO4. 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

PO5. 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

PO6. 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

PO7. 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

PO8.Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

PO10. 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

PO11. 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

PO12. 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

Programme Specific Outcomes (PSOs) - Regulations 2019

PSO1. Open source software: Develop customized solutions for real world problems using open source software

PSO2. Data science: Manage, store, retrieve and analyze the voluminous data efficiently

Dr. Mahalingam College of Technology, Pollachi
2019 Regulations - Course Code Generation Procedure for UG Courses(v1)

Regulations

Mode of Assessment	
Character Type – Number	
1	Theory
2	Theory with Practical
3	Practical
4	Practical with Theory
5	Theory with SSU
6	Customized

Semester Number	
Character Type – Number	
1 to 8	Semester
0	Floating

Sequence Number
Character Type – Number
01, 02, 03, . . . , 99

1	2	3	4	5	6	7	8	9	10
1	9	A	U	B	G	1	1	0	1

Board/Department/Programme	
Character Type – Alphabet	
AU	Automobile
CE	Civil
CS	Computer Science
EC	Electronics and Communication
EE	Electrical and Electronics
EI	Electronics and Instrumentation
IT	Information Technology
MC	Mechatronics
ME	Mechanical
CH	Chemistry
EN	English
MA	Mathematics
PH	Physics
PS	Professional Skills
SH	Science and Humanities

Course Type	
Character Type – Alphabet	
B	Basic Science
S	Engineering Science
H	Humanities
C	Professional Core
E	Professional Elective
O	Open Elective
N	Online
I	Industry Offered
V	One Credit
P	Project/Skill Development/ Internship
M	Mandatory Non-Credit

Common to any Programme	
Character Type – Alphabet	
G	Generic
C	Common
N	Non-Common

Dr. MAHALINGAM MCET
COLLEGE OF ENGINEERING AND TECHNOLOGY
Enlightening Technical Minds Estd. 1998
An Autonomous Institution (Since 2011)

Dr. MAHALINGAM
COLLEGE OF ENGINEERING AND TECHNOLOGY
Affiliated to Anna University, Chennai; Approved by AICTE ; Accredited by NAAC with Grade 'A++'
Accredited by NBA - Tier1 (Mech, Auto, Civil, EEE, ECE, E&I and CSE)
Udumalai Road, Pollachi - 642 003 Tel: 04259-236030/40/50 Fax: 04259-236070 www.mcet.in

Programme: B.Tech. Information Technology
2019 Regulations
Curriculum for Semesters I to VIII

Course Code	Course Title	Duration	Credits	Marks
19SHMG6101	Induction Program	3 Weeks	-	100

Semester I

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1102	Linear Algebra and Infinite Series	3	1	0	4	100	CS,IT & AD
19ENHG2101	Communication Skills – I	2	0	2	3	100	All
19PHBC2002	Physics for Information Sciences	3	0	2	4	100	CS,IT & AD
19EESC2101	Introduction to Electrical and Electronics Engineering	3	0	2	4	100	CS,IT & AD
19ITSN2101	Problem Solving using C	3	0	3	4.5	100	-
19PSHG6001	Wellness for students	0	0	2	1	100	All
Total		**14**	**1**	**11**	**20.5**	**600**	

Semester II

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1202	Calculus and Transforms	3	1	0	4	100	CS,IT & AD
19ENHG2201	Communication Skills – II	2	0	2	3	100	All
19ECSC2201	Digital System Design	2	0	2	3	100	CS,IT & AD
19ITSN2201	Data Structures using C	3	0	3	4.5	100	-
19MESC4001	Engineering Drawing	1	0	3	2.5	100	AU,CS,EC,EI, IT,ME,MC,PR
19CSSC4001	IT Practices Lab	1	0	4	3	100	CS,IT & AD
19CHMG6201	Environmental Sciences	1	0	0	-	100	All
Total		**13**	**1**	**14**	**20**	**700**	

Semester III

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1303	Discrete Mathematics	3	1	0	4	100	CS & IT
19ITCN1301	Design and Analysis of Algorithms	4	0	0	4	100	-
19ITCN1302	Object Oriented Programming using Java	3	0	0	3	100	-
19ITSN2301	Computer Organization and Microprocessor	3	0	2	4	100	-
19ITCN2301	Software Engineering	3	0	2	4	100	-
19ITCN3301	Design and Analysis of Algorithms Laboratory	0	0	3	1.5	100	-
19ITCN3302	Object Oriented Programming using Java Laboratory	0	0	3	1.5	100	-
XXXXXXXXXX	One Credit Course	0	0	2	1	100	-
Total		**16**	**1**	**12**	**23**	**800**	

Semester IV

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABG1401	Probability and Statistics	3	1	0	4	100	All
19ITCN1401	Operating System	3	0	0	3	100	-
19ITCN2401	Computer Networks	3	0	2	4	100	-
19ITCN2402	Database Management Systems	3	0	3	4.5	100	-
19ITCN4401	Programming with Python Laboratory	1	0	3	2.5	100	-
19ITPN6401	Mini – Project	0	0	4	2	100	-
19PSHG6002	Universal Human Values 2 : Understanding Harmony	2	1	0	3	100	All
XXXXXXXXXX	One Credit Course	0	0	2	1	100	-
Total		**15**	**2**	**14**	**24**	**800**	

Course Code	Course Title	Duration	Credits	Marks
XXXXXXXXXX	Internship or Skill Development*	2 Weeks	1	100

*Refer to clause: 4.8 in UG academic regulations 2019

Semester V

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19ITCN1501	Web Technology	3	0	0	3	100	-
19ITCN2501	Data Mining	3	0	2	4	100	-
19ITCN2502	Cryptography and Network Security	3	0	2	4	100	-
XXXXXXXXXX	Professional Elective – I	3	0	2	4	100	-
XXXXXXXXXX	Professional Elective – II	3	0	0	3	100	-
XXXXXXXXXX	Open Elective – I	3	0	0	3	100	-
19ITCN3501	Web Technology Laboratory	0	0	3	1.5	100	-
19ITCN4501	Mobile Programming Laboratory	1	0	3	2.5	100	-
19PSHG6501	Employability Skills 1: Teamness and Interpersonal Skills	0	0	2	1	100	All
Total		**19**	**0**	**14**	**26**	**900**	

Semester VI

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19ITCN1601	Cloud Computing	3	0	0	3	100	-
19ITCN2601	Internet of Things	3	0	2	4	100	-
XXXXXXXXXX	Professional Elective – III	3	0	2	4	100	-
XXXXXXXXXX	Professional Elective – IV	3	0	0	3	100	-
XXXXXXXXXX	Open Elective – II	3	0	0	3	100	-
19ITCN3601	Cloud Computing Laboratory	0	0	3	1.5	100	-
19ITPN6601	Innovative and Creative Project	0	0	4	2	100	-
19PSHG6601	Employability Skills 2: Campus to Corporate	0	0	2	1	100	All
Total		**15**	**0**	**13**	**21.5**	**800**	

Course Code	Course Title	Duration	Credits	Marks
XXXXXXXXXX	Internship or Skill Development*	2 or 4 Weeks	1	100

*Refer to clause: 4.8 in UG academic regulations 2019

Semester VII

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19ITHN1701	Engineering Economics and Management	3	0	0	3	100	-
19ITCN2701	Artificial Intelligence and Machine Learning	3	0	2	4	100	-
XXXXXXXXXX	Professional Elective – V	3	0	0	3	100	-
XXXXXXXXXX	Professional Elective – VI	3	0	0	3	100	-
XXXXXXXXXX	Open Elective – III	3	0	0	3	100	-
19ITCN4701	Data Science Laboratory	1	0	4	3	100	-
Total		**16**	**0**	**6**	**19**	**600**	-

Semester VIII

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19ITPN6801	Project	0	0	16	8	200	-
Total		**0**	**0**	**16**	**8**	200	

Course Code	Course Title	Duration	Credits	Marks
XXXXXXXXXX	Internship or Skill Development*	8 or 16 weeks	4	100

*Refer to clause: 4.8 in UG academic regulations 2019

Total Credits: 168

Professional Electives

Course Code	Course Title	Hours / Week			Credits	Marks	Common to Programmes
		L	T	P			
Professional Electives (4 Credits)							
19ITEN2001	Developing Web Applications using .NET	3	0	2	4	100	-
19ITEN2002	Server Side Programming	3	0	2	4	100	-
19ITEN2003	Game Programming	3	0	2	4	100	-
19ITEN2004	Arduino Programming	3	0	2	4	100	-
19ITEN2005	Responsive Web Design	3	0	2	4	100	-
19ITEN2006	AngularJS	3	0	2	4	100	-
19ITEN2007	Machine Learning with Python	3	0	2	4	100	-
19ITEN2008	Data Analytics using R	3	0	2	4	100	-
19ITEN2009	Advanced Problem Solving using C	3	0	2	4	100	-
19ITEN2010	Advanced Problem Solving using Java	3	0	2	4	100	-
19ITEN2011	Malware Analysis	3	0	2	4	100	-
19ITEN2012	Advanced Problem Solving using Python	3	0	2	4	100	-
Professional Electives (3 Credits)							
19ITEN1001	Object Oriented Analysis and Design	3	0	0	3	100	-
19ITEN1002	Mobile Communication	3	0	0	3	100	-
19ITEN1003	Software Project Management Concepts	3	0	0	3	100	-
19ITEN1004	TCP/IP Protocols	3	0	0	3	100	-
19ITEN1005	Distributed Databases	3	0	0	3	100	-
19ITEN1006	Quantum Computing	3	0	0	3	100	-
19ITEN1007	Block Chain Technologies	3	0	0	3	100	-
19ITEN1008	Information Storage and Management	3	0	0	3	100	-
19ITEN1009	Service Oriented Architecture	3	0	0	3	100	-
19ITEN1010	Cyber Security Concepts	3	0	0	3	100	-
19ITEN1011	Augmented and Virtual Reality	3	0	0	3	100	-
19ITEN1012	Principles of Management	3	0	0	3	100	-
19ITEN1013	Information Security	3	0	0	3	100	-
19ITEN1014	Cyber Physical Systems	3	0	0	3	100	-
19ITEN1015	Big Data and Analytics	3	0	0	3	100	-
19ITEN1016	Business Intelligence and its Application	3	0	0	3	100	-

Course Code	Course Title	Hours / Week			Credits	Marks	Common to Programmes
		L	T	P			
19ITEN1017	Data Visualization Techniques	3	0	0	3	100	-
19ITEN1018	Robotic Process Automation	3	0	0	3	100	-
19ITEN1019	Natural Language Processing	3	0	0	3	100	-
19ITEN1020	Computer Vision	3	0	0	3	100	-
19ITEN1021	Industry 4.0	3	0	0	3	100	-
19ITEN1022	Software Quality and Testing	3	0	0	3	100	-
19ITEN1023	Agile Project Development	3	0	0	3	100	-
19ITEN1024	Building Enterprise Applications	3	0	0	3	100	-
19ITEN1025	Total Quality Management Techniques	3	0	0	3	100	-
19ITEN1026	Deep Learning	3	0	0	3	100	-
19CSEC6701	Professional Readiness for Innovation, Employability and Entrepreneurship	0	0	6	3	100	CS,IT & EC

Open Electives

Course Code	Course Title	Hours / week			Credits	Marks
		L	T	P		
19ITOC1001	Open Source Technologies	3	0	0	3	100
19ITOC1002	Enterprise Resource Planning	3	0	0	3	100
19ITOC1003	Multimedia Systems and Applications	3	0	0	3	100
19ITOC1004	Cyber Law and Information Security	3	0	0	3	100
19ITOC1005	E-Commerce	3	0	0	3	100
19ITOC1006	Graphical User Interface Design	3	0	0	3	100
19ITOC1007	Disaster Management	3	0	0	3	100
19ITOC1008	Software Modeling-Principles and Practices	3	0	0	3	100
19ITOC1009	Machine Learning using Python	3	0	0	3	100
19ITOC1010	Big Data Management and Analytics	3	0	0	3	100
19ITOC1011	Database Technology	3	0	0	3	100
19ITOC1012	Software Engineering and Design	3	0	0	3	100

Regulations 2019

Detailed Syllabi for Semesters I to VIII

Course Code: 19SHMG6101	**Course Title: Induction Program (common to all BE/B.Tech. programmes)**
Course Category: Mandatory Non-Credit Course	**Course Level: Introductory**
Duration: 3 Weeks	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain various sources available to meet the needs of self, such as personal items and learning resources
2. Explain various career opportunities, opportunity for growth of self and avenues available in the campus
3. Explain the opportunity available for professional development
4. Build universal human values and bonding amongst all the inmates of the campus and society

List of Activities

1. History of Institution and Management: Overview on NIA Education Institutions-Growth of MCET – Examination Process-OBE Practices – Code of Conduct – Centre of Excellence
2. Lectures by Eminent People, Motivational Talk – Alumni, Employer
3. Familiarization to Dept./Branch: HoD Interaction – Senior Interaction – Department Association
4. Universal Human Value Modules: Module 1, Module 2,Module 3 and Module 4
5. Orientation on Professional Skill Courses
6. Proficiency Modules – Mathematics, English, Physics and Chemistry
7. Introduction to various Chapters, Cell, Clubs and its events
8. Creative Arts: Painting, Music and Dance
9. Physical Activity: Games and Sports, Yoga and Gardening
10. Group Visits: Visit to Local areas and Campus Tour

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain various sources available to meet the needs of self, such as personal items and learning resources through visit to local areas and campus	Understand
CO2: Explain various career opportunities and avenues available in the campus through orientation sessions	Understand
CO3: Explain the opportunity available for professional development through professional skills, curricular, co-curricular and extracurricular activities	Understand
CO4: Build universal human values and bonding amongst all the inmates of the campus and society for having a better life	Apply

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	1	2	-	-	-	-
CO2	-	-	-	-	-	-	-	2	1	2	-	-	-	-
CO3	-	-	-	-	-	-	-	2	1	2	-	-	-	-
CO4	-	-	-	-	-	-	-	2	1	2	-	-	-	-

Assessment Pattern

Component	Marks	Details
Attendance	10	Minimum 80% and 1 mark for every 2% observed
Knowledge Test	40	Objective type questions
Work plan for future	50	Career plan developed consulting mentor
Total	**100**	

Non-letter Grades

Marks Scored	Performance Level
70 & above	Good
30 – 69	Average
< 30	Fair

Semester I

Course Code: 19MABC1102		**Course Title: Linear Algebra and Infinite Series (common to CS,IT & AD)**	
Course Category: Basic Science		**Course Level: Introductory**	
L:T:P(Hours/Week) 3: 1: 0	**Credits:4**	**Total Contact Hours:60**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Determine the solution of system of equations using echelon forms
2. Apply the properties of vector spaces
3. Use the Gram-Schmidt process to orthogonalize set of vectors
4. Determine the canonical form of a quadratic form using orthogonal transformation
5. Use different testing methods to check the convergence of infinite series

Unit I Matrices 9+3 Hours

System of linear equations-Homogeneous and Non homogeneous forms-row echelon form-row reduced echelon form-rank of a matrix-Crout's method-Applications to linear systems.

Unit II Basis and Dimension of Vector Spaces 9+3 Hours

Vector spaces -Linear dependence of vectors-Basis, dimension, row space, column space, null space, rank nullity theorem- Linear transformations-matrix associated with a linear map, range and kernel of linear map-Inverse of linear transformation.

Unit III Orthogonality and Inner Product Space 9+3 Hours

Inner product space of vectors-Inner product spaces-length of a vector, distance between two vectors, orthogonally of vectors-orthogonal projection of a vector-Gram-Schmidt process-orthonormal basis.

Unit IV Eigen Values and Eigen Vectors 9+3 Hours

Eigen values and vectors-symmetric, skew symmetric and orthogonal matrices- Diagonalization of symmetric matrices through orthogonal transformation- reduction of quadratic forms to canonical form-rank ,index, signature nature of quadratic forms-Singular Value decomposition.

Unit V Sequences and Series 9+3 Hours

Sequences-definitions and examples- Series-Tests for convergence-comparison test, integral test, Cauchy's root test, Alembert's ratio test- Alternating series –Leibnitz's test.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Solve system of equations using echelon forms	Apply
CO2: Apply the properties of vector spaces	Apply
CO3: Determine orthogonal set of vectors using Gram Schmidt orthogonal process	Apply
CO4: Determine the canonical form of a quadratic form using orthogonal transformation	Apply
CO5: Use different testing methods to check the convergence of infinite series	Apply

Text Book(s):

T1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & sons, 2010.

T2. David C Lay, "Linear Algebra and its Applications", 3rd Edition, Pearson India, 2011.

T3. Howard Anton, Chris Rorres, "Elementary Linear Algebra Applications version", 9th Edition, Wiley India Publications, 2011.

Reference Book(s):

R1. Veerarajan, "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi,2008.

R2. V.Krsihnamurthy, V.P.mainra and J. L. Arora, "An introduction to Linear Algebra", Affiliated East-West press, Reprint 2005.

Web References:

1. https://nptel.ac.in/downloads/111102011/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	1	-	1	1	1	1	2	-	2
CO2	3	2	1	1	-	1	-	1	1	1	1	2	-	2
CO3	3	2	1	1	-	1	-	1	1	1	1	2	-	2
CO4	3	2	1	1	-	1	-	1	1	1	1	2	-	2
CO5	3	2	1	1	-	1	-	1	1	1	1	2	-	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	Tutorial	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ENHG2101	Course Title: Communication Skills – I (common to all BE/B.Tech. programmes)		
Course Category: Humanities		Course Level: Introductory	
L:T:P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max. Marks:100

Pre-requisites

- The student should have undergone English as his/her first or second language in school

Course Objectives

The course is intended to:

1. Listen and understand monologues and dialogues of a native speaker on par with B1 of CEFR level
2. Speak in simple sentences to convey their opinions and ideas on par with B1 of CEFR level
3. Read and infer a given text on par with B1 of CEFR level
4. Draft basic formal written communication on par with B1 of CEFR level

Unit I Listening 15 Hours

Importance of active listening – Physical condition needed for active listening-Identifying relevant points while taking notes.- Framing questions at different linguistic contexts - Listening for specific details of concrete monologues and dialogues – Listening to organize ideas - Developing ideas – Listening to compose paragraphs – Paraphrasing the aural input.

Unit II Speaking 15 Hours

Importance of note making to practice speaking - Traditional note making, developing Mind map - Collecting points from various sources - Identifying relevant ideas needed for the speech -Using mind-map to organize thought processing - Prioritizing the ideas - Types of sentences - Frequently used words (Institution, home and leisure) - Mother Tongue Influence - Expressing the thoughts in simple sentences - Tenses & Voices (Active & Passive) - Postures, gestures and eye contact - Intonation and Sentence stress - Express one's thoughts coherently.

Unit III Reading 15 Hours

Reading strategies - Skimming -Scanning - Interpretation of visual data - Factual texts on subjects of relevance - Inferring texts – Reading to write a review – Checking the accuracy of reading while presenting the interpreted data – Reading to comprehend.

Unit IV Writing 15 Hours

Writing Simple and short sentences **-** Writing E-mail, Memo, Note and Message - Letter Writing - Importance of punctuations -- Identifying the main points - Organising the main ideas - Writing a draft.

List of Tasks

1. BEC Preliminary Listening Test-I & Speaking Test-1
2. BEC Preliminary Listening Test-2 & Speaking Test-2
3. BEC Preliminary Listening Test-3 & Speaking Test-3
4. BEC Preliminary Listening Test-4 & Speaking Test-4
5. BEC Preliminary Listening Test-5 & Speaking Test-5
6. BEC Preliminary Listening Test-6 & Speaking Test-6

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Listen actively and paraphrase simple messages and specific details of concrete monologues and dialogues	Apply
CO2: Express one's views coherently in a simple manner	Apply
CO3: Read and comprehend factual texts on subjects of relevance	Understand
CO4: Write texts bearing direct meanings for different contexts maintaining an appropriate style	Apply

Text Book(s):

T1. Whitby Norman, “Business Benchmark Pre-intermediate to Intermediate Students’ Book”, 2nd Edition, CUP Publications , 2014.

T2. Wood Ian, Williams Anne, Cowper Anna, “Pass Cambridge BEC Preliminary”, 2nd Edition, Cengage Learning, 2015.

T3. Learners Book prepared by the Faculty members of Department of English.

Reference Book(s):

R1. BEC-Preliminary - Cambridge Handbook for Language Teachers, 2nd Edition, CUP 2000.

R2. Hewings Martin - Advanced Grammar in use - Upper-intermediate Proficiency, 3rd Edition, CUP, 2013.

Web References:

1. http://www.grammarinenglish.com -Jan 23, 2018
2. https://www.northshore.edu/support_centre /pdf/listen-notes.pdf
3. http://www.examenglish.com/BEC/BEC_Vantage.html - Jan 23, 2018

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	3	3	-	2	-	-
CO2	-	-	-	-	-	-	-	2	3	3	-	2	-	-
CO3	-	-	-	-	-	-	-	1	-	3	-	2	-	-
CO4	-	-	-	-	-	-	-	1	-	3	-	2	-	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	2,3,4	50	20
	CCET II	2,3,4	50	
	CCET III	2,3,4	50	
	Continuous Assessment – Practical	1,2	75	10
	Final Assessment – Practical	1,2	50	10
End Semester Examination	ESE	2,3,4	100	60
			Total	100

Course Code: 19PHBC2002	**Course Title: Physics for Information Sciences (common to CS,IT & AD) (2020 Batch onwards)**		
Course Category: Basic Science		**Course Level: Introductory**	
L:T:P(Hours/Week) 3: 0: 2	**Credits:4**	**Total Contact Hours:75**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain the fundamental concepts of light
2. Illustrate the characteristics, principles and applications of laser
3. Explain the mode of propagation and losses in optical fibers
4. Identify a suitable technique for fabricating integrated circuits
5. Use the concept of luminescence in various electronic display devices

Unit I Wave Optics 9 Hours

Nature of Light- Laws of reflection and refraction -Total internal reflection – Reflectivity and Transmissivity-The electromagnetic spectrum- properties of electromagnetic radiation- Interference of light waves- Young's double slit experiment – Newton's rings : determination of radius of bright and dark rings- Diffraction of light waves- Fresnel and Fraunhofer diffraction at single slit and circular aperture – Diffraction grating and resolving power.

Unit II Laser 9 Hours

Characteristics of laser light- Einstein's theory of matter radiation interaction A& B Coefficients- Stimulated and spontaneous emissions of radiations - Population inversion and pumping methods – Types of laser: Neodymium Yttrium Aluminum (Nd: YAG) laser and Carbon di oxide (CO_2) molecular gas laser - Semiconductor laser (Homo junction and hetro junction) – Applications: Holograms and Holographic data storage (record/read).

Unit III Fiber Optics 9 Hours

Optical fibers – Principle of light propagation through optical fibers - Expressions for numerical aperture and acceptance angle - Types of optical fibers based on material, refractive index, and mode of propagation - Fabrication of optical fiber : Double crucible method - Dispersion and attenuation in optical fiber - Photo detectors: PN, PIN & Avalanche photo diodes- Fiber optic communication system and its advantages.

Unit IV Integrated Circuits 9 Hours

Introduction to semiconductors: Intrinsic and extrinsic semiconductors- Advantages of Integrated circuits (ICs) over discrete components- IC classification- Construction of bipolar transistor - Epitaxial growth & Oxidation- Photolithography- Isolation diffusion -Base diffusion- Emitter diffusion - Contact mask- Aluminium metallization – Passivation- Structures of integrated PNP transistor.

Unit V Display Devices 9 Hours

Human vision - Red, Blue, and Green (RGB) color scheme – Primary and secondary colors- Color addition and subtraction-Optical Emissions: Luminescence, photoluminescence, cathodoluminescence- electroluminescence -Injection electro Luminescence- Displays (Working principles): Plasma display, LED display, Liquid crystal display (LCD) and Numeric display.

List of Experiments 30 Hours

1. Determination of Laser parameters- Wave length and particle size
2. Determination of Acceptance angle and Numerical aperture of an optical fiber
3. Determination of band gap of semi conducting material – Thermistor
4. Light Illumination characteristics of Light Dependent Resistor
5. Thickness of thin material – Air wedge
6. Determination of wavelength of the given light source using spectrometer

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Explain the fundamentals of light and properties of electromagnetic spectrum	Understand
CO2: Explain the application of Laser through their properties	Understand
CO3: Differentiate various types of optical fiber and its usefulness towards industrial applications	Understand
CO4: Explain the suitable methodology for fabricating integrated circuits	Understand
CO5: Describe the concept of colors and luminescence in various display devices	Understand

Text Book(s):

T1. M. N. Avadhanulu and P. G. Kshirsagar, “Text Book of Engineering Physics”, S. Chand & Company Ltd., New Delhi, 2018.

T2. David Armitage, “Introduction to Micro displays”, John Wiley & Ltd, 2006.

T3. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, 3rd Edition ,New Age International Pvt. Ltd, 2010.

Reference Book(s):

R1. D. Halliday., R. Resnick and J. Walker, “Fundamentals of Physics”, 10th Edition,Wiley Publications, 2014.

R2. Ajoy Ghatak, “Optics”, 5th Edition, Tata McGraw-Hill Education, New Delhi, 2012.

R3. A. Marikani, “Engineering Physics”, 2nd Edition, PHI Learning, New Delhi, 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc17_cy07/preview
2. https://onlinecourses.nptel.ac.in/noc17_ph01/preview
3. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	-	1	2	3	2	3	-	1	1	1
CO2	2	1	1	-	-	1	2	3	2	3	-	1	1	1
CO3	2	1	1	-	-	1	2	3	2	3	-	1	1	1
CO4	2	1	1	-	-	1	2	3	2	3	-	1	1	1
CO5	2	1	1	-	-	1	1	-	1	3	-	1	1	1

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code:19EESC2101	**Course Title: Introduction to Electrical and Electronics Engineering (common to CS,IT & AD)**		
Course Category: Engineering Science		**Course Level: Introductory**	
L:T:P (Hours/Week) **3: 0: 2**	**Credits:4**	**Total Contact Hours:75**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain basics of DC Circuits
2. Explain the fundamentals of AC Circuits
3. Describe the basic electrical machines
4. Summarize the semiconductor devices
5. Outline the display devices and transducers
6. Utilize carpentry and Piping methods

Unit I Fundamentals of DC Circuits 9 Hours

Definition, symbol and unit of quantities – Active and Passive elements – Ohm's Law: statement, illustration and limitation – Kirchhoff's Laws: statement and illustration – Resistance in series and voltage division rule – Resistance in parallel and current division rule– Method of solving a circuit by Kirchhoff's laws – Star to Delta and Delta to Star transformation.

Unit II AC Fundamentals 9 Hours

Magnetic Circuits: Definition of magnetic quantities – Law of electromagnetic induction – Generation of single phase alternating EMF – Terminology – 3 Phase System: 3-Wire and 4 Wire system – Root Mean Square (RMS) – Average value of AC – Phasor representation of alternating quantities – Pure Resistive, Inductive and Capacitive circuits.

Unit III Electrical Machines 9 Hours

DC Generator and DC Motor: Construction, Working Principle, Characteristics of shunt and series motor – Single phase transformer: Construction, working principle - Three phase and Capacitor start and run single phase induction motor: Construction and Working Principle.

Unit IV Semiconductor Devices

9 Hours

Theory of Semiconductor: PN junction diode, Forward Bias Conduction, Reverse Bias Conduction, V-I Characteristics – Bipolar Junction Transistor: Operation of NPN and PNP Transistor, Common Emitter Configuration – Field Effect Transistor & MOSFET: construction and working principle.

Unit V Display Devices and Transducers 9 Hours

Opto-Electronic Devices: Working principle of Photoconductive Cell, Photovoltaic Cell-solar cell Display Devices: Light Emitting Diode (LED) – Liquid Crystal Display (LCD) – Transducers: Capacitive and Inductive Transducer, Thermistors, Piezoelectric and Photoelectric Transducer.

List of Experiments 30 Hours

[A] Electrical & Electronics

1. Identification of resistor and capacitor values
2. Soldering practice of simple circuit and checking the continuity
3. Fluorescent tube, staircase, house wiring and need for earthing

[B] Civil & Mechanical

1. Make a wooden Tee joint to the required dimension
2. Make a tray in sheet metal to the required dimension
3. Assemble the pipeline connections with different joining components for the given layout

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain basic laws and simplification techniques in electrical engineering using DC Circuits	Understand
CO2: Explain the fundamentals and basic principles of AC Circuits	Understand
CO3: Describe the principles of basic electrical machines	Understand
CO4: Summarize the working of semiconductor devices	Understand
CO5: Outline the features of display devices and transducers	Understand
CO6: Utilize Carpentry and Piping methods	Apply

Text Book(s):

T1. R.Muthusubramanian and S.Salivahanan, “Basic Electrical and Electronics Engineering”, McGraw Hill India Limited, New Delhi, 2014.

Reference Book(s):

R1. B.L Theraja, “Fundamental of Electrical Engineering and Electronics”, S.Chand Limited – 2006.

R2. J.B.Gupta, “Basic Electrical and Electronics Engineering”, S.K.Kataria & Sons, 2009.

R3. Smarajit Ghosh, “Fundamental of Electrical and Electronics Engineering”, Second Edition, PHI Learning Private Limited New Delhi, 2010.

R4. S. K. Sadhev, “Basic Electrical Engineering and Electronics”, Tata Mcgraw Hill, 2017.

Web References:

1. https://www.nptel.ac.in/courses/108108076/
2. https://www.oreilly.com/library/view/basic-electrical-and/9789332579170/
3. http://www.ait.ac.jp/en/faculty/lab-enginnering/latter/elec-material/
4. http://www.electrical4u.com
5. http://www.allaboutcircuits.com

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	2	3	2	-	-	1	1
CO2	2	1	-	-	-	-	-	2	3	2	-	-	1	1
CO3	2	1	-	-	-	-	-	2	3	2	-	-	1	1
CO4	2	1	-	-	-	-	-	1	-	1	-	-	1	1
CO5	2	1	-	-	-	-	-	1	-	1	-	-	1	1
CO6	3	2	1	1	-	-	-	2	3	2	-	-	3	2

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	**CO.No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,6	75	10
	Final Assessment – Practical	1,2,3,6	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITSN2101		Course Title: Problem Solving using C	
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 3	Credits:4.5	Total Contact Hours:90	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Write solutions using problem solving techniques and appropriate programming constructs
2. Develop programs using selection, iteration statements and arrays
3. Construct programs using functions and strings
4. Implement programs using pointers, structures and unions
5. Write programs using files and preprocessor directives

Unit I C Programming Basics 9 Hours

General Problem solving strategy – Program development cycle - Problem Solving Techniques : Algorithm, Pseudocode and Flow Chart - Overview of C – Structure of C program – C Character set – keywords- Identifiers – Variables and Constants – Data types – Type conversion – Operators and Expressions – Managing formatted and unformatted Input & Output operation.

Unit II Control Structures and Arrays 9 Hours

Storage classes - Statements: Selection statements - Jump statements - Iteration statements. Arrays: Characteristics of Array – Single-dimensional array – Two-dimensional array – Array Operations – Applications: Linear search, Selection sort, Matrix Operations.

Unit III Functions and Strings 9 Hours

Functions: Declaration & Definition – Return statement – Classification of functions – Parameter passing methods: call by value – call by reference – Passing Array to a Function– Returning Array from a function – Recursion. Strings: Declaration and Initialization of string – Display of strings with different formats – String library Functions – String conversion functions.

Unit IV Pointers, Structures and Union 10 Hours

Pointers: Features and Types of pointers – Operations on pointers – Pointers to an Array. Structures: Declaration & Initialization of Structures – Structure within Structure – Array of Structures – Pointer to Structures – Structure and Functions – typedef. Union: Declaration & Initialization of Union – Operations on Union – Enumerations.

Unit V Files and Preprocessor Directives 8 Hours

Introduction to Files – Streams and File Types – File operations (Open, close, read, write) – Command line arguments – Preprocessor Directives: Macro Expansion, File Inclusion, Conditional Compilation – Graphics functions.

List of Exercises 45 Hours

1. Programs to process data types, operators and expression evaluation
2. Programs using decision and looping statements
3. Programs using arrays and strings
4. Programs using functions and pointers
5. Programs using structures and union
6. Programs using files and graphics functions

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Write solutions using problem solving techniques and appropriate programming constructs for solving problems	Apply
CO2: Develop programs using selection, iteration statements and arrays for a given scenario	Apply
CO3: Construct programs using functions & strings for a given application	Apply
CO4: Implement programs using pointers, structures & unions for various real time applications	Apply
CO5: Write programs using files & preprocessor directives and graphics functions for a given scenario	Apply

Text Book(s):

T1. Ajay Mittal, “Programming in C - A Practical Approach”, 3rd Edition, Pearson Education, 2010.

Reference Book(s):

R1. Venit S, and Drake E, “Prelude to Programming Concepts and Design”, 6th Edition, Pearson Education, 2015

R2. Ashok N.Kamthane, Amit.N.Kamthane, “Programming in C”, 3rd Edition, Pearson Education, 2015.

R3. Yashavant P.Kanetkar, “Let Us C”, 16th Edition, BPB Publications, 2018.

R4. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, 2nd Edition, Oxford University Press, 2013.

Web References:

1. http://www.cprogramming.com/
2. http://www.c4learn.com/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	3	3	2	2	2	2	3	3	2
CO2	3	2	2	2	2	3	3	2	2	2	2	3	3	2
CO3	3	2	2	2	2	3	3	2	2	2	2	3	3	2
CO4	3	2	2	2	2	3	3	2	2	2	2	3	3	2
CO5	3	2	2	2	2	3	3	2	2	2	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19PSHG6001	**Course Title: Wellness for Students (Common to all BE/B.Tech. Programmes) (2020 Batch onwards)**		
Course Category: Humanities		**Course Level: Introductory**	
L:T:P(Hours/Week) 0: 0: 2	**Credits:1**	**Total Contact Hours:30**	**Max. Marks:100**

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Set SMART goals for academic, career and life
2. Apply time management techniques
3. Articulate the importance of wellness for success in life.
4. Understand the dimensions of wellbeing and relevant practices

Unit I Goal Setting

Understanding Vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people. Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume. Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment.

Unit II Time Management - Tools and Techniques

Importance of planning and working to time. Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination

Unit III Practices for Physical Wellness

Concept of wellness – impact of absence of wellness - Wellness as important component to achieve success. Wellbeing as per WHO - Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods

Simplified Physical Exercises. Fitness as a subset of Wellness – health related physical fitness - skill related physical fitness. Joint movements, Warm up exercises, simple asanas, WCSC simplified exercises.

Unit IV Practices for Mental Wellness

Meditation: Mind and its functions - mind wave frequency – Simple basic meditation – WCSC meditation and introspection tables. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.
Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas

Unit V Putting into Practice

Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews.

Course Outcomes At the end of this course, students will be able to:	**Cognitive/ Affective**
CO1: Set well-articulated goals for academics, career, and personal aspirations	Apply
CO2: Apply time management techniques to complete planned tasks on time	Apply
CO3: Explain the concept of wellness and its importance to be successful in career and life	Apply
CO4: Explain the dimensions of wellness and practices that can promote wellness	Apply
CO5: Demonstrate the practices that can promote wellness	Valuing

Text book(s):

T1. Reading material, workbook and journal prepared by PS team of the college.

Reference Book(s):

R1. Stephen R Covey, “First things first”, Simon & Schuster Uk, Aug 1997.
R2. Sean Covey, “Seven habits of highly effective teenagers”, Simon & Schuster Uk, 2004.
R3. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar, “Value education for harmonious life (Manavalakalai Yoga)”, Vethathiri Publications, Erode, I Ed. (2010).
R4. Dr. R. Nagarathna, Dr.H.R. Nagendra, “Integrated approach of yoga therapy for positive health”, Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Ed.
R5. Tony Buzan, Harper Collins, The Power of Physical Intelligence (English).

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO1
CO1	-	-	-	-	-	-	-	-	1	1	-	1	-	-
CO2	-	-	-	-	-	-	-	-	1	-	1	1	-	-
CO3	-	-	-	-	-	-	-	-	1	-	-	1	-	-
CO4	-	-	-	-	-	-	-	-	1	-	-	1	-	-
CO5	-	-	-	-	-	1	1	-	1	-	-	1	-	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	Personal Effectiveness	1,2,5	35	75
	Yoga and physical Exercise: Physical Exercises Meditation Assessment of student's workbook	3,4,5	 20 10 10	
End Semester Examination	Written test (MCQ and short answers) Physical exercises Viva-voce	1,2,3,4,5	30 50 20	Marks out of 100 is reduced to 25
			Total	100

Semester II

Course Code: 19MABC1202	**Course Title: Calculus and Transforms (common to CS,IT & AD)**		
Course Category: Basic Science		**Course Level: Introductory**	
L:T:P(Hours/Week) 3: 1: 0	**Credits:4**	**Total Contact Hours:60**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Determine the curvature and equation of evolutes of a curve
2. Apply partial derivatives to find extreme values of functions of two variables and to vector fields
3. Determine the solution of first and second order ordinary differential equations
4. Compute the Fourier series expansion for given periodic functions
5. Compute Z transform and inverse transform for discrete time sequences

Unit I Differential Calculus 9+3 Hours

Curvature-Cartesian and Polar coordinates- radius of curvature-center of curvature- circle of curvature- Evolutes and Involutes.

Unit II Multivariable Calculus 9+3 Hours

Partial derivatives-total derivatives-Jacobian- maxima and minima and saddle points- method of lagrange multipliers-Gradient- directional derivative- curl and divergence.

Unit III Ordinary Differential Equations of First and Second Order 9+3 Hours

Solution of differential equations of first order and first degree: homogeneous form-linear form and exact differential equations-Second order linear differential equations with constant coefficients-Solution by variation of parameters.

Unit IV Fourier Series 9+3 Hours

Fourier series - Dirichlet's condition - Half range sine and cosine series - Parseval's identity - Harmonic Analysis-Applications.

Unit V Z Transforms 9+3 Hours

Z transform- region of convergence- properties of z transforms- inverse transform-Solution to homogeneous linear constant difference equations-Interpretation of stability in Z domain.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Determine the curvature and equation of evolutes of a curve using differentiation techniques	Apply
CO2: Apply partial derivatives to find extreme values of functions and to vector fields	Apply
CO3: Solve the various types of first, second and higher order ordinary differential equations using various techniques	Apply
CO4: Compute the Fourier series expansion for given periodic functions	Apply
CO5: Compute Z transform and inverse transform for discrete time sequences	Apply

Text Book(s):

T1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & sons, 2010.

T2. B.S.Grewal, "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, 2014.

Reference Book(s):

R1. Veerarajan, "Engineering Mathematics (for semester III)", 3rd Edition, Tata McGraw-Hill, New Delhi, 2010.

R2. Srimanta Pal & Subodh C. Bhunia. "Engineering Mathematics", 1st Edition, Oxford University Press,2015.

Web References:

1. https://nptel.ac.in/courses/117105134/15
2. https://nptel.ac.in/courses/122101003/44

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	1	-	1	1	1	1	2	-	2
CO2	3	2	1	1	-	1	-	1	1	1	1	2	-	2
CO3	3	2	1	1	-	1	-	1	1	1	1	2	-	2
CO4	3	2	1	1	-	1	-	1	1	1	1	2	-	2
CO5	3	2	1	1	-	1	-	1	1	1	1	2	-	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	Tutorial	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ENHG2201	Course Title: Communication Skills – II (common to all BE/B.Tech. programmes)		
Course Category: Humanities		Course Level: Introductory	
L:T:P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max. Marks:100

Pre-requisites

- Communication Skills- I

Course Objectives

The course is intended to:

1. Listen and understand monologues and dialogues of a native speaker on par with B2 of CEFR level
2. Speak in simple sentences to convey their opinion and ideas on par with B2 of CEFR level
3. Read and infer a given text on par with B2 of CEFR level
4. Draft basic formal written communication on par with B2 of CEFR level

Unit I Listening 15 Hours

Importance and purpose of extensive listening and intensive listening - Body Language – Listening tasks on complex and abstract themes- Correlating Ideas related to listening input – importance of empathetic- listening for main ideas – Paraphrasing- Listening to native speakers English – Compound and Complex sentences - Developing ideas – Listening to compose paragraphs.

Unit II Speaking 15 Hours

Jotting down ideas collected from listening to speak – organising the ideas – Expressing one's view coherently – Understanding grammatical elements (Noun – Pronoun Antecedent) – Expressing ideas assertively – Answering questions during presentations – Understanding the use of discourse markers – word stress and sentence stress – voice modulation and pauses – Highlighting significant points – interpretation of visual data – Using verbal cues - Preparing simple hand - outs.

Unit III Reading 15 Hours

Reading strategies – Skimming & Scanning – Inferring meaning- Barriers to reading – sub vocalisation, Eye fixation, Regression – Speed Reading Techniques - Reading different types of texts and their contexts with speed – Note making – Reading a review – Paraphrasing – Reading to comprehend.

Unit IV Writing 15 Hours

Reported speech & Concord (Subject - verb Agreement) - Report writing - Different kinds of Report - Structure of the report - Writing Proposal - Plagiarism – References – Appendices – Techniques for Report writing – Registers.

List of Tasks

1. BEC Vantage Listening Test- I & Speaking Test-1
2. BEC Vantage Listening Test-2 & Speaking Test-2
3. BEC Vantage Listening Test-3 & Speaking Test-3
4. BEC Vantage Listening Test-4 & Speaking Test-4
5. BEC Vantage Listening Test-5 & Speaking Test-5
6. BEC Vantage Listening Test-6 & Speaking Test-6

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Listen actively and empathetically, and paraphrase discussions and presentations on complex and abstract themes and topics	Apply
CO2: Express one's views coherently, fluently and confidently highlighting the significant points with supporting details	Apply
CO3: Read and comprehend different types of texts and their contexts reasonably at moderate speed	Understand
CO4:Write detailed reports on variety of subjects synthesizing information gathered during listening & reading citing appropriate references	Apply

Text Book(s):

T1. Whitby Norman, “Business Benchmark Upper Intermediate Students’ Book”, 2nd Edition, CUP Publications, 2014.

T2. Learners Book prepared by the Faculty members of Department of English.

Reference Book(s):

R1. Cambridge BEC Vantage - Practice Tests, Self-study Edition, Cambridge University Press, 2002.

R2. Hewings Martin , “Advanced Grammar in use - Upper-intermediate Proficiency”, 3rd Edition, CUP, 2013.

Web References:

1. http://www.grammarinenglish.com -Jan 23, 2018
2. https://www.northshore.edu/support_centre /pdf/listen-notes.pdf
3. http://www.examenglish.com/BEC/BEC_Vantage.html - Jan 23, 2018

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	3	3	-	2	-	-
CO2	-	-	-	-	-	-	-	2	3	3	-	2	-	-
CO3	-	-	-	-	-	-	-	1	-	3	-	2	-	-
CO4	-	-	-	-	-	-	-	1	-	3	-	2	-	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	2,3,4	50	20
	CCET II	2,3,4	50	
	CCET III	2,3,4	50	
	Continuous Assessment – Practical	1,2	75	10
	Final Assessment – Practical	1,2	50	10
End Semester Examination	ESE	2,3,4	100	60
			Total	100

Course Code: 19ECSC2201	Course Title: Digital System Design (common to CS,IT & AD)		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 2: 0: 2	Credits: 3	Total Contact Hours: 60	Max Marks:100

Pre-requisites

- Introduction to Electrical and Electronics Engineering

Course Objectives

The course is intended to:

1. Explain fundamental concepts of digital logic design
2. Explain logic processes and implement logical operations using combinational logic circuits
3. Understand concepts of synchronous sequential circuits and to analyze synchronous sequential systems
4. Understand concepts of asynchronous sequential circuits and to analyze asynchronous sequential systems
5. Understand the basic computer system and the peripherals

Unit I Digital Fundamentals 6 Hours

Number System Representation and Conversion - Logic Gates, Universal Gates - Boolean Algebra and Simplification Techniques: SOP – POS and Karnaugh Map Methods for Boolean Expression Simplification.

Unit II Combinational Circuits 6 Hours

Implementing Combinational Logic - Arithmetic Circuits: Full Adder – Full Subtractor - Magnitude Comparator – Multiplexer – Demultiplexer – Encoder and Decoder.

Unit III Synchronous Sequential Circuits 6 Hours

Flip-Flop: RS - JK – T and D – Types of Triggering – Analysis of synchronous sequential circuit - Shift Register.

Unit IV Asynchronous Sequential Circuits 6 Hours

Analysis of asynchronous sequential circuit – Hazards – Static, Dynamic and Essential Hazards.

Unit V Basic Computer System , Memory and I/O Peripherals 6 Hours

Computer System – Computer Memory - Random Access Memory - Read Only Memory - Expanding Memory Capacity – Input / Output Devices - Secondary Storage.

List of Experiments **30 Hours**

1. Verification of Boolean theorems using digital logic gates
2. Implementation of combinational circuits using basic gates
3. Logic verification of half adder and full adder
4. Logic verification of Multiplexer / Demultiplexer
5. Logic verification of 4 bit shift register
6. Logic verification of 3 bit binary counter

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain fundamental concepts in digital logic design	Understand
CO2: Explain the design of combinational logic circuits	Understand
CO3: Elucidate the analysis of synchronous sequential logic circuits	Understand
CO4: Elucidate the analysis of asynchronous sequential logic circuits	Understand
CO5: Categorize a computer system including Input /Output devices and Memory devices	Understand

Text Book(s):

T1. Anil K. Maini, "Digital Electronics Principles, Devices and Applications", John Wiley & Sons, 1st Edition, 2007.

T2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", 6th Edition, McGraw-Hill, 2011.

Reference Book(s):

R1. Morris Mano, Michael Ciletti, "Digital Design", 5th Edition, Pearson Publication, New Delhi, 2014.

R2. Charles H.Roth, Jr. "Fundamentals of Logic Design", 7th Edition, Jaico publishing House, New Delhi, 2014.

R3. Tokheim, "Digital Electronics Principles and Applications", Tata McGraw Hill, 6th Edition, 2004

R4.Leach P Donald, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications", 7th Edition, Mcgraw Hill, 2010

Web References:

1. http://www.nptel.ac.in/courses/ 108105132
2. https://www.surrey.ac.uk/Projects/Labview/boolalegebra/index.html
3. https://scilab.in/textbook_run/2672/42/5

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	2	3	2	-	-	1	1
CO2	2	1	-	-	-	-	-	2	3	2	-	-	1	1
CO3	2	1	-	-	-	-	-	2	3	2	-	-	1	1
CO4	2	1	-	-	-	-	-	2	3	2	-	-	1	1
CO5	2	1	-	-	-	-	-	1	-	1	-	-	1	1

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4	75	10
	Final Assessment – Practical	1,2,3,4	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITSN2201	Course Title: Data Structures using C		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 3	Credits:4.5	Total Contact Hours:90	Max. Marks:100

Pre-requisites

- Problem Solving using C

Course Objectives

The course is intended to:

1. Construct programs using pointer
2. Develop programs using stack and queue
3. Implement Tree structure
4. Implement Graph structure
5. Apply suitable algorithms for sorting and hashing techniques

Unit I Pointers and Linked List 9 Hours

Introduction to pointers- Accessing the address of a variable- Declaring & Initializing pointer variable- Accessing a variable through its pointers- Pointer & Arrays- Array of pointers- Pointers as Function arguments- Pointers to Functions- Pointers and Structures- Types of Data Structures- List ADT: Array and Linked List Implementation – Doubly Linked List – Circularly Linked List-Applications: Radix sort.

Unit II Stack and Queue 9 Hours

Stack ADT: Stack Model – Array and Linked List Implementation of Stack Applications: Balancing Symbols - Postfix Expressions- Infix to Postfix Conversion – Queue ADT: Queue Model – Array and Linked List Implementation of Queue-Double ended Queue.

Unit III Trees 9 Hours

Trees: Implementation of Trees - Tree Traversals – Binary Trees: Implementation – Expression Trees – Binary Search Tree: Implementation– AVL Trees: Single Rotation – Double Rotation – Implementation – Binary Heap.

Unit IV Graph 9 Hours

Graphs: Definitions – Representation of Graphs – Graph Traversals: Breadth First Search – Depth First Search -Topological Sort – Shortest Path Algorithms: Unweighted Shortest Paths – Dijkstra's Algorithm - All Pairs Shortest Path: Floyds Algorithm -Minimum Spanning Tree: Prim's Algorithm – Krushkal's Algorithm.

Unit V Sorting and Hashing 9 Hours

Sorting:-Insertion Short-Shell Sort-Merge Sort-Quick sort-External sorting: Simple Algorithm-Multiway Merge-Hashing: Hash Functions-Separate Chaining-Open Addressing-Rehashing-Extendible hashing.

List of Exercises 45 Hours

1. Array implementation of ADT
    a. List
    b. Stack
    c. Queue
2. Linked list implementation of ADT
    a. List
    b. Stack
    c. Queue
3. Implementation of Binary Tree
    a. Tree Traversal
    b. Binary Search Tree
4. Implementation of Graph
    a. Depth First Search
    b. Breadth First Search
    c. Dijkstra's Algorithm
5. Implementation of Sorting algorithms
    a. Insertion Sort
    b. Quick Sort

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Construct programs using pointers for a given scenario	Apply
CO2: Develop programs using stack and queue for given application	Apply
CO3: Implement Tree structure for a given scenario	Apply
CO4: Implement Graph structures for Networking problem	Apply
CO5: Apply suitable algorithms for sorting and hashing techniques for a given scenario	Apply

Text Book(s):

T1. E.Balagurusamy, "Programming in ANSI C", 4th Edition, Tata McGraw-Hill Education,2017.

T2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education Asia, New Delhi, 2011.

Reference Book(s):

R1. Ajay Mittal, "Programming in C - A Practical Approach", 3rd Edition, Pearson Education, 2010.

R2. Sahni, "Data Structures Using C", Tata McGraw-Hill, New Delhi, 2006.

R3. Michael.T.Goodrich, "Data Structures and Algorithm Analysis in C", Wiley student Edition, New Delhi, 2007.

R4. Thomas H.Cormen, Charles E. Leiserson, Ronald L Rivest, Clifford Stein, "Introduction to Algorithms", MIT Press, England, 2009.

Web References:

1. https://www.coursera.org/specializations/data-structures-algorithms
2. http://www.csse.monash.edu.au/~lloyd/tildeAlgDS
3. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms
4. http://www.c4learn.com

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	2	2	1	1	3	3	2
CO2	3	2	2	2	2	2	2	2	2	1	1	3	3	2
CO3	3	2	2	2	2	2	2	2	2	1	1	3	3	2
CO4	3	2	2	2	2	2	2	2	2	1	1	3	3	2
CO5	3	2	2	2	2	2	2	2	2	1	1	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19MESC4001	**Course Title: Engineering Drawing (common to AU,CS,EC,EI,IT,ME,MC & PR)**		
Course Category: Engineering Science		**Course Level: Introductory**	
L:T:P(Hours/Week) 1: 0: 3	**Credits: 2.5**	**Total Contact Hours: 60**	**Max. Marks:100**

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Develop skills for communication of concepts and ideas
2. Expose them to existing national standards related to technical drawings

Unit I Orthographic Projection 12 Hours

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Projection of points, Projection of straight lines located in the first quadrant. Determination of true lengths and true inclinations. Visualization principles –conversion of pictorial into orthographic views.

Unit II Projection of Solids 12 Hours

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

Unit III Projection of Sectioned Solids 12 Hours

Sectioning of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by cutting planes inclined to one reference plane and perpendicular to the other – Orthographic views of sections of simple solids.

Unit IV Development of Surfaces 12 Hours

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones.

Unit V Isometric Projection 12 Hours

Principles of isometric projection – Isometric scale – Isometric projections of simple solids and truncated solids.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Sketch the orthographic projections of the given pictorial view of the object using first angle projection	Apply
CO2: Sketch the projections of simple solids such as prism, pyramid, cylinder and cone using rotating object method	Apply
CO3: Sketch the projections of simple sectioned solids with all necessary dimensions meeting the standards	Apply
CO4: Sketch the lateral surface of simple solids using straight line and radial line development methods	Apply
CO5: Sketch the isometric view of simple solids and truncated solids using principles of isometric projection	Apply

Text Book(s):

T1. Cencil Jensen, Jay D.Helsel and Dennis R. Short, "Engineering Drawing and Design", 7th Edition, Tata McGraw Hill India, New Delhi, 2017.

T2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", 53rd Edition, Charotar Publishing House, Gujarat, 2015.

T3. K. V. Natrajan, "A Text book of Engineering Graphics", 48th Edition, Dhanalakshmi Publishers, Chennai, 2018.

Reference Book(s):

R1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", 2nd Edition, Tata McGraw Hill India, New Delhi, 2013.

R2. John K.C., "Engineering Graphics", 1st Edition, PHI Learning, Delhi, 2009.

R3. Dhananjay A. Jolhe, "Engineering Drawing with an introduction to AutoCAD", 3rd Edition Tata McGraw India, New Delhi, 2008.

<u>Publications of Bureau of Indian Standards</u>

1. IS 10711 – 2001: Technical products Documentation – Size and layout of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Web References:

1. http://nptel.ac.in/courses/112103019/
2. https://en.wikipedia.org/wiki/Engineering_drawing

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	-	-	2	3	2	-	1	-	-
CO2	3	2	2	2	-	-	-	2	3	2	-	1	-	-
CO3	3	2	2	2	-	-	-	2	3	2	-	1	-	-
CO4	3	2	2	2	-	-	-	2	3	2	-	1	-	-
CO5	3	2	2	2	-	-	-	2	3	2	-	1	-	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	**CO. No.**	**Marks**	**Total Marks**
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	4,5	50	
			Total	100

Course Code:19CSSC4001	**Course Title: IT Practices Lab (2020 Batch onwards) (common to CS,IT & AD)**		
Course Category: Engineering Science		**Course Level: Introductory**	
L:T:P(Hours/Week) 1: 0: 4	**Credits: 3**	**Total Contact Hours: 75**	**Max Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Build a web page with all web page elements
2. Develop a web design for any real time application
3. Design a Mobile application with GUI components
4. Build a real time mobile application

Unit I Introduction 7 Hours

Internet and World Wide Web – Web Browser – Web Server – Web Page – URIs and URLs – Client Side Scripting – Server Side Scripting
Study of Open Source Tools: Open Element, MIT App Inventor, any other Open source Tool

Unit II HTML 8 Hours

Structure of HTML -Special Characters and Horizontal rules – Headers - Lists – Tables – Forms – Links – Images - Internal Linking – frameset element - meta Elements.

List of Experiments 60 Hours

Web Applications

1. Develop a web page with image, text, links, tables
2. Build a web page with Menus, Image links and Navigations bars
3. Create a web page with containers and Media
4. Construct a web page to display own resume
5. Construct a web page to display the products of a company

Mobile Applications

6. Design an application with GUI widgets
7. Design an application with Layouts and Media
8. Create an application using Event handlers
9. Develop a calculator application to perform all arithmetic operations
10. Construct an application to calculate BMI

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Build a web page with all web page elements	Apply
CO2: Develop a web design for any real time application	Apply
CO3: Design a Mobile application using mobile development framework involving GUI components	Apply
CO4: Build a real time mobile application to handheld devices	Apply

Reference(s):

R1. Harvey M. Deitel , Paul J. Deitel,"Internet and World Wide Web – How to Program", Fourth Edition ,Pearson Education Asia, 2009.

R2. David Wolber , Hal Abelson , Ellen Spertus, Liz Looney, "App Inventor 2: Create Your Own Android Apps", 2nd Edition,O'Reilly Media, 2014.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	2	3	2	-	2	3	2
CO2	3	2	2	2	2	1	1	2	3	2	-	2	3	2
CO3	3	2	2	2	2	1	1	2	3	2	-	2	3	2
CO4	3	2	2	2	2	1	1	2	3	2	-	2	3	2

High-3; Medium-2;Low-1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4	50	
			Total	100

Course Code: 19CHMG6201	**Course Title: Environmental Sciences (Common to all BE / B.Tech. Programmes)**	
Course Category: Mandatory Non-Credit Course	**Course Level: Introductory**	
L:T:P(Hours/Week) **1: 0: 0**	**Total Contact Hours:15**	**Max. Marks: 100**

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Create awareness for conservation and equitable use of natural resources.
2. Explain the measures of prevention of pollution and disaster management.
3. State the importance of environmental legislation in India.
4. Expose the general environmental issues relevant to human health.
5. Explain the innovative measures for day to day environmental issues.

Unit I Natural Resources 2 Hours

Role of individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

Unit II Environmental Pollution and Disaster Management 2 Hours

Role of an individual in prevention of pollution; Disaster management : floods, earthquake, cyclone and landslides.

Unit III Environmental Ethics and Legislations 2 Hours

Environmental ethics : Environment Protection Act; Air Act; Water Act ; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation.

Unit IV Environmental Issues and Public Awarness 2 Hours

Public awareness - Environment and human health

Unit V Environmental Activities 7 Hours

(a) Awareness Activities*:*

i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
ii) Slogan making event
iii) Poster making event

(b) Actual Activities:

i) Plantation
ii) Cleanliness drive
iii) Drive for segregation of waste
iv) To know about the different varieties of plants
v) Shutting down the fans and ACs of the campus for an hour or so

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Describe the measures for conservation and equitable use of natural resources	Understand
CO2: Describe the measures for pollution prevention and disaster management	Understand
CO3: Brief the importance of environmental legislation in India	Understand
CO4: Explain the general environmental issues in relevant to human health	Understand
CO5: Demonstrate innovative measures for day to day environmental issues	Understand

Text Book(s):

T1.Benny Joseph, "Environmental Studies", Tata McGraw Hill, New Delhi, 2006.
T2.Mackenzie Davis and Susan Masten, "Principles of environmental engineering and science", Mc-Graw Hill, 3rd Edition, 2014.

Reference Book(s):

R1.Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol.I and II, Enviro Media.
R2.Cunningham, W.P.Cooper,T.H. Gorhani, "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO2	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO3	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO4	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO5	1	-	-	-	-	-	-	2	1	2	-	-	-	-

High-3; Medium-2; Low-1

Assessment Pattern

Component	Marks	Details
Attendance	10	Minimum 80% and 1 mark for every 2% observed
Knowledge Test	40	Objective type questions
Activity(ies)	50	Report on the activity performed
Total	**100**	

Non-letter Grades

Marks Scored	Performance Level
70 & above	Good
30 – 69	Average
< 30	Fair

Semester III

Course Code: 19MABC1303		**Course Title: Discrete Mathematics (common to CS &IT)**	
Course Category: Basic Science		**Course Level: Introductory**	
L:T:P(Hours/Week) 3: 1: 0	**Credits:4**	**Total Contact Hours:60**	**Max. Marks:100**

Pre-requisites

- Linear Algebra and Infinite Series

Course Objectives

The course is intended to:

1. Use the concepts of propositional logic to test the validity of arguments
2. Use the concepts of sets, relations and functions in programming
3. Use combinatorics in counting problems
4. Use the concepts of groups to study the algebraic structures
5. Use Euclidean algorithm to compute gcd and congruence equations

Unit I Logic 9+3 Hours

Propositions- Logical operators – Logical equivalences and implications - Normal forms –Rules of inference-Consistency and inconsistency- Theory of Inference – Proofs – Predicates-Quantifiers- Universe of discourse – Validity of arguments.

Unit II Sets, Relations and Functions 9+3 Hours

Relations –Types of relations – Properties of relations - Equivalence relations –Relational matrix - Graph of relations – Partial ordering relation - Poset – Hasse Diagram - Lattices – Properties of Lattices. Functions - Type of functions: Injective, surjective and bijective functions –Composition of functions – Inverse functions.

Unit III Combinatorics 9+3 Hours

Mathematical induction- Basics of counting–Pigeon hole principle – Permutations with and without repetition – Circular permutation – Combinations - Recurrence relations-Solution of linear recurrence relations.

Unit IV Algebraic Structures 9+3 Hours

Algebraic Systems – properties – Semi groups and monoids – Homomorphism – Sub semi groups and sub monoids – Groups – Abelian group – Cyclic group – Cosets – Lagrange's theorem – Codes and Group codes.

Unit V Divisibility and Congruence 9+3 Hours

Division Algorithm – Prime and Composite Numbers – Fundamental theorem of Arithmetic - Euclidean algorithm - GCD and LCM – Congruence – Linear congruence – Chinese Remainder Theorem.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply logic to test the validity of arguments	Apply
CO2: Apply the concepts of sets, relations and functions in discrete structures	Apply
CO3: Solve the counting problems using combinatorics	Apply
CO4: Apply the concepts of groups and its properties to algebraic structures	Apply
CO5: Compute GCD using Euclidean algorithm and solve system of linear congruence equations	Apply

Text Book(s):

T1. J.P.Trembly, R. Manohar, "Discrete Mathematical Structures with applications to Computer Science", First edition, TMH International Edition,July 2017.

T2. T.Veerarajan, "Discrete Mathematical Structures with Graph Theory and Combinatorics", First edition, Tata McGraw-Hill Education Private Limited, New Delhi, July 2017.

Reference Book(s):

R1. Kennth H. Rosen, "Discrete Mathematics and Its Applications", Seventh edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, July 2017.

R2. Ralph P Grimaldi, Ramana. B. V, " Discrete and Combinatorial Mathematics", Fifth Edition, Pearson Education India, 2011.

R3. Tom M.Apostol, "Introduction to Analytic Number Theory", Springer Science+ Business Media, Newyork, 1976.

Web References:

1. Logic, Relations: http://nptel.ac.in/courses/106106094
2. Combinatorics: https://nptel.ac.in/courses/111/104/111104026/
3. Algebraic Structures: https://nptel.ac.in/courses/106/103/106103205/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	1	-	1	1	1	1	2	3	2
CO2	3	2	1	1	-	1	-	1	1	1	1	2	3	2
CO3	3	2	1	1	-	1	-	1	1	1	1	2	3	2
CO4	3	2	1	1	-	1	-	1	1	1	1	2	3	2
CO5	3	2	1	1	-	1	-	1	1	1	1	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	Tutorial	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN1301		Course Title: Design and Analysis of Algorithms	
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 4: 0: 0	Credits:4	Total Contact Hours:60	Max. Marks:100

Pre-requisites

- Problem Solving using C
- Data Structures using C

Course Objectives

The course is intended to:

1. Apply the fundamental principles of algorithm analysis
2. Apply the different algorithm design techniques
3. Analyze different algorithmic solutions
4. Identify different problem types
5. Introduce the various class of problems and reducibility concept

Unit I Analysis of Algorithms 12 Hours

Introduction: Algorithm specifications - Performance Analysis - Space complexity - Time complexity - Asymptotic Notations & its properties - Basic efficiency classes - Important problem types - Mathematical analysis of non-recursive algorithms - Mathematical analysis of recursive algorithms – Applications: Linear and Non Linear Data Structures.

Unit II Brute Force and Divide & Conquer 12 Hours

Brute Force: General Method - String Matching - Sorting: Selection sort, Bubble sort - Searching: Sequential search.

Divide & Conquer - General method - Merge sort, Quick sort - Finding maximum and minimum element - Strassen's Matrix Multiplication - Searching: Binary search.

Unit III Dynamic Programming and Greedy Techniques 12 Hours

Dynamic Programming: Principles of Optimality - Multistage Graphs - 0/1 Knapsack problem - All pair shortest path - Optimal Binary Search tree - Traveling Salesman Problem.

Greedy: The General method - Knapsack Problem - Tree Vertex splitting - Optimal storage on tapes - Huffman trees.

Unit IV Backtracking 12 Hours

Backtracking: The General method – N Queens Problem - Hamiltonian Circuit Problem - Sum

of Subsets – Graph Coloring – Knapsack Problem.

Unit V Branch & Bound and Computability Classes 12 Hours

Branch and Bound Techniques: The General method - FIFO Branch & Bound - LC Branch & Bound - 0/1 Knapsack problem - Traveling Salesman Problem - Assignment Problem – P, NP, NP Complete, NP Hard Problems– Theory of Reducibility.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply the fundamental principles of algorithm analysis for various problems	Apply
CO2: Compare different algorithm design technique for the stated problem	Analyze
CO3: Analyze different algorithmic solutions for the given scenario	Analyze
CO4: Categorize the problem type using various design techniques	Analyze
CO5: Demonstrate the various class of problems and reducibility concept for computational problems	Apply

Text Book(s):

T1. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, Third Edition, 2013.

Reference Book(s):

R1. Thomas H. Cormen,Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, 3rd Edition, MIT Press and McGraw-Hill Publications,2009.

R2. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education Asia, New Delhi, 2011.

R3. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran,”Fundamentals of Computer Algorithms”, 2nd Edition, Galgotia Publications, NewDelhi 2008.

Web References:

1. http://webpages.uncc.edu/ras/ITCS2215.html
2. http://www.pearsoned.co.in/prc/book/anany-levitin-introduction-design-analysisalgorithms-2e-2/9788131718377
3. https://vtucsenotes.wordpress.com/fourth-sem/design-and-analysis-ofalgorithms/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	1	1	1	1	2	3	2
CO2	3	3	2	2	3	2	2	1	2	1	1	2	3	3
CO3	3	3	2	2	3	2	2	1	2	1	1	2	3	3
CO4	3	3	2	2	3	2	2	1	2	1	1	2	3	3
CO5	3	2	2	2	2	2	2	1	1	2	1	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN1302		Course Title: Object Oriented Programming using Java	
Course Category: Professional Core		Course Level: Practice	
L: T :P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Problem Solving using C

Course Objectives

The Course is intended to

1. Create simple program using java variables, operators and statements
2. Use inheritance concepts to achieve reusability
3. Handle errors using Exception handling and leverage multi-threading capability
4. Use files to store and process data of java program
5. Develop simple GUI based applications and handle objects using collections

Unit I Introduction 9 Hours

Java Features - Java Program Structure - Constants – Variables - Data Types - Scope of Variables – Operators - Java Virtual Machine -Command Line Arguments – Classes & Methods - Object Creation - Constructors – Method Overloading - Static Members - Garbage Collection – Arrays.

Unit II Inheritance, Packages and Interfaces 9 Hours

Class Inheritance: Types - Method Overriding - Super Keyword - Final Variables and Methods - Final Classes. Abstract Classes and Methods – Interfaces - Extending Interfaces - Implementing Interfaces - Hiding Classes - Packages - Importing Packages - Visibility Control - String Class -String Buffer.

Unit III Exception Handling and Thread 9 Hours

Exception: Types - Uncaught Exceptions - Try - Catch - Multiple Catch -Nested Try -Throw-Throws - Finally - Built in Exceptions – User Defined Exceptions – Thread - Extending the Thread Class - Thread Life Cycle -Multithreading-Thread Exception -Thread Priority -Thread Model.

Unit IV Stream and Built in Classes 9 Hours

Introduction to File & Operations - Introduction to Stream - Byte Streams - DataInput / OutputStream —FileInput / OutputStream) - Character Streams (Reader/Writer-FileReader/Writer) - StringTokenizer - Calendar- Date.

Unit V Collections and GUI Programming 9 Hours

Collection, Set, List, Queue, Collections Classes – Array List, Hash Set, Tree Set. Accessing a Collection via Iterators. Map Interfaces - SWING Basics - Layout Managers - Event Handling – Swing Components: JLabel- JButton - JTextField - JRadioButton – JTextArea.

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Create simple java programs that solve simple business problems	Apply
CO2: Apply inheritance and packages in order to attain code minimization and reusability	Apply
CO3: Differentiate multi- threading and multi- tasking concepts and incorporate threads in java application	Apply
CO4: Incorporate data persistence in Java Applications using Streams and Files	Apply
CO5: Design Graphical User Interface (GUI) by using Swing	Apply

Text Book(s):

T1. Schildt. Herbert., “Java - The complete Reference”, 9th Edition, McGraw Hill Education, 2014.

Reference Book(s):

R1. Deitel and Deitel, “Java How to Program”, Prentice Hall, 10th Edition, 2014.

R2. Bruce Eckel, “Thinking In Java”, 4th Edition, Pearson, 2008.

R3. Timothy Budd, “An Introduction to object oriented programming”, 3rd Edition, Pearson Education,2002

Web References:

1. http://docs.oracle.com/javase/7/docs/api/
2. http://www.programmingsimplified.com/java-source-codes
3. http://www.coderanch.com/forums/f-33/java
4. http://www.programmingsimplified.com/java-source-codes

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	3	3	2	2	3	2	3	3	2
CO2	3	2	2	2	2	3	3	2	2	3	2	3	3	2
CO3	3	2	2	2	2	3	3	2	2	3	2	3	3	2
CO4	3	2	2	2	2	3	3	2	2	3	2	3	3	2
CO5	3	2	2	2	2	3	3	2	2	3	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITSN2301	Course Title: Computer Organization and Microprocessor		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits: 4	Total Contact Hours: 75	Max Marks:100

Pre-requisites

- Digital System Design

Course Objectives

The course is intended to:

1. Explain computer system and apply the various addressing schemes
2. Explain the basic processing unit and analyze the issues in pipelining organization
3. Illustrate the functionality of Memory hierarchy
4. Apply the programming concepts of 8086 microprocessor
5. Apply the programming concepts of 8051 microcontroller

Unit I Basic Structure Of Computers and Instruction Set 9 Hours

Functional Units – Basic Operational Concepts – Performance - Memory Location and Addressing - Instructions and Instruction Sequencing - RISC & CISC Architecture.

Unit II Basic Processing and Pipelining 9 Hours

Basic Processing Fundamental Concepts - Instruction Execution - Hardwired Control - Micro Programmed Control. Pipeline Organization - Pipelining Issues – Data Dependencies - Memory Delays – Branch Delays.

Unit III Memory and I/O System 9 Hours

Memory Technology - Semiconductor RAM Memories - Read only memories - Cache Memories - Virtual memory - Accessing I/O devices – Interrupts - Direct Memory Access

Unit IV 8086 Microprocessor 9 Hours

8086 Microprocessor – Architecture - Minimum mode and maximum mode - Addressing modes – Instruction set – Assembler directives – Assembly language programming – Interrupts - Interrupt service routine - Programmable Peripheral Interfacing (PPI)

Unit V 8051 Microcontroller 9 Hours

8051 Architecture – Special Function Registers – Memory organization - Counters and Timers - Interrupts and its types - Instruction sets - Assembly language programming - Keyboard display interfacing.
Introduction to the Arduino – Arduino IDE – Arduino Programs (Not for examination)

List of Experiments **30 Hours**

1. Arithmetic operation using 8086
2. Interfacing stepper motor with 8086
3. Arithmetic operation using 8051
4. Interfacing 7 segment LED display with 8051
5. LED ON/OFF and Proximity sensor control using Arduino
6. Mini project using Arduino

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain computer system and apply the various addressing schemes for instruction sequencing	Understand
CO2: Enlighten the basic processing unit and analyze the issues in pipelining organization	Understand
CO3: Illustrate the functionality of Memory hierarchy	Apply
CO4: Apply the programming concepts of 8086 microprocessor	Apply
CO5: Apply the programming concepts of 8051 microcontroller	Apply

Text Book(s):

T1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, 6th Edition, McGraw-Hill, 2017. (Unit-I, Unit-II and Unit-III)

T2. Ray.A.K. & Bhurchandi.K.M, “Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing”, 3rd Edition Tata Mc Graw Hill, 2013. (Unit-IV and Unit-V)

Reference Book(s):

R1. William Stallings, “Computer Organization & Architecture - Designing for Performance”, 10th Edition, Pearson Publication, 2015.

R2. John Hayes, “Computer Architecture and Organization”, 3rd Edition, McGraw Hill Education, 2017.

R3. Kenneth J. Ayala, “The 8086 Microprocessor: Programming & Interfacing the PC”, 1st Edition, Delmar Publishers, 2007.

R4. Mohamed Ali Mazidi, Janice Gillispie Mazidi, “The 8051 Microcontroller and Embedded Systems using Assembly and C”, Second Edition, Pearson Education / Prentice Hall of India, 2007.

Web References:

1. https://nptel.ac.in/courses/106103068/
2. https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/#bci
3. https://create.arduino.cc/projecthub

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	2	1	1	2	2	2	2	2
CO2	2	2	2	2	2	2	2	1	1	2	2	2	2	2
CO3	3	2	2	2	2	2	2	1	1	2	2	2	3	2
CO4	3	2	2	2	2	2	2	2	2	2	2	2	3	2
CO5	3	2	2	2	2	2	2	2	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Comprehensive Evaluation	CCET 1	1, 2	50	20
	CCET 2	3, 4	50	
	CCET 3	5	50	
	Continuous Assessment – Practical	1,2	75	10
	Final Assessment – Practical	1,2	50	10
End Semester Examination	ESE	1, 2, 3, 4, 5	100	60
Total				100

Course Code: 19ITCN2301		Course Title: Software Engineering	
Course Category: Professional Core		Course Level: Introductory	
L:T:P (Hours/Week) 3 : 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Identify the suitable software process model
2. Demonstrate the requirement model of software
3. Classify the software architecture
4. Apply the selected testing strategy and maintenance
5. Illustrate the concepts of software quality and configuration management

Unit I Software Process and Agile Development 9 Hours

Introduction to Software Engineering - Process Framework-Process Models: Waterfall model-Incremental model-Evolutionary model- Object Oriented Model- Introduction to Agility-Agile process model: XP – scrum.

Unit II Requirement Engineering 9 Hours

Requirement Engineering Tasks- Groundwork-Eliciting requirements- Developing Use Cases – Building the analysis Model – Negotiating Requirements-Validating Requirements-SRS-UML Diagram-Requirement Analysis Modelling:Data Modeling- Scenario Based Modeling- Flow Oriented Modeling-Class Based Modeling.

Unit III Design Engineering 9 Hours

Introduction to design Engineering- Design process and quality – Design Concepts-Design Model–Architectural Styles- Architectural Design – Agility and Architecture-Component level Design: Designing Class based components, Designing traditional Components- User Interface Design: Interface analysis, Interface Design: The Golden rules-User interface analysis and design- Interface analysis- Design issues.

Unit IV Testing and Maintenance 9 Hours

Strategic approach to Software testing- Test strategies for conventional software- Unit testing- Integration testing- Validation testing—system testing-White Box testing- Basis path testing – Black box testing-Graph based testing-Equivalence partitioning –BVA- Software Reengineering – Reverse Engineering.

Unit V Software Quality and Project Management 9 Hours

Software Quality Assurance- Software reviews-Formal technical reviews-Statistical software quality assurance – Reliability- Software configuration Management- SCM Repository- The SCM process- Agile Project Management.

List of Exercises 30 Hours

1. Identify suitable software development model for the specific scenario and demonstrate it
2. Identify the requirements from specific scenario and categorize functional and nonfunctional requirements
3. Create the software requirement specification document for identified scenario
4. Manage the requirements using test link requirement management tool and validate the requirement coverage for specific scenario
5. Select appropriate test cases, prioritize the test case execution and report the failed test execution using test link
6. Generate the test execution report and test coverage report using test link

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Identify the suitable software process model for specific scenario	Understand
CO2: Illustrate the relevant requirement for software	Understand
CO3: Build the software architecture using appropriate design Models.	Apply
CO4: Apply the selected testing strategy and maintenance to the developed software	Apply
CO5: Outline the concepts of software quality and configuration management for project	Understand

Text Book(s):

T1. Roger S.Pressman, Bruce.R.Maxim, “Software Engineering – A Practitioner’s Approach”, 8th Edition, McGraw-Hill International Edition, New Delhi, 2015.

Reference Book(s):

R1.Ian Sommerville, “Software Engineering”, 10th Edition, Pearson Education Asia, 2015.

R2.Shari Lawrence Pfleeger, Joanne M Atlee, “Software Engineering – Theory and Practice”, 4th Edition, Pearson Education Asia, 2012.

R3. Mark C.Layton, “Agile Project Management for Dummies”, John Wiley &Sons, 2012.

R4. Aggarwal K.K And Yogesh Singh, “Software Engineering”, 3rd Edition, New Age International Publishers, 2014.

Web Reference(s):

1. https://nptel.ac.in/courses/106/105/106105182/
2. http://freevideolectures.com/Course/2318/Software-Engineering

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO3	3	2	2	2	2	3	3	2	2	2	2	2	3	2
CO4	3	2	2	2	2	3	3	2	2	2	2	2	3	2
CO5	3	2	1	1	2	3	3	2	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Comprehensive Evaluation	CCET 1	1, 2	50	20
	CCET 2	3, 4	50	
	CCET 3	5	50	
	Continuous Assessment – Practical	1,2	75	10
	Final Assessment – Practical	1,2	50	10
End Semester Examination	ESE	1, 2, 3, 4, 5	100	60
Total				100

Course Code: 19ITCN3301	**Course Title: Design and Analysis of Algorithms Laboratory**		
Course Category: Professional Core		**Course Level: Practice**	
L:T:P(Hours/Week) 0: 0: 3	**Credits:1.5**	**Total Contact Hours:45**	**Max Marks:100**

Pre-requisites

- Problem Solving using C
- Data Structures using C

Course Objectives

The course is intended to:

1. Introduce Searching and Sorting algorithms concepts
2. Apply the fundamental principles of algorithm analysis
3. Apply the different algorithm design techniques
4. Identify different problem types
5. Explore all possible solution for a given problem using Backtracking and Branch & Bound

List of Exercises

1. Implement and Analyze Sorting Algorithms: Selection Sort and Bubble Sort
2. Implement and Analyze Searching Algorithms: Sequential search and Binary search
3. Implement and Analyze Recursive Algorithms
4. Implement and Analyze Brute-force string Matching Problem
5. Implement and Analyze Min-Max Algorithm using Divide and Conquer Approach
6. Implement and Analyze Multistage Graphs using Dynamic Programing Approach
7. Implement and Analyze All pair shortest path using Dynamic Programing Approach
8. Implement and Analyze Knapsack Problem using Greedy Approach
9. Implement and Analyze Sum of subsets using Back Tracking Approach
10. Implement and Analyze Traveling Salesman Problem using Branch and Bound Approach

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Analyze the Searching and Sorting algorithm for the given value	Analyze
CO2: Apply the fundamental principles of algorithm analysis for various problems	Apply
CO3: Analyze different algorithmic solutions for the same problem	Analyze
CO4: Identify different problem types using various design techniques	Apply
CO5: Explore all possible solution for a given problem using Backtracking and Branch & Bound	Analyze

Reference (s):

R1. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2013.

R2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran,"Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications, NewDelhi 2008.

R3. Ajay Mittal, "Programming in C – A Practical Approach" , 3rd Edition, Pearson Education, 2010.

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	2	2	2	3	2	2	2	3	3
CO2	3	2	2	2	2	2	2	2	3	2	2	2	3	2
CO3	3	3	2	2	3	2	2	2	3	2	2	2	3	3
CO4	3	2	2	2	2	2	2	2	3	2	2	2	3	2
CO5	3	3	2	2	3	2	2	2	3	2	2	2	3	3

High-3; Medium-2; Low-1

Assessment pattern

Continuous Assessment	Assessment component	CO. No.	Marks	Total Marks
	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

Course Code: 19ITCN3302	**Course Title: Object Oriented Programming using Java Laboratory**		
Course Category: Professional Core		**Course Level: Practice**	
L:T:P(Hours/Week) 0: 0: 3	**Credits:1.5**	**Total Contact Hours:45**	**Max Marks:100**

Pre-requisites

- Problem Solving using C

Course Objectives

The course is intended to:

1. Develop java program using classes and object
2. Develop java application using inheritance and interface
3. Develop java application to handle exceptions and multithreading
4. Develop simple GUI based applications

List of Exercises:

Introduction

1. Programming in Java Environment
2. Creation of classes and use of different types of functions (inclusive static methods)

Inheritance and Abstract Classes

3. Programs using inheritance
4. Programs using method overloading & overriding
5. Interfaces & Abstract classes
    a. Developing user-defined interfaces
    b. Use of abstract classes and methods

Exception Handling

6. Exception Handling Mechanism in Java
    a. Handling pre-defined exceptions
    b. Creating user-defined exceptions

Multi-Threading and Files

7. Threading
    a. Creation of thread in Java applications
    b. Multi-Threading

8. Programs using Files & Streams

Collections and GUI

9. Programs using Java Collection classes
10. Programs using Swing Components

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Develop java program using classes and object for real world problems	Apply
CO2: Develop java application for achieving code reusability using inheritance and interface	Apply
CO3: Develop java application to handle exceptions and multithreading	Apply
CO4: Develop simple GUI based applications using swing components	Apply

Reference (s):

R1. Schildt. Herbert., "Java - The complete Reference", 9th Edition, McGraw Hill Education, 2014.

R2. Deitel and Deitel, "Java How to Program", Prentice Hall, 10th Edition, 2014.

R3. Timothy Budd, "An Introduction to object oriented programming", 3rd Edition, Pearson Education,2002.

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	1	3	3	2	3	3	2
CO2	3	2	2	2	2	2	2	1	3	3	2	3	3	2
CO3	3	2	2	2	2	2	2	1	3	3	2	3	3	2
CO4	3	2	2	2	2	2	2	1	3	3	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	**CO. No.**	**Marks**	**Total Marks**
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4	50	
			Total	100

Semester IV

Course Code: 19MABG1401	**Course Title: Probability and Statistics (Common to All Branches)**		
Course Category: Basic Science		**Course Level: Introductory**	
L:T:P(Hours/Week) 3: 1: 0	**Credits:4**	**Total Contact Hours:60**	**Max Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Calculate expectations and variances of random variables
2. Apply the concepts of standard distributions to solve practical problems
3. Calculate the correlation and regression for two variables
4. Test the samples based on hypothesis
5. Analyze the samples based on variance

Unit I Probability and Random Variables 9+3 Hours

Axioms of Probability- Conditional Probability- Total Probability -Baye's Theorem- Random Variables- Probability Mass Function- Probability Density Functions- Properties - Moments- Moment generating functions and their properties.

Unit II Standard Distributions 9+3 Hours

Binomial- Poisson- Uniform –Exponential- Normal Distributions and their properties-Functions of a random variable.

Unit III Two Dimensional Random Variables 9+3 Hours

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression – Transformation of random variables.

Unit IV Testing of Hypotheses 9+3 Hours

Sampling Distributions- Testing of hypotheses for mean, variance, proportions and differences using Normal, t, Chi-Square and F distributions – Tests for independence of attributes and Goodness of fit.

Unit V Design of Experiments 9+3 Hours

Analysis of Variance (ANOVA)- One way Classification – Completely Randomized Design(CRD) – Two way Classification – Randomized Block Design (RBD) – Latin square.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Calculate expectations and variances of random variables	Apply
CO2: Apply the concepts of standard distributions to solve practical problems	Apply
CO3: Calculate the correlation and regression for two variables	Apply
CO4: Test the samples based on hypothesis	Apply
CO5: Analyze the samples based on variance	Apply

Text Book(s):

T1. Veerarajan T, "Probability, Statistics and Random process", 4th Edition, Tata McGraw-Hill, New Delhi, 2013.

T2. Douglas C.Montgomery and George C. Runger, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley India Pvt.Ltd.,2017.

T3. Dr.J.Ravichandran, "Probability and Statistics for Engineers", 1st Edition, Wiley India Pvt.Ltd.,2010.

Reference Book(s):

R1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition Pearson Education, Asia, 2016.

R2. M.R. Spiegel,J. Schiller and R.A. Srinivasan, "Schaum's Outlines Probability and Statistics", 3rd Edition,Tata McGraw Hill edition, 2009.

R3. Morris DeGroot, Mark Schervish, "Probability and Statistics", Pearson Educational Ltd, 4th Edition, 2014.

R4. Johnson and C.B. Gupta, "Probability and Statistics for Engineers", 9th Edition, Pearson Education, Asia, 2016.

Web References:

1.Unit I to Unit IV: https://onlinecourses.nptel.ac.in/111105041/

2.Unit I to Unit IV: https://nptel.ac.in/courses/111105090/

3.Unit V : https://nptel.ac.in/courses/111104075/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	1	-	1	1	1	1	2	3	2
CO2	3	2	1	1	-	1	-	1	1	1	1	2	3	2
CO3	3	2	1	1	-	1	-	1	1	1	1	2	3	2
CO4	3	2	1	1	-	1	-	1	1	1	1	2	3	2
CO5	3	2	1	1	-	1	-	1	1	1	1	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Comprehensive Evaluation	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	5	50	
	Tutorial	1,2,3,4,5	30	10
	Quiz	1,2,3,4,5		
	Assignment	1,2,3,4,5		
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Course Code: 19ITCN1401	Course Title: Operating System		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

- Problem Solving using C

Course Objectives

The course is intended to:

1. Explain the structure of operating systems and the concepts of the processes
2. Classify various process management using CPU scheduling, synchronization and deadlocks
3. Select the memory management schemes
4. Compare the various file system interface and its implementation
5. Identify the I/O and disk management functions in operating systems

Unit I Overview of Operating System 8 Hours

Introduction: Computer-System Architecture-Operating System Structure- Operating System Operations-Computing Environments: Virtualization. System Structures: Services-System Calls – Types of System Calls. Process Concept: Process Scheduling: Scheduling Queues-Schedulers-Context Switch– Operations on Processes – Interprocess Communication. Threads: MultiThreading Models – Threading Issues.

Unit II Process Scheduling, Synchronization and Deadlocks 10 Hours

CPU Scheduling: Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling. Synchronization: The Critical Section Problem – Peterson's Solution-Synchronization Hardware – Mutex Locks-Semaphores – Classic Problems of Synchronization. Deadlocks: System Model – Deadlock Characterization –Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance –Deadlock Detection – Recovery from Deadlock.

Unit III Memory Management 9 Hours

Memory Management Strategies- Background – Swapping – Contiguous Memory Allocation – Segmentation- Paging – Structure of the Page Table. Virtual-Memory Management: Demand Paging – Page Replacement-Allocation of Frames-Thrashing.

Unit IV File System 9 Hours

File-System Interface: File Concept – Access Methods – Directory and Disk Structure.

Implementing File-System: File-System Implementation-Directory Implementation – Allocation Methods – Free-Space Management

Unit V Mass Storage Structure and I/O Systems 9 Hours

Mass-Storage Structure: Disk Structure- Disk Scheduling – Disk Management – Swap-Space Management - RAID Structure. I/O Systems: I/O Hardware – Application I/O Interface – Kernel I/O Subsystem – Transforming I/O to Hardware Operations-STREAMS. Case Study-Linux System : Design Principles - Kernel Modules - Process Management – Scheduling - Memory Management - File System - Input-Output - Inter-process Communication.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the structure of operating systems and the concepts of the processes for process scheduling	Understand
CO2: Classify various process management using CPU scheduling, synchronization and deadlocks for concurrently executing the processes	Apply
CO3: Select the memory management schemes to improve both the utilization of the CPU and the speed of its response to its users	Apply
CO4: Compare the various file system interface and its implementation for on-line storage and access to both data and programs	Apply
CO5: Identify the I/O and disk management functions in operating systems for device management	Apply

Text Book(s):

T1. Silberschatz, Galvin, and Gagne, “Operating System Concepts”, 9th Edition, Wiley India Edition, New Delhi 2015.

Reference Book(s):

R1. Andrew S. Tanenbaum, “Modern Operating Systems”, 4th Edition, Pearson Education/PHI, New Delhi 2014.

R2. Gary Nutt, “Operating Systems”, 3rd Edition, Pearson Education, New Delhi, 2009.

R3. Harvey M. Deital, “Operating Systems”, 3rd Edition, Pearson Education, New Delhi, 2009.

R4. Charles Crowley, “Operating Systems A Design –Oriented Approach”, Tata McGraw Hill edition, New Delhi,2002.

Web References:

1. http://codex.cs.yale.edu/avi/os-book/OS9
2. http://fivedots.coe.psu.ac.th/~cj/os/slides/slide-ppt.html
3. http://www.wiley.com/college/silberschatz6e/0471417432/
4. http://engineeringppt.blogspot.in/2009/07/operating-system-concepts-8th-edition.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	2	3	2	2	2	1	1
CO2	3	2	2	2	2	2	2	2	3	2	2	2	3	2
CO3	3	2	2	2	2	2	2	2	3	2	2	2	3	2
CO4	3	2	2	2	2	2	2	2	3	2	2	2	3	2
CO5	3	2	2	2	2	2	2	2	3	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN2401	Course Title: Computer Networks		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Problem Solving using C

Course Objectives

The course is intended to:

1. Emulate the OSI and TCP/IP layers
2. Identify the roles of data link control protocols
3. Explain the network layers working principles
4. Analyze the transport layer functionalities
5. Describe the application layer functionalities

Unit I Introduction 9 Hours

Data Communications - Networks - Network Types - Standards and Administration - Protocol Layering – The OSI Model – TCP/IP Protocol Suite - Transmission media - Guided Media - Unguided Media.

Unit II Data Link Layer 9 Hours

Link Layer Introduction – Addressing - Address Resolution Protocol - Block Coding – Cyclic Redundancy Check – Checksum - Data Link Control services - Stop and Wait Protocol – Go Back N ARQ - Selective Repeat ARQ.

Unit III Network Layer 9 Hours

Network Layer Services - Packet Switching-Network Layer Performance - IPv4 Addresses – Forwarding of IP packets - Internet Protocol – IP Routing Option - ICMPv4 - Distance Vector Routing - Link State Routing - IPv6 Protocols.

Unit IV Transport Layer 9 Hours

Transport Layer Services – Connectionless and Connection - Oriented Protocols - User Datagram Protocol – Transmission Control Protocol - TCP Services – TCP Features – Segment – TCP Connection Establishment and Termination – TCP Congestion Control.

Unit V Application Layer 9 Hours

Client Server Programming - World Wide Web - Hyper Text Transfer Protocols - FTP – Electronic Mail - Telnet – Secure Shell - Domain Name Space - Concept of SDN.

List of Exercises 30 Hours

1. Network trouble-shooting and performance monitoring using ipconfig, ping, netstat commands
2. Visualization of packet flow using Wireshark
3. Interpret the working principles of address resolution protocol using Wireshark
4. Examine IP traffic and its routing options using Wireshark
5. Analyze the TCP connection establishment and termination using Wireshark
6. Configure LAN either using GNS3 or NS2 for generation of data traffic

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Emulate the layers of OSI and TCP/IP networks	Analyze
CO2: Identify the solution for the error control and flow control problems	Analyze
CO3: Explain the working principles of IP layer and its routing algorithms	Evaluate
CO4: Analyze the functionalities of transport layer protocols and its congestion control mechanism	Analyze
CO5: Describe the functionalities of application layer protocols	Analyze

Text Book(s):

T1. Behrouz A. Forouzan, “Data communication and Networking”, 5th Edition, Tata McGraw-Hill Publishing Co. Pvt., Ltd., New Delhi 2014.

Reference Book(s):

R1. James F. Kurose and Keith W. Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, 6th Edition, Pearson Education, New Delhi 2012.

R2. Andrew S. Tanenbaum, “Computer Networks”, 5th Edition, Prentice Hall, New Delhi, 2010.

R3. William Stallings, “Data and Computer Communication”, 10th Edition, Pearson Education, New Delhi 2013.

R4. Thomas D. Nadeau, Ken Gray, “SDN: Software Defined Networks: An Authoritative Review of Network Programmability Technologies”, 1st Edition, O'Reilly Media, 2013.

Web References:

1. http://highered.mheducation.com/sites/0073376221/student_view0/index.html
2. http://nptel.ac.in/courses/106105081/1
3. http://www-net.cs.umass.edu/kurose-ross-ppt-6e/
4. http://iiscs.wssu.edu/drupal/node/4643

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	2	2	2	2	2	2	2	3	3
CO2	3	3	2	2	3	2	2	2	2	2	2	2	3	3
CO3	3	3	2	3	3	2	2	2	2	2	2	2	3	3
CO4	3	3	2	2	3	2	2	2	2	2	2	2	3	3
CO5	3	3	2	2	3	2	2	2	2	2	2	2	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment - Practical	1,2,3,4,5	75	10
	Final Assessment - Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN2402		Course Title: Database Management Systems	
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3:0:3	Credits:4.5	Total Contact Hours:90	Max. Marks:100

Pre-requisites

- Data Structures using C

Course Objectives

The course is intended to:

1. Construct relational databases for the given application
2. Build SQL queries to manipulate the data in the database
3. Design the databases with efficient storage space
4. Use correct concurrency control protocols to ensure the ACID property of transaction
5. Build NoSQL queries to deal the unstructured data

Unit I Introduction 9 Hours

Purpose of Database System – Views of data – Database Languages –Database System Architecture – Database users and Administrator – Applications of DBMS-Structure of Relational Databases-Database Schema-Keys-Schema Diagrams-Relational Algebra.

Unit II SQL 9 Hours

Overview of SQL – Integrity Constraints –SQL Data Types and Schemas-Index Definition in SQL – Set Operations-Aggregate Functions-Nested Sub queries-Accessing SQL from a Programming Language-Functions and Procedures-Triggers.

Unit III Database Design 9 Hours

ER Model– Complex Attributes– Mapping Coordinalities– Reducing E-R Diagrams to Relational Schemas–Functional Dependencies – Non-loss Decomposition – Dependency Preservation – First, Second, Third Normal Forms – Boyce/Codd Normal Form– Fourth Normal Form.

Unit IV Transaction 9 Hours

Transaction Concepts – Transaction Recovery – ACID Properties– Concurrency – Need for Concurrency– Lock Based Protocols– Deadlock Handling –Timestamp Based Protocols – Validation-Based Protocols– Serializability.

Unit V Query Processing and Optimization 9 Hours

Indexing – Ordered Indices– B+ Tree Index Files– Hash Indices–Query Processing –Query Optimization – Introduction to Distributed Databases- Introduction to No SQL- Mongo DB-Creating and Deleting Documents- Querying.

List of Exercises **45 Hours**

(Exercises are to be carried out in MySQL for RDBMS and MongoDB for NoSQL with required front end software)

1. DDL, DML,DCL and TCL operations in Relational DataBase Management Systems.
2. Retrieving Data from a Database using Clause, Aggregate Functions, Joins, Views and Sub queries.
3. Write a program to implement trigger.
4. Write a program to implement stored procedure.
5. Working with NoSQL Databases (MongoDB).
6. Build a GUI to any one of the following applications with back-end connectivity.
   - Library Information system
   - Students information system
   - Ticket Reservation system
   - Hotel Management System
   - Hospital Management System
   - Inventory Control
   - Retail Shop Management
   - Employee Information System
   - Payroll system
   - And any other similar system

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Construct relational databases for the given application	Apply
CO2: Build SQL queries to manipulate the data in the database	Apply
CO3: Design the databases with efficient storage space using normalization techniques	Apply
CO4: Use correct concurrency control protocols to ensure the ACID property of transaction	Apply
CO5: Build NoSQL queries to deal the unstructured data using MongoDB	Apply

Text Book(s):

T1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, March 2019.(Unit I - IV)

T2. Kristina Chodorow, "Mongo DB: The Definitive Guide", Second Edition, O'reilly Publications, 2013 (Unit V)

Reference Book(s):

R1. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill Publications, 2015.

R2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson, 2011.

Web References:

1. www.tutorialspoint.com

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	2	3	2	2	2	3	2
CO2	3	2	2	2	2	2	2	2	3	2	2	2	3	2
CO3	3	2	2	2	2	2	2	2	3	2	2	2	3	2
CO4	3	2	2	2	2	2	2	2	3	2	2	2	3	2
CO5	3	2	2	2	2	2	2	2	3	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment - Practical	1,2,3,4,5	75	10
	Final Assessment - Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN4401	Course Title: Programming with Python Laboratory		
Course Category: Professional Core		Course Level: Practice	
L: T: P (Hours/Week) 1: 0: 3	Credits:2.5	Total Contact Hours: 60	Max Marks:100

Pre-requisites

- Problem solving using C
- Object Oriented Programming using Java

Course Objectives

The course is intended to:

1. Develop Python programs using variables and statements for simple business logic
2. Utilize suitable data structures for a given problem and its constraints
3. Create classes and objects for provided business requirement
4. Create a GUI based application with data persistence using databases

Unit I Introduction to Python and Data Structures 7 Hours

Introduction to Python- Variables, Expressions and Statements – File handling operations- Conditionals - Lists- Tuples- -Dictionaries – Strings –Functions.

Unit II OOPS Concepts and GUI Programming in Python 8 Hours

Classes- Creating Instance Objects- Built-In Class Attributes- Inheritance- TKinter – Widget creation- Database Connection: INSERT - READ - UPDATE - DELETE Operation-GUI application with database connection.

List of Exercises 45 Hours

1. Basic exercise in Python interpreter command line
2. Write a Python program using variables, expressions & statements
3. Implement the file handling operations in Python
4. Create a Python program using List, Tuple, and Dictionary
5. Write Python program to utilize strings
6. Write Python program to utilize pre-defined modules in IDLE environment
7. Create a python program to demonstrate OOP’S concepts

8. Design a GUI programming with Tkinter for given application
9. Create a Python program to store and process data from a database
10. Create a Python GUI application with database connection

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Build a console-based application using variables, expressions and functions	Apply
CO2: Develop a python application using list, tuple and dictionary	Apply
CO3: Apply object-oriented programming concepts to develop console-based applications	Apply
CO4: Develop an GUI application using Tkinter and database packages	Apply

Reference (s):

R1. Allen Downey, “Think Python” ,2nd Edition, Green Tea Press, 2012

R2. Laura Cassell, Alan Gauld, “Python Projects”, Wrox Publication,2015

Web References:

1. https://www.coursera.org/learn/python
2. https://www.fullstackpython.com/databases.html
3. http://www.effbot.org/tkinterbook/tkinter-index.htm

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	1	2	2	2	3	3	2
CO2	3	2	2	2	2	2	2	1	2	2	2	3	3	2
CO3	3	2	2	2	2	2	2	1	2	2	2	3	3	2
CO4	3	2	2	2	2	2	2	1	2	2	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	CO. No.	Marks	Total Marks
Continuous Assessment	Each Lab Experiment	1,2,3,4	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4	50	
			Total	100

Course Code: 19ITPN6401		**Course Title: Mini – Project**	
Course Category: Project		**Course Level: Practice**	
L:T:P(Hours/Week) **0: 0: 4**	**Credits:2**	**Total Contact Hours:60**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Formulate the solutions using relevant modern tools
2. Combine in teams performing different roles for effective accomplishment of project goals
3. Propose the methods and materials, findings, results and solutions through reports and presentations

The objective of Mini-Project is to enable the student to take up exploratory study in the broad field of Information Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Formulate the solutions using relevant modern tools to simple engineering problems that are relevant to the discipline	Create
CO2: Combine in teams performing different roles for effective accomplishment of project goals following ethical practices	Create
CO3: Propose the methods and materials, findings, results and solutions through reports and presentations in appropriate forums.	Create

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	Review 1	1,2,3	25	75
	Review 2	1,2,3	25	
	Review 3	1,2,3	25	
End Semester Examination	ESE	1,2,3	25	25
			Total	100

Course Code: 19PSHG6002	**Course Title: Universal Human Values 2 :Understanding Harmony (Common to all BE/B.Tech. Programmes)**		
Course Category: Humanities		**Course Level: Practice**	
L:T:P (Hours/Week) 2:1: 0	**Credits:3**	**Total Contact Hours:45**	**Max Marks:100**

Pre-requisites

- Induction Program (UHV 1)

Course Objectives

The course is intended to:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Strengthening of self-reflection
3. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
4. Development of commitment and courage to act

Unit I Introduction to Value Education 6+3 Hours

Need for the Value Education; Self -exploration as the process for value education ; Continuous Happiness and Prosperity: A look at basic Human Aspirations; Right understanding: Relationship and Physical Facilities ; Happiness and Prosperity: current scenario ; Method to fulfill the Basic human aspirations.

Unit II Harmony in Human Being 6+3 Hours

Human being as a co-existence of self (‘I’) and the material ‘Body’; needs of Self ('I') and 'Body'; The Body as an instrument of ‘I’; Harmony in the self (‘I’); Harmony of the self (‘I’) with body; Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Unit III Harmony in the Family and Society 6+3 Hours

Harmony in the Family the basic unit of human interaction; Values in human to human relationship; Trust as the foundational values of relationship; Respect as the right evaluation ;Understanding harmony in the society (society being an extension of family); Vision for the universal human order.

Unit IV Harmony in the Nature 6+3 Hours

Understanding the harmony in the Nature Interconnectedness, self-regulation and mutual fulfillment among the four orders of nature; Existence as Co-existence at all levels; Holistic perception of harmony in existence.

Unit V Harmony on Professional Ethics 6+3 Hours

Natural acceptance of human values ;Definitiveness of Ethical Human Conduct; Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics ;Case study: holistic technologies, management models and production systems;Strategy for transition towards value based life and profession.

Course Outcomes	**Affective Level**
At the end of this course, students will be able to:	
CO1.Reflect on values, aspiration, relationships and hence identify strengths and weaknesses	Responding
CO2.Appraise physical, mental and social wellbeing of self and practice techniques to promote wellbeing	Responding
CO3.Value human relationships in family and society and maintain harmonious relationships	Valuing
CO4.Respect nature and its existence for survival and sustainable of all life forms and hence practice conservation of nature	Valuing
CO5.Appreciate ethical behaviour as a result of value system in personal and professional situations	Receiving

Text Book(s):

T1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference Book(s):

R1.Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3. The story of stuff, Annie Leonard, Free Press, New York 2010.

Web References:

1. https://aktu.ac.in/hvpe/ResourceVideo.aspx
2. http://hvpenotes.blogspot.com/
3. https://nptel.ac.in/courses/109/104/109104068/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	1	2	2	-	-	2	-	-
CO2	-	-	-	-	-	1	2	2	2	1	-	2	-	-
CO3	-	-	-	-	-	2	2	2	2	1	-	2	-	-
CO4	-	-	-	-	-	2	2	2	2	-	-	2	-	-
CO5	-	-	-	-	-	1	2	2	2	-	-	2	-	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment component	CO No.	Marks	Total marks weightage
Continuous assessment	Socially relevant project/Group Activities/ Assignments	1,2,3,4,5	20	75%
	Assessment by faculty mentor		10	
	Self-assessment		10	
	Assessment by peers		10	
End Semester Examination	Part A – Objective type – 20x1=20 marks Part B – Short answer questions – 15x 2 = 30 marks Part C – Descriptive Type Questions (Either or Pattern) – 5 x 10 = 50 marks	1,2,3,4,5	100	25%
			Total	100%

Semester V

Course Code: 19ITCN1501		**Course Title: Web Technology**	
Course Category: Professional Core		**Course Level: Practice**	
L:T:P(Hours/Week) **3: 0: 0**	**Credits:3**	**Total Contact Hours:45**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Design a static webpage
2. Design the dynamic web page
3. Develop dynamic and interactive pages
4. Develop rich internet application
5. Design a webpage with database connectivity

Unit I Web Essentials & HTML 8 Hours

Web Essentials: Internet Protocols- HTTP Request and Response Message - Web Clients and Servers - HTML 5.0: Basics – Linking – Images - Text & Block Level formatting - Lists – Tables - Forms – Frames.

Unit II CSS & Client side scripting 10 Hours

Style Specification Formats - Font & Text Properties - Backgrounds & Borders- Box model and Text Flow - Transformations and Transitions. JavaScript: Variables and Datatypes – Statements - Operators - Control Statements- Functions- Arrays - Dynamic documents with JavaScript- Validation.

Unit III Java Framework 9 Hours

DOM: Introduction to DOM - Document Tree-Event Handling - JSP: Basic JSP, Database Access using JSP. Angular JS: Expressions – Directives – Events, Introduction to Spring.

Unit IV XML & JSON 9 Hours

XML: Basics- Namespaces - XSLT-DTD's – XML Schema – AJAX: Basics - RIAs with Ajax - JSON: Basics- JSON Parse & Stringify – JSON Arrays - JSON with HTML.

Unit V Server Side Scripting 9 Hours

PHP: Introduction - Primitive Operations and Expressions -Control Statements – Arrays - Functions - Farm Handling - Database Access with PHP & MYSQL.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Design a static webpage by applying HTML elements	Apply
CO2: Apply CSS concepts for designing HTML web pages	Apply
CO3: Develop dynamic and interactive pages using JavaScript, JQuery and Angular JS	Apply
CO4: Develop rich internet application using XML and AJAX	Apply
CO5: Design a webpage with database connectivity by applying JSP , PHP with MySQL	Apply

Text Book(s):

T1. Robert W Sebesta, “Programming the world wide web“, 8th edition, Pearson, 2015.

Reference Book(s):

R1. Jaffrey C.Jackson, “Web Technologies- A Computer Science Perspective”, Pearson Education, 2014.

R2. Thomas Powell, “The Complete Reference HTML and CSS”, 5th Edition, Tata McGraw Hill, 2010.

R3. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel , “Internet & World Wide Web : How to Program”, 5th Edition, PH Professional Business, 2012.

Web References:

1. www.w3schools.com
2. www.tutorialspoint.com
3. www.html.com
4. www.htmlref.com

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	1	2	2	2	3	3	2
CO2	3	2	2	2	2	1	1	1	2	2	2	3	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	3	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	3	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN2501		**Course Title: Data Mining**	
Course Category: Professional Core		**Course Level: Practice**	
L:T:P(Hours/Week) **3: 0: 2**	**Credits:4**	**Total Contact Hours:75**	**Max. Marks:100**

Pre-requisites

- Database Management Systems

Course Objectives

The course is intended to:

1. Identify the types of data to be pre-processed for the given dataset
2. Examine the prediction accuracy for the real world data
3. Categorize the kinds of patterns that are discovered by association rule mining
4. Construct a cluster of data for the given dataset
5. Analyze the data mining trends and applications

Unit I Introduction 9 Hours

Introduction: Different Kinds of Data and Patterns Mined –Applications – Attribute Types – Data Preprocessing: Data Cleaning – Data Integration – Data Reduction – Data Transformation - Data Discretization - Data Visualization.

Unit II Classification 10 Hours

Basic Concepts- Decision Tree Induction – Bayes Classification Methods – Rule Based Classification – K-Nearest-Neighbor Classifier - Model Evaluation and Selection – Techniques to Improve Classification Accuracy.

Unit III Association 8 Hours

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts - Frequent Itemset Mining using Apriori Algorithm - A Pattern-Growth Approach for Mining Frequent Itemsets - Pattern Evaluation Methods.

Unit IV Clustering 9 Hours

Cluster Analysis: Partitioning Methods: k-Means - k-Medoids - Hierarchical Methods: Agglomerative – Divisive – BIRCH – Chameleon - Density-Based Methods: DBSCAN – OPTICS - DENCLUE – Grid-Based Methods: STING - CLIQUE.

Unit V Data Mining Trends 9 Hours

Mining Complex Data Types-Statistical Data Mining-Views on Data Mining Foundations-Visual and Audio Data Mining-Data Mining Applications-Data Mining and Society.

List of Exercises 30 Hours

1. Identification of dataset and its characteristics
2. Data preprocessing: Cleaning, Transformation, Integration and Reduction
3. Data Classification using Decision Tree on the given data set
4. Identification of frequent itemset and generation of association rules using Apriori algorithm
5. Cluster the given data set using K-Means clustering algorithm
6. Visualize and analyze the results for the given dataset using various performance metrics

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Identify the types of data to be pre-processed for the given dataset using the preprocessing technique	Apply
CO2: Examine the prediction accuracy using different classification algorithms for the real world data	Analyze
CO3: Categorize the kinds of patterns that are discovered by association rule mining for transaction database	Analyze
CO4: Construct a cluster of data using different clustering algorithms for the given dataset	Apply
CO5: Analyze the data mining trends and applications for societal problems	Analyze

Text Book(s):

T1. Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining: Concepts and Techniques”, 3rd Edition, Elsevier, 2014.

Reference Book(s):

R1. Jure Leskovec, Anand Rajaraman, Jeffery David Ullman, “Mining of Massive Datasets”, 2nd Edition, Cambridge University Press, 2014.

R2. Ian H.Witten, Eibe Frank, Mark A.Hall, “Data Mining: Practical Machine Learning Tools and Techniques”, 3rd Edition, Elsevier, 2011.

R3. EMC Education Services, “Data Science and Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data”, Wiley, 2015.

R4. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons 2013.

Web References:

1. http://www.cs.waikato.ac.nz/ml/weka/documentation.html
2. https://cran.r-project.org/manuals.html
3. https://archive.ics.uci.edu/ml/index.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	2	2	2	2	2	3	2
CO2	3	3	2	2	3	2	2	2	2	2	2	2	3	3
CO3	3	3	2	2	3	2	2	2	2	2	2	2	3	3
CO4	3	2	2	2	2	2	2	2	2	2	2	2	3	2
CO5	3	3	2	2	3	2	2	2	2	2	2	2	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment - Practical	1,2,3,4,5	75	10
	Final Assessment - Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN2502		Course Title: Cryptography and Network Security	
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Computer Networks

Course Objectives

The course is intended to:

1. Examine the strength of classical and modern cipher mechanisms
2. Identify various number theory functions
3. Recognize the various authentication techniques
4. Analyze wired and wireless security mechanism
5. Choose the suitable internet security standards

Unit I Symmetric Key Cryptography 12 Hours

OSI Security Architecture - Classical Encryption techniques: Caesar cipher - Hill cipher - Play fair cipher - Row transposition cipher - Column transposition cipher. Data Encryption Standard - Modes of Operation: Electronic Code Book - Cipher block chaining – Counter. Advanced Encryption Standard (AES): Basic Structure – Transformation – Key Expansions Process.

Unit II Asymmetric Key Cryptography 9 Hours

Public Key Cryptography- RSA - Elliptic Curve Cryptography- Elgamal Cryptosystem - Key Management- Diffie- Hellman Key Exchange Algorithm.

Unit III Data, User And Server Authentication 9 Hours

Message Authentication Code -Hash Functions -Security of Hash Functions and MACs - Secure Hash Algorithm - HMAC - Digital Signature Standard- Remote User Authentication- Kerberos - X.509 Authentication Service.

Unit IV Wired And Wireless Security 8 Hours

Web Security – Secure Socket Layer- Transport Layer Security – HTTPS – SSH - IEEE 802.11i Wireless LAN Security- Wireless Transport Layer Security- WAP End-to-End Security.

Unit V Email Application Internet Security 7 Hours

Pretty Good Privacy- S/MIME - Domain Keys Identified Mail - IP Security Overview- IP Security Policy - Internet Key Exchange – Overview of Intrusion Detection System.

List of Exercises 30 Hours

1. Implementation of Classical Encryption Techniques
2. Implementation of Simplified DES
3. Study of Cipher Mechanisms using Cryptool
4. Implementation of RSA for confidentiality and authentication
5. Implementation of Diffie-Hellman Key Exchange Algorithm
6. Implementation of Digital Signature Generation and Verification

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Examine the strength of classical and modern cipher mechanisms using various cryptanalytic techniques	Analyze
CO2: Identify various mathematical functions used in public key encryption techniques for encryption of data	Apply
CO3: Recognize the techniques for signature generation and verification of web application documents using authentication functions	Analyze
CO4: Analyze various security mechanisms of Wired and Wireless devices based on its infrastructure	Analyze
CO5: Choose the suitable security standards for an Internet based applications	Evaluate

Text Book(s):

T1. William Stallings, “Cryptography and Network Security: Principles and Practices”, 8th Edition, Pearson Education, 2018.

Reference Book(s):

R1. Behrouz A Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata McGraw Hill Ltd. 2017.
R2. Atul Kahate, “Cryptography and Network Security”, 3rd Edition, Tata McGraw Hill Ltd, 2013.
R3. Douglas R. Stinson, “Cryptography: Theory and Practice”, 3rd Edition, CRC Publishers, 2005.
R4. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, “Handbook of Applied Cryptography”, CRC Press, 2010.

Web References:

1. https://en.wikipedia.org/wiki/RSA_(cryptosystem)
2. https://en.wikipedia.org/wiki/Digital_Signature_Algorithm
3. http://nptel.ac.in/courses/106105031/
4. http://williamstallings.com/Cryptography/%20Video%20References
5. https://www.coursera.org/learn/crypto

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	2	2	2	2	2	2	2	3	3
CO2	3	2	2	2	2	2	2	2	2	2	2	2	3	2
CO3	3	3	2	2	3	2	2	2	2	2	2	2	3	3
CO4	3	3	2	2	3	2	2	2	2	2	2	2	3	3
CO5	3	3	2	3	3	2	2	2	2	2	2	2	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN3501	**Course Title: Web Technology Laboratory**		
Course Category: Professional Core		**Course Level: Practice**	
L:T:P(Hours/Week) 0: 0: 3	**Credits:1.5**	**Total Contact Hours:45**	**Max Marks:100**

Pre-requisites

- Object Oriented Programming using Java

Course Objectives

The course is intended to:

1. Apply the HTML elements
2. Design the Web pages using CSS
3. Develop interactive web pages
4. Develop a rich internet application
5. Implement database connectivity

List of Exercises:

Develop a mini project for an application by implementing the below listed experiments

1. Develop a HTML 5.0 web page by including
   i) Lists, Tables, Frames, Forms, Media, and Graphics
   ii) Embed image and fix the hot spots. Show all the related information when the hot spots are clicked
2. Create a web page with all types of Cascading style sheets and apply Layouts and CSS effects to the web page
3. Apply JavaScript concepts to validate form fields in web page
4. Design Drop down lists and navigation bar using JQuery
5. Programs using DOM
6. Programs using Angular JS
7. Introduce XML to store and transfer values to HTML
   a) XML with CSS
   b) XSLT
8. Programs using AJAX and JSON
9. Database connectivity with JSP page

10. Database connectivity with PHP & MySQL page

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Design a webpage using HTML elements	Apply
CO2: Create a dynamic web page by applying CSS concepts	Apply
CO3: Develop interactive web pages using JavaScript, JQuery, Angular JS	Apply
CO4: Develop a rich internet application using XML and AJAX	Apply
CO5: Implement database connectivity using JSP/PHP with MySQL	Apply

Reference (s):

R1. Robert W Sebesta, "Programming the world wide web", 8th edition, Pearson, 2015.

R2. Jaffrey C.Jackson, "Web Technologies- A Computer Science Perspective", Pearson Education 2014.

R3. Thomas Powell "The Complete Reference HTML and CSS", 5th Edition, Tata McGraw Hill,2010.

R4. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel "Internet & World Wide Web : How to Program", 5th Edition, PH Professional Business, 2012.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	1	3	2	2	2	3	2
CO2	3	2	2	2	2	2	2	1	3	2	2	2	3	2
CO3	3	2	2	2	2	2	2	1	3	2	2	2	3	2
CO4	3	2	2	2	2	2	2	1	3	2	2	2	3	2
CO5	3	2	2	2	2	2	2	1	3	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	**CO. No.**	**Marks**	**Total Marks**
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4,5	50	
Total				100

Course Code: 19ITCN4501	Course Title: Mobile Programming Laboratory		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 1: 0: 3	Credits:2.5	Total Contact Hours: 60	Max Marks:100

Pre-requisites

- Object Oriented Programming using Java

Course Objectives

The course is intended to:

1. Develop mobile app using UI Elements and Intents Activity
2. Build android application with Database connectivity
3. Design mobile app using Animation APIs
4. Develop android application using multimedia components

Unit I App User Interface and Data Access 8 Hours

Introduction- Activity- UI Elements and Events-Interaction Among Activities- Services-Notifications- Intents and Intent Resolution-Broadcast Receivers - Shared Preferences-Mobile Databases Such as SQLite Relational Data.

Unit II Animation And Multimedia 7 Hours

Graphics and Animation-Android Graphics-Android Animation - Audio, Video and Images-Playback, Capture and Storage - Telephony and SMS.

List of Experiments : 45 Hours

1. To understand Activity, Create sample application with login module.(Check username and password)
2. Design simple GUI application with activity and intents e.g. calculator
3. Create an android app for database creation using SQLite Database
4. Create an android app using animation properties
5. Write a program to capture image using built in camera
6. Write a program to play audio and video files.
7. Write a program to send SMS

8. Write a program to call a number
9. Write a program to convert text to speech
10. Create a Mini Project for any mobile application using Android Studio

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Develop mobile app using User Interface elements and allow interaction among activities	Apply
CO2: Build android application with SQLite Database connection	Apply
CO3: Design mobile app using graphics and animation	Apply
CO4: Develop android application using multimedia components	Apply

Reference (s):

R1. Anubhav Pradhan, Anil V Deshpande," Composing Mobile Apps", First Edition, Wiley Publication, 2014.

R2. Vedat Coskun, Kerem Ok, Busra Ozdenizci, "Professional NFC Application Development for Android, First Edition, Wiley Publication, 2013.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	1	3	2	2	2	3	2
CO2	3	2	2	2	2	1	1	1	3	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	3	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	3	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	**CO. No.**	**Marks**	**Total Marks**
Continuous Assessment	Each Lab Experiment	1,2,3,4	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4	50	
			Total	100

Course Code: 19PSHG6501		Course Title: Employability Skills 1: Teamness and Interpersonal Skills (common to all BE/B.Tech. programmes)	
Course Category: Humanities		Course Level: Introductory	
L: T:P (Hours/Week): 0:0:2	Credit :1	Total Contact Hours: 30	Max. Marks: 100

Pre-requisites

- **Nil**

Course objectives

The course is intended to

1. Demonstrate effective communicative attributes and facilitate presentation and public speaking skills
2. Identify and explore the true self and handle negatives
3. Develop interpersonal skills and to groom as a professional
4. Educate the importance of Nonverbal skill set to attain perfection
5. Build teamness and its ethics to facilitate corporate working

Unit I Effective Communication & Presentation Skills 6 Hours

Barriers of Communication–Fear Of English–Handling Social Factors–Handling Psychological Factors–Handling Practical Problems–Do's & Don't's-**Effective Presentation**-Presentation–Importance of Presentation – Slide orientation – Introduction in a presentation –Styles of a slide – Slide Templates– Font ,color, Background –Graph Diagrammatic representation – Delivery of presentation –Body Language &Gestures – Verbal Attributes – Communication – Handling stammers and breaks – Handling fear of stage – Maintaining Confidence – Content delivery methods– Do's and Don'ts in a presentation– Tips to handle it–Effective Conclusion.

Unit II Positive Atttitude & Handling Rejections 6 Hours

A,B,C's Of Attitude –Influencing Factors –Individual Factors –Character Comparison – Strategies to Handle ourselves–Benefits of Positive Attitude – Do's& Don't's –**Handling Rejections**: Identifying Negativities –Nuances of handling it –Necessary changes –To do List –Creating One's self –Self Qualifiers.

Unit III Interpersonal Skills 6 Hours

Life skills –Core IP Skills –Importance of IP Skills –Tips to improve IP Skills–Necessity of IP Skills

Unit IV Body Language, Dressing & Grooming 6 Hours

Unconscious Physical moments – Metrics of Body Language – Good Posture –Head Motion – Facial Expression – Eye contact – Gestures –Dressing – Grooming & Outlook – Necessity of good Body Language.

Unit V Team Ethics 6 Hours

Team Ethics–Necessity of Team Work–Teams Everywhere – Benefits of team culture – Reason for team failure – Conflicts – Handling Conflicts – Being a team player – Work difference from college

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Demonstrate effective communicative attributes as part of their skills and facilitate presentation & public speaking skills	Apply
CO2: Identify and explore the true self and handle negatives	Apply
CO3: Develop interpersonal skills and to groom as a professional	Apply
CO4: Explain the importance of Nonverbal skill set to attain perfection	Understand
CO5: Build teamness and its ethics to facilitate corporate working	Apply

Text Book(s):

T1: John C Maxwell, " The 17 Indisputable Laws of Teamwork: Embrace Them and Empower Your Team", Harper Collins Leadership Publishers, 2013

Reference Book(s):

R1: Patrick Lencioni, " The Five Dysfunctions of a Team: A Leadership Fable" Jossey Bass Publishers, 2006
R2: Malcolm Gladwell, "Talking to Strangers: What We Should Know about the People We Don't Know" Penguin Publishers, 2019
R3: Harvey Segler, " Body Language: Discovering & Understanding the Psychological secrets behind reading & Benefiting from Body Language" Kindle Edition, 2016

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	3	-	1	-	-
CO2	-	-	-	-	-	-	-	-	2	-	-	1	-	-
CO3	-	-	-	-	-	-	-	-	2	-	1	1	-	-
CO4	-	-	-	-	-	-	-	-	-	1	-	1	-	-
CO5	-	-	-	-	-	-	-	2	1	-	-	1	-	-

High-3; Medium-2; Low-1

Assessment pattern

Mode of Delivery:

1. Continuous learning and reviews guided by faculty

2. Guided Learning Workshop

Assessment	Details	Weight (%)	Remarks
Continuous Assessment	Diagnostic assessment of a student's communication skills, cognitive abilities, and behavioural traits during the course	25	Continuous
	MCQs/Diagnostic tests and Viva-voce	25	Two per semester - After CCET1 and after CCET2
Final Assessment	MCQs/Diagnostic tests and Viva-voce	50	End of Semester

Semester VI

Course Code: 19ITCN1601		**Course Title: Cloud Computing**	
Course Category: Professional Core		**Course Level: Practice**	
L:T:P(Hours/Week) **3: 0: 0**	**Credits:3**	**Total Contact Hours:45**	**Max. Marks:100**

Pre-requisites

- Database Management Systems

Course Objectives

The course is intended to:

1. Utilize the various types of layers and its features
2. Apply the key concepts in cloud infrastructure
3. Categorize the various technologies and tools
4. Examine the data management and monitoring techniques
5. Compare the significance of cloud benefits

Unit I Introduction to Cloud Computing 9 Hours

Introduction – Roots of Cloud Computing – Layers and types – Desired features of a Cloud – Cloud Infrastructure Management – Case studies – Challenges and Risks.

Unit II Infrastructure as a Service (IaaS) 9 Hours

Virtualization Technology Overview – Virtual machine Provisioning and Manageability – VM migration Services – Anatomy of Cloud infrastructures – Distributed management of virtual infrastructures – Cluster as a Service: Logical Design.

Unit III Platform and Software as a Service (Paas and SaaS) 9 Hours

Technologies and Tools – ANEKA cloud platform – ANEKA resource provisioning Service – Hybrid Cloud Implementation – CometCloud: An autonomic Cloud Engine – Architecture – Autonomic behavior of CometCloud – Dynamic Datacenter – Workflow engine for clouds.

Unit IV Monitoring and Management 9 Hours

Introduction – SAP system – Virtualized Data center – A model for federated cloud computing – Security considerations – SLA management in Cloud – Traditional Approaches – Types of SLA- Life cycle of SLA.

Unit V Applications of Cloud 9 Hours

Cloud applications in the AWS – Business benefits – Technical benefits - Understanding AWS - cloud concepts – Cloud best practices – Case study.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Utilize the various types of layers and its features available in cloud computing techniques	Apply
CO2: Apply the key concepts in cloud infrastructure using Iaas services for virtualization	Apply
CO3: Categorize the various technologies and tools for hybrid cloud implementation using PaaS and SaaS.	Analyze
CO4: Examine the data management and monitoring techniques for SAP system	Analyze
CO5: Compare the significance of cloud benefits using AWS services in cloud applications	Analyze

Text Book(s):

T1. Rajkumar Buyya, James Broberg, Andrzej goscinski, “Cloud Computing: Principles and Paradigms”, Wiley publication, 2014 (Reprint).

Reference Book(s):

R1. Kris Jamsa, “Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and more”, Jones & Bartlett Learning Company LLC, 2013.

R2. Huseni Saboowala, Muhammad Abid, Sudhir Modali, “Designing Networks and Services for the Cloud: Delivering business-grade cloud applications and services” ,Cisco Press, 2013.

Web References:

1. http://www.service-architecture.com/
2. http://www.opengroup.org/standards/soa
3. http://xml.coverpages.org/soa.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO2	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO3	3	3	2	2	3	2	2	2	2	2	2	3	3	3
CO4	3	3	2	2	3	3	3	2	2	2	2	3	3	3
CO5	3	3	2	2	3	3	3	2	2	2	2	3	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN2601	Course Title: Internet of Things		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 2	Credits: 4	Total Contact Hours: 75	Max. Marks: 100

Pre-requisites

- Computer Organization and Microprocessor

Course Objectives

The course is intended to:

1. Recognize various levels and domains in IoT
2. Compare the architectural overview of IoT
3. Develop a portable IoT application
4. Design an IoT application using Raspberry pi board
5. Examine IoT data analytics tools and techniques

Unit I Introduction to Internet of Things 9 Hours

Introduction-Physical Design of IoT - Logical Design of IoT- IoT enabling Technologies - IoT levels –Domain Specific IoT: Home Automation – Cities – Environment – Energy – Agriculture –Industry.

Unit II IoT and Machine to Machine (M2M) 9 Hours

Introduction to IoT and M2M – SDN and NFV for IoT - Need for IoT system management – SNMP - Network Operator Requirements - NETCONF – YANG - IoT system management with NETCONF-YANG.

Unit III IoT Design Methodology 9 Hours

IoT Design Methodology - IoT system logical design using python: Introduction - Python Data types and Data structures - Control flow – Functions – Modules – Packages - File handling - Date/Time Operations – Classes - Python packages for IoT.

Unit IV IoT Physical Devices – Raspberry Pi 9 Hours

Basic building blocks - Raspberry pi – Architecture - Linux on Raspberry pi - Linux on Raspberry pi – Interfaces - Programming Raspberry pi with Python - IOT Physical Servers and Cloud Offerings: WAMP - Django Architecture - Amazon Web Services for IOT.

Unit V Data Analytics for IoT 9 Hours

Introduction - Apache Hadoop - Using Hadoop Mapreduce for Batch Data Analytics: Hadoop YARN - Apache Oozie: Setting up – Workflows for IoT Data analytics – ApacheSpark - Apache Strom.

List of Experiments 30 Hours

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation
2. Interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds
3. Implement temperature sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings
4. Interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed
5. Interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth
6. Explore an industry cloud application using pneumatic hydraulic system

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Recognize various levels and Domains in IoT for application such as home and Industry automation	Apply
CO2: Compare the Architectural Overview of IoT between M2M and IoT	Apply
CO3: Develop a portable IoT application using python programming	Apply
CO4: Design an IoT application using Raspberry pi board for a real time scenario	Apply
CO5: Examine IoT data analytics tools and techniques for real time application	Apply

Text Book(s):

T1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2020.

Reference Book(s):

R1. Adrian Mcewen , Hakin Cassimally "Designing The Internet of Things" , Wiley publications, 2015.

R2. Oliver Hersent , David Boswarthick , Omar Elloumi , "The Internet of Things: Key Applications and Protocols", Wiley publications, 2015.

R3. Cuno Pfister , "Getting Started with the Internet of Things", Shroff; First edition, 2019.

Web References:

1. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html
2. https://www.coursera.org/specializations/internet-of-things
3. https://onlinecourses.nptel.ac.in/noc17_cs22/preview

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	1	2	2	2	3	3	2
CO2	3	2	2	2	2	2	2	1	2	2	2	3	3	2
CO3	3	2	2	2	2	2	2	1	2	2	2	3	3	2
CO4	3	2	2	2	2	2	2	1	2	2	2	3	3	2
CO5	3	2	2	2	2	2	2	1	2	2	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

Continuous Assessment	**Assessment Component**	**CO. No.**	**Marks**	**Total**
	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN3601	**Course Title: Cloud Computing Laboratory**		
Course Category: Professional Core		**Course Level: Practice**	
L:T:P(Hours/Week) 0: 0: 3	**Credits:1.5**	**Total Contact Hours:45**	**Max Marks:100**

Pre-requisites

- Object Oriented programming using Java

Course Objectives

The course is intended to:

1. Apply the tool kits
2. Develop the web services/Applications
3. Construct virtual machines
4. Design the systems, protocols and mechanisms

List of Exercises:

1. Identify the procedure to run the virtual machine of different configuration and examine how many virtual machines can be utilized at particular time using Eucalyptus or OpenNebula or OpenStack
2. Construct virtual block in virtual machine and check whether it holds the data even after the release of the virtual machine using Eucalyptus or OpenNebula or OpenStack
3. Write a program to perform the migration of virtual machine based on the load from one node to the other using Eucalyptus or OpenNebula or OpenStack
4. Write a program to create a datacenter with one host and run one cloudlet on it using cloudsim toolkit
5. Develop a program to create two datacenters with one host and run two cloudlets on them using cloudsim toolkit
6. Demonstrate how to pause and resume the simulation, and create simulation entities dynamically in cloudsim toolkit
7. Create simulation entities in run-time using a globar manager entity (GlobalBroker) using cloudsim toolkit
8. Implement a MapReduce program to count the occurrence of each word from the file
9. Write a program to use the API'S of Hadoop to interact with it

10. Write a word count program to demonstrate the use of Map and Reduce Tasks

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply the tool kits for cloud environment	Apply
CO2: Develop the web services/Applications in cloud framework	Apply
CO3: Construct virtual machines to run in different configuration	Apply
CO4: Design the systems, protocols and mechanisms to support cloud computing	Apply

Reference (s):

R1. Kris Jamsa, “Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and more”, Jones & Bartlett Learning Company LLC, 2013.

R2. Rajkumar Buyya, James Broberg, Andrzej goscinski, “Cloud Computing: Principles and Paradigms”, Wiley publication, 2014 (Reprint).

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	3	3	3	2	2	3	2
CO2	3	2	2	2	2	2	2	3	3	3	2	2	3	2
CO3	3	2	2	2	2	2	2	3	3	3	2	2	3	2
CO4	3	2	2	2	2	2	2	3	3	3	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	**CO. No.**	**Marks**	**Total Marks**
Continuous Assessment	Each Lab Experiment	1,2,3,4	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4	50	
			Total	100

Course Code: 19ITPN6601		**Course Title: Innovative and Creative Project**	
Course Category: Project		**Course Level: Practice**	
L:T:P(Hours/Week) **0: 0: 4**	**Credits:2**	**Total Contact Hours:60**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Propose the strategies for creative innovation
2. Create the effective creative projects that provide an innovative solution
3. Compile the effective strategies for designing innovative projects in collaboration with team members

The objective of Innovative and Creative Project is to enable the student to take up innovative and creative ideas in the field of Information Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Propose the strategies for creative innovation by applying appropriate legal and ethical standards	Create
CO2: Create the effective creative projects that provide an innovative solution to real-world Problems	Create
CO3: Compile the effective strategies for designing innovative projects in collaboration with team members to develop an effective creative project	Create

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	Review 1	1,2,3	25	75
	Review 2	1,2,3	25	
	Review 3	1,2,3	25	
End Semester Examination	ESE	1,2,3	25	25
			Total	100

Course Code: 19PSHG6601		Course Title: Employability Skills 2: Campus to Corporate (common to all BE/B.Tech. programmes)	
Course Category: Humanities		Course Level: Introductory	
L: T:P (Hours/Week): 0:0:2	Credit :1	Total Contact Hours: 30	Max Marks: 100

Pre-requisites

- **Nil**

Course objectives

The course is intended to:

1. Understand emotions and necessity to handle it to evolve as an effective social animal
2. Build effective resumes to project the positives to be employable
3. Facilitate working in a collaborative work environment and to engage in healthy agreements for building person's professional facet
4. Formulate the growth attribute to outperform, initiate and grow in professional arena
5. Explain time management and impart leadership skills.

Unit I Emotional Intelligence 6 Hours

Nature of Emotions – Importance of EI – EQ vs IQ – Behavioral difference between EQ & IQ – Acquiring Emotional Intelligence – Benefits of high EI – Steps to develop EI – Role of EI in Interviews.

Unit II Resume Preparation 6 Hours

Importance of Resume – Good Resume – Planning Resume – Organizing Resume –Spell check – Benefits of good resume – Resume Writing.

Unit III Group Discussion 6 Hours

Purpose of GD – Prerequisites of GD–Benefits of GD– Features of GD– Do's & Don'ts in GD– Accept Criticism &Feedback–Accepting Suggestions–GD Phrases–Effective Introduction & Conclusion– Preferred Etiquette of GD.

Unit IV Interview Etiquette(Netiquette) 6 Hours

Definition of Interview–Types of Interview – Prior interview– Know the Company – Employer's perspective in interview –Non Verbal etiquette–Dressing–Verbal Communication in Interview–Facing Rejection in Interview–Do's & Don'ts in an Interview–

Common Interview Questions – Handling Stress Questions – Handling Telephonic Interviews.

Unit V Leadership Skills & Time Management 6 Hours

Leadership –Leadership Traits – Leadership styles – Types of Leaders – Qualities of a leader – Developing Perspectives

Time Management – Necessity of Time Management – Types of time – Estimation of time – Process of Time management – Efficient utilization of Time – Time wasting culprits – Tips to manage time – Goal setting in Time Management.

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Understand the emotions and necessity to handle them	Understand
CO2: Build effective resumes to project the positives to be employable	Apply
CO3: Facilitate collaborative work environment and to engage in health agreements for building person's professional facet	Understand
CO4: Formulate the growth attribute to outperform, initiate and grow in professional arena	Apply
CO5: Explain time management and impart leadership skills	Understand

Text Book(s):

T1. Thea Kelley, "Get That Job! The Quick and Complete Guide to a Winning Interview " Plover crest Press, 2017.

Reference Book(s):

R1. Daniel Goleman, " Emotional Intelligence Reader's Guide", BANTAM Publishers, 1997.

R2. Daniel Goleman, Richard Boyatzis & Annie McKee, " Primal Leadership: Unleashing the Power of Emotional Intelligence" Harvard Business Review Press; Anniversary edition, 2013.

R3. Stephen R Covey, " The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change" Simon & Schuster; Anniversary edition, 2013.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	-	1	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	1	-	-
CO3	-	-	-	-	-	-	-	-	1	1	-	1	-	-
CO4	-	-	-	-	-	-	-	-	1	-	-	1	-	-
CO5	-	-	-	-	-	-	-	1	-	-	1	1	-	-

High-3; Medium-2; Low-1

Assessment pattern

Mode of Delivery:

1. Continuous learning and reviews guided by faculty
2. Guided Learning Workshop

Assessment	Details	Weight (%)	Remarks
Continuous Assessment	Diagnostic assessment of a student's communication skills, cognitive abilities, and behavioural traits during the course	25	Continuous
	MCQs/Diagnostic tests and Viva-voce	25	Two per semester - After CCET1 and after CCET2
Final Assessment	MCQs/Diagnostic tests and Viva-voce	50	End of Semester

Semester VII

Course Code: 19ITHN1701		**Course Title: Engineering Economics and Management**	
Course Category: Humanities		**Course Level: Practice**	
L:T:P(Hours/Week) **3: 0: 0**	**Credits:3**	**Total Contact Hours:45**	**Max. Marks:100**

Pre-requisites

- Probability and Statistics

Course Objectives

The course is intended to:

1. Apply the concepts of engineering economics
2. Evaluate various Interest formulas
3. Estimate the present, future and Annual Worth of an asset
4. Determine the replacement policy of an asset
5. Examine the key activities of financial management

UNIT I Introduction 9 Hours

Introduction to Economics-Concept of Engineering Economics-Elements of Costs-Other Costs and Revenues- Cost Estimating Models-Index Number- Inflation: Causes of Inflation-Types-Break-Even Analysis- Profit/Volume Ratio - Elementary Economic Analysis: Introduction-Examples for Simple Economic Analysis.

Unit II Value Engineering 9 Hours

Make or Buy decisions: Introduction-Criteria for Make or Buy-Approaches for Make or Buy Decision-Value Engineering: Introduction- When to Apply Value Analysis- Function - Aims-Value Engineering Procedure-Interest Formulas and their Applications: Time Value of Money-Interest Formulas- Bases for Comparison of Alternatives.

Unit III Cash Flow 9 Hours

Methods for Comparison of Alternatives-Present Worth Method: Revenue-dominated Cash Flow Diagram- Cost-dominated Cash Flow Diagram- Future Worth Method: Revenue-dominated Cash Flow Diagram- Cost-dominated Cash Flow Diagram- Annual Equivalent Method: Revenue-dominated Cash Flow Diagram- Cost-dominated Cash Flow Diagram-Rate of Return method.

Unit IV Replacement And Maintenance Analysis 9 Hours

Introduction- Types of Maintenance-Types of Replacement Problem-Determination of Economic Life of an Asset-Replacement of Existing Asset with a New Asset-Simple Probabilistic Model for Items Which Fail Completely

Unit V Financial Management 9 Hours

Introduction-Goal- Building blocks- Risk-return Tradeoff- Agency Problem-Financial system: Functions-Assets–Markets-Market Returns- Financial Intermediaries-Growth and Trends in Indian Financial System- Capital Budgeting.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply the theories, cost concepts and policies related to economics	Apply
CO2: Evaluate various Interest formulas and their applications for different investment situations	Apply
CO3: Estimate the present, future and Annual Worth for a given business problem	Apply
CO4: Determine the replacement policy based on the economic value of an asset	Apply
CO5: Examine the key activities of financial management in the competitive business scenario	Apply

Text Book(s):

T1. Panneer Selvam.R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2nd Edition, 2016. (Unit – I to IV).

T2. Prasanna Chandra, “Financial Management - Theory & Practice”, 10th Edition, Tata Mcgraw Hill Publications, New Delhi, 2019(Unit – V).

Reference Book(s):

R1. Samuelson Paul A,Nordhaus W.D., “Economics”, Tata Mcgraw Hill Publishing Company Ltd, New Delhi, 2010.

R2. Mote V L, Samuel Paul,Gupta G S, “Managerial Economics: Concepts and Cases”, Tata Mcgraw Hill Publishing Company Ltd, 2017.

Web References:

1. https://nptel.ac.in/courses/112/107/112107209/
2. https://lecturenotes.in/subject/15/engineering-economics-ee/note

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	2	2	2	2	2	2	3	-	-
CO2	3	2	2	2	-	2	2	2	2	2	2	3	-	-
CO3	3	2	2	2	-	2	2	2	2	2	2	3	-	-
CO4	3	2	2	2	-	3	3	2	2	2	2	3	-	-
CO5	3	2	2	2	-	3	3	2	2	2	2	3	-	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN2701		Course Title: Artificial Intelligence and Machine Learning	
Course Category: Professional core		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Data Mining

Course Objectives

The course is intended to:

1. Study the concepts of artificial intelligence
2. Learn the methods of solving problems using artificial intelligence
3. Introduce the concepts of knowledge reasoning and planning
4. Understand the basics of supervised and unsupervised machine learning
5. Learn the concepts of machine learning applications

Unit I Intelligent Agents 9 Hours

Introduction to AI -Intelligent Agents: Agents and Environments – Concept of Rationality-nature of Environments – Structure of Agents- Problem Solving Agents – Search algorithms.

Unit II Problem Solving and heuristic search 9 Hours

Informed search Strategies – Heuristic functions – Local Search and Optimization Problems-Local Search in Continuous Spaces- Game Theory - Optimal Decisions in Games.

Unit III Knowledge Reasoning and Planning 9 Hours

Constraint Satisfaction Problem: Backtracking search in CSP- Local search in CSP-Knowledge based agents- Propositional logic- Agents based on Propositional Logic.

Unit IV Supervised Learning and Unsupervised Learning 9 Hours

Forms of Learning- Supervised Learning – Linear Regression and Classification: Univariate Linear Regression - Linear classification with Logistic Regression- Ensemble Learning: Random Forest - Unsupervised Learning and Transfer Learning - multitask learning.

Unit V Applications 9 Hours

Reinforcement Learning: Passive and Active Reinforcement Learning - Natural Language Processing: Language Models – Grammar - Computer vision: Image Formation-Classifying Im – Detecting Objects – Robotics: Robotic Perception – Humans and Robots.

List of Exercises **30 Hours**

1. Implementation of A* algorithm.
2. Implementation of Minimax algorithm.
3. Implementation of Backtracking search.
4. Implementation of Logistic Regression.
5. Implementation of classification using SVM.
6. Implementation of Random forest.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Evaluate Artificial Intelligence (AI) methods and describe their foundations	Apply
CO2: Apply the characteristics of artificial intelligence that makes it useful to solve real-world problems	Apply
CO3: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation and learning	Apply
CO4: Apply supervised and unsupervised learning models for appropriate AI applications	Apply
CO5: Identify the theory of machine learning models for relevant AI applications	Apply

Text Book(s):

T1. Stuart Russell and Peter Norvig., “Artificial Intelligence – A Modern Approach”, Fourth Edition, Pearson, 2020.

Reference Book(s):

R1. Ric, E., Knight, K and Shankar, B. 2009. Artificial Intelligence, 3rd edition, Tata McGraw Hill.
R2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar Foundations of Machine Learning, MIT Press, 2012.

Web References:

1. http://www.myreaders.info/html/artificial_intelligence.html
2. www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_tutorial.pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	1	2	2	2	2	3	2
CO2	3	2	2	2	2	2	2	1	2	2	2	2	3	2
CO3	3	2	2	2	2	2	2	1	2	2	2	2	3	2
CO4	3	2	2	2	2	2	2	1	2	2	2	2	3	2
CO5	3	2	2	2	2	2	2	1	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITCN4701	Course Title: Data Science Laboratory		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 1: 0: 4	Credits:3	Total Contact Hours:75	Max Marks:100

Pre-requisites

- Programming with Python Laboratory
- Data Mining

Course Objectives

The course is intended to:

1. Prepare, import, process the dataset
2. Build an application for the given dataset
3. Apply commands for data analysis
4. Develop methodology to analyze and visualize the data

Unit I Data Manipulation **7 Hours**

Understanding data types in Python-Basics of Numpy arrays-Introduction to Pandas Objects: Series object, Data frame object, Index object-Data Indexing and selection-Operation of data in pandas.

Unit II Visualization **8 Hours**

Line plots-Scatter plots-Histogram-Multiple subplots-3D plotting in Matplotlib-Visualization with Seaborn-Introduction SciKit-Learn -Correlation and Regression in statistics.

List of Exercises: **60 Hours**

Students are suggested to use the listed packages:

Numpy, Scipy, Plotpy, Matplotlib, Pandas, Seaborn, Bokeh, Statmodels, SciKit-Learn, Glob,Os, geopandas

1. Reading, writing descriptive types of different data types.
2. Perform Data Exploration and Pre-processing.
3. Implementation of Data Analysis using Correlation and Scatterplot.
4. Implementation of Data Analysis using Frequency distribution.
5. Implementation of Data Analysis using regression dataset.
6. Visualization and analysis of static data.

7. Visualization and analysis of web data.
8. Create lists of files and directories for batch processing.
9. Statistical Distributions and Hypothesis Testing
10. Handling files and directories

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Prepare and import the dataset using data structures, other data importing options	Apply
CO2: Develop an application using the given dataset for the real world problem.	Apply
CO3: Apply commands for data analysis for the various available data sets	Apply
CO4: Develop methodology to analyze and visualize the data using different plot	Apply

Reference(s):

1. Jake VanderPlas, "Python Data Science Handbook Essential Tools for Working with Data" 3rd Edition, O REILLY Publications, 2019
2. Mckinney Wes, "Python For Data Analysis: Data Wrangling With Pandas Numpy and Ipython" 2nd Edition, Shroff Publishers, 2018
3. Brown Martin C, "Python: Complete Reference", 4th Edition, Tata McGraw Hill, 2018.

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	1	3	2	2	2	3	2
CO2	3	2	2	2	2	1	1	1	3	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	3	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	3	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

Continuous Assessment	**Assessment component**	**CO. No.**	**Marks**	**Total Marks**
	Each Lab Experiment	1,2,3,4	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4	50	
			Total	100

Semester VIII

Course Code: 19ITPN6801		**Course Title: Project**	
Course Category: Project		**Course Level: Practice**	
L:T:P(Hours/Week) 0: 0: 16	**Credits:8**	**Total Contact Hours:240**	**Max. Marks:200**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Propose a sound technical knowledge of their selected project topic.
2. Formulate problem identification, and solution.
3. Combine the knowledge, skills and attitudes of a professional engineer

The objective of Project is to enable the student to take up investigative study in the broad field of Information Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Propose a sound technical knowledge of their selected project topic by formulating proper methodology..	Create
CO2: Formulate problem identification, and solution to successfully complete the project	Create
CO3: Combine the knowledge, skills and attitudes of a professional engineer to formulate, analyze and investigate problems systematically.	Create

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	Review 1	1,2,3	50	150
	Review 2	1,2,3	50	
	Review 3	1,2,3	50	
End Semester Examination	ESE	1,2,3	50	50
			Total	200

Professional Electives

Professional Electives (4 Credits)

Course Code: 19ITEN2001		**Course Title: Developing Web Applications using .NET**	
Course Category: Professional Elective		**Course Level: Mastery**	
L:T:P(Hours/Week) 3: 0: 2	**Credits:4**	**Total Contact Hours:75**	**Max. Marks:100**

Pre-requisites

- Object Oriented Programming using Java
- Database Management Systems
- Programming with Python Laboratory

Course Objectives

The course is intended to:

1. Explore the MVC framework structure in ASP.NET application creation
2. Understanding the controller's role in web design
3. Design the ASP.NET web application model
4. Display dynamic data from a data source by using data binding
5. Programmatically exploring the WEB APIs

Unit I Introduction 9 Hours

Introduction to ASP.NET MVC- ASP.NET MVC Fits in with ASP.NET-MVC Pattern –MVC 5-ASP.NET MVC 5 Overview-ASP.NET Identity- Bootstrap Templates- Installing ASP.NET MVC 5 - Creating an ASP.NET MVC 5 Application - ASP.NET MVC and Conventions - Convention over Configuration.

Unit II Controllers & View 9 Hours

The Controller's Role- A Sample Application: The MVC Music Store –Controller Basics -A Simple Example: The Home Controller-Parameters in Controller Actions-VIEWS : View Basics-Strongly Typed Views- View Models- Adding a View- Razor View Engine- Razor Syntax-Specifying a Partial View.

Unit III Models 9 Hours

Modeling the Music Store- Scaffolding- Scaffolding and the Entity Framework- Scaffolding Template - Executing the Scaffolder Code- Building a Resource to Edit an Album Responding to the Edit POST Request- Default Model Binder- Explicit Model Binding- Forms.

Unit IV Data Annotations and Validation 9 Hours

HTML Helpers - Adding Inputs - Helpers, Models, and View Data - Other Input Helpers - Rendering Helpers - : Data Annotations And Validation : Validation Annotations - Custom Error Message - Controller Actions and Validation Errors - Custom Validation Logic - Display and Edit Annotations.

Unit V ASP.NET Web API 9 Hours

Web API - Writing an API Controller - Configuring Web API - Adding Routes to Your Web API - Binding Parameters - Filtering Requests - Enabling Dependency Injection - Exploring APIs Programmatically - Tracing the Application - Web API Example: Products Controller.

List of Exercises 30 Hours

1. Create a simple ASP.NET MVC 5 Application
2. Create a user control and a custom server control and add them to an ASP.NET page
3. Create a sample application: The MVC Music Store and add home controls for that application
4. Create a MVC application by focusing on model objects
5. Create a web application using dynamic data from a data source by using data binding
6. Create a Web API that exposes a simple data object through Entity Framework's Code

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the MVC framework features and explain the importance of these features	Understand
CO2: Develop a Music Store application	Apply
CO3: Create a Web form with Model controls	Apply
CO4: Demonstrate the data annotations for validation controls in ASP.NET	Apply
CO5: Deploy an ASP.NET application to a production Web server	Apply

Text Book(s):

T1. Jon Galloway ,Brad Wilson ,K. Scott Allen ,David Matson, "professional ASP.NET MVC 5" , 1st edition, O'Reilly, 2014.

Reference Book(s):

R1. Adam Freeman, "Pro ASP.NET MVC 5", 5th Edition Apress, 2014.

R2. Jamie Munro,"ASP.NET MVC 5 with Bootstrap and Knockout.js: Building Dynamic, Responsive Web Applications" , 1st Edition O'Reilly, 2015.

R3. Jeffrey Palermo , Ben Scheirman , Jimmy Bogard, " ASP.NET MVC in Action" ,1st Edition, Dreamtech Press, 2009.

R4. Lee Naylor, "ASP.NET MVC with Entity Framework and CSS Paperback", 1st edition Apress, 2016.

Web References:

1. https://dotnet.microsoft.com/apps/aspnet/mvc
2. https://dotnettutorials.net/course/asp-dot-net-mvc-tutorials/
3. https://dotnettutorials.net/course/asp-dot-net-mvc-tutorials/
4. https://www.c-sharpcorner.com/technologies/asp-dot-net-programming

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	1	1	2	2	2	2	1	1
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	20
	CCET 2	3,4	50	
	CCET 3	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN2002	Course Title: Server Side Programming		
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Design web page using PHP
2. Create the web database and store the data in web database
3. Implement security features in web page
4. Integrate JavaScript and PHP
5. Develop web application projects

Unit I Introduction to PHP 9 Hours

Introduction -Storing and Retrieving Data-Arrays-String Manipulation and Regular Expressions-Reusing Code and Writing Functions-Object-Oriented PHP-Error and Exception Handling.

Unit II Introduction to MySQL 9 Hours

Designing Your Web Database- Creating Your Web Database - Working with Your MySQL Database - Accessing Your MySQL Database from the Web with PHP - Advanced MySQL Administration - Advanced MySQL Programming.

Unit III Web Application Security 9 Hours

Web Application Security Risks - Building a Secure Web Application - Implementing Authentication Methods.

Unit IV Server Side Programming 9 Hours

Interacting with the File System and the Server - Using Network and Protocol Functions - Managing the Date and Time - Internationalization and Localization - Generating Images - Using Session Control - Integrating JavaScript.

Unit V Building Practical 9 Hours

Using PHP and MySQL for Large Projects - Debugging and Logging - Building User Authentication and Personalization.

List of Exercises 30 Hours

1. Design a web page using PHP
2. Create a database in MySQL for storing the data
3. Implement the security features in web page
4. Design the web page using images and java script concepts
5. Develop the application using Server side objects
6. Develop the mini project

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Design the web page using PHP for real world scenario	Apply
CO2: Create the web database and store the data in the database using MySQL	Apply
CO3: Implement the security features in web page for the web application using web application security	Apply
CO4: Develop the web application using java script and PHP	Apply
CO5: Create the mini project using PHP & MySQL	Apply

Text Book(s):

T1. Welling Luke; Thomson Laura, “PHP and MySQL Web Development”, 5th Edition, Addison-Wesley, 2018.

Reference Book(s):

R1. Steven Holzner, “PHP: The Complete Reference”, McGraw Hill Education,2017.

R2. Richard Blum,” PHP, MySQL & JavaScript All - in - One For Dummies”, Wiley,2018.

R3. Andrei Besedin, “How to Learn PHP, MySQL and Javascript Quickly (For Dummies)”, Andrei Besedin,2019.

R4. Mike McGrath,” PHP and MySQL”, McGraw Hill Education,2017.

Web References:

1. https://www.w3schools.com/php/php_mysql_intro.asp
2. https://www.tutorialspoint.com/php/php_and_mysql.htm
3. https://www.php.net/manual/en/book.mysql.php

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	20
	CCET 2	3,4	50	
	CCET 3	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN2003		Course Title: Game Programming	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Programming with Python Laboratory

Course Objectives

The course is intended to:

1. Explain the basics of 3D graphics for game development
2. Outline the stages of game development
3. Understand the basics of game engine design
4. Select the gaming development environment and toolkits
5. Develop simple games using Pygame environment

Unit I 3D Graphics for Game Programming 8 Hours

Coordinate Systems, Vertex Transformation, Rasterization and Fragment Operations, Vector Properties, Matrix Properties, Transforms.

Unit II Game Design Principles 9 Hours

Game Concepts, Character development, Story Telling, Game Balancing, Principles of level design.

Unit III Gaming Engine Design 10 Hours

Rendering Concept, Software Rendering, Hardware Rendering, Spatial Sorting Algorithms, Algorithms for Game Engine, Collision Detection.

Unit IV Overview of Gaming Platforms and Frameworks 9 Hours

Organizing your assets, Gaming Objects, Components, Managers and Pathfinding, The Player and Environment, Beginning Unity 2D, Publishing Your game.

Unit V Game Development Using Pygame 9 Hours

Introducing Pygame, Creating Visuals, Making Things Move, Accepting User Input, Exploring the Third Dimension, Making Things Go Boom, Simple Game Creation.

List of Exercises **30 Hours**

1. Designing Simple Objects for Game Development using Unity/Pygame
2. Animating Objects using Unity/Pygame
3. Creating a dynamic text using Unity/Pygame
4. Using keyboard controls for games
5. Creating simple games using Unity
6. Creating simple games using Pygame

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Outline the concepts of 3D graphics for game programming	Understand
CO2: Summarize the game design principles for game development	Understand
CO3: Explain the implementation of gaming engines.	Understand
CO4: Construct a simple gaming objects using unity	Apply
CO5: Develop a simple games using Pygame environment for real world entity	Apply

Text Book(s):

T1. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", 3rd Edition, Course Technology PTR, 2011(Unit I).

T2. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", 2nd Edition Prentice Hall / New Riders, 2009 (Unit II).

T3. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics", 2nd Edition, Morgan Kaufmann, 2006(Unit III).

T4. Brian Moakley, "Unity Games by Tutorials", Razeware LLC,2016 (Unit IV).

T5. Will McGugan, "Beginning Game Development with Python and Pygame", Apress Publishers, 2007(Unit V).

Reference Book(s):

R1. Will McGugan, "Beginning Game Development with Python and Pygame: From Novice to Professional", Apress Publishers, 2007.

R2. Jung Hyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 2011.

Web References:

1. unity3d.com/learn/tutorials
2. https://www.edureka.co/blog/pygame-tutorial

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	1	1	2	2	2	2	1	1
CO2	1	1	1	1	1	1	1	1	2	2	2	2	1	1
CO3	1	1	1	1	1	1	1	1	2	2	2	2	1	1
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN2004	**Course Title: Arduino Programming**		
Course Category: Professional Elective		**Course Level: Practice**	
L:T:P(Hours/Week) **3: 0: 2**	**Credits: 4**	**Total Contact Hours: 75**	**Max. Marks: 100**

Pre-requisites

- Computer Organization and Microprocessor

Course Objectives

The course is intended to:

1. Configure the Arduino IDE
2. Create the Arduino program
3. Implement Serial Communication in Arduino
4. Interface Arduino with devices such as sensors
5. Implement Wireless Communication in Arduino

Unit I Arduino Programming Environment 8 Hours

Installing the Integrated Development Environment (IDE) – Setting Up the Arduino Board – Prepare an Arduino Sketch – Uploading and Running the Blink Sketch – Creating and Saving a Sketch – Arduino with LDR – Structuring an Arduino Program.

Unit II Basics of Arduino Programming 9 Hours

Making the Sketch: Variables - Data types – Arrays - Strings – Operators - Decision statements – Looping – Functions - Mathematical Operators: Arithmetic Operations-Increment and Decrement.

Unit III Serial communication 9 Hours

Sending Debug Information - Sending Formatted Text and Numeric Data - Receiving Serial data - Sending and Receiving Multiple Text Fields, Binary Data - Sending and Receiving Data to and fro Two Serial Devices at the Same Time - Setting Up Processing on Computer to Send and Receive Serial Data

Unit IV Arduino Input and Output with Sensors 10 Hours

Simple Digital and Analog Input using Switch – Sensors - Detecting Movement, Light, Motion, Vibration, Sound and Temperature - Reading RFID Tags - Tracking Rotary Movement - Getting Location from a GPS - Connecting and Adjusting an LED - Controlling the Position of a Servo - Playing Tones.

Unit V Arduino Wireless communication 9 Hours

Send message using Wireless modules - Connecting Arduino to Wireless modules - Sending Messages Using Low-Cost Transceivers - Communicating with Bluetooth Devices - Setting up of Ethernet shield - Requesting Data from a Web Server - Setting Up an Arduino to Be a Web Server - Handling Incoming Web Requests.

List of Exercises 30 Hours

1. Explore the Installation of Arduino Integrated Development Environment (IDE) and Setting Up the Arduino Board.
2. Experiment with Arduino using basics of Programming
3. Implement Digital and Analog Interface using LED
4. Interface the Arduino Kit with sensors
   i. Ultrasonic Sensor
   ii. IR sensor
   iii. Temperature sensor
5. Interface the Arduino Kit with LCD / Play a Tone using Arduino
6. Experiment with Arduino kit by connecting to Wireless communication

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Configure the Arduino IDE to create Sketch	Apply
CO2: Create the Arduino program using function libraries.	Apply
CO3: Implement Serial Communication in Arduino for tranceiving data	Apply
CO4: Interface Arduino with devices such as sensors for I/O operations	Apply
CO5: Implement Wireless Communication in Arduino to handling Web services	Apply

Text Book(s):

T1. Michael, Margolis, "Arduino Cookbook",3rd Edition, O'Reilly Media, 2020.

Reference Book(s):

R1. James A. Langbridge, “Arduino Sketches: Tools and Techniques for Programming Wizardry”, 1st Edition, Wiley publication,2015 .

R2. Bahga, Arshdeep, and Vijay Madisetti, “Internet of Things: A Hands-on Approach” VPT Publisher, 2014.

R3. McEwen, Adrian, and Hakim Cassimally, “Designing the Internet of Things”, John Wiley & Sons, 2013.

Web References:

1. https://www.arduino.cc/en/Tutorial/HomePage
2. https://onlinecourses.swayam2.ac.in/aic20_sp04/preview
3. https://www.javatpoint.com/arduino-coding-basics

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN2005	Course Title: Responsive Web Design		
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 2	Credits:3	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Web Technology

Course Objectives

The course is intended to:

1. Apply various HTML 5 tags for Responsive Web based User Interface Design
2. Explain the concepts of CSS 3 and apply it for presentation of the web content
3. Apply the latest HTML 5 tags and CSS 3 methods for graphics and interactive web design
4. Develop a responsive web page using Bootstrap
5. Develop a responsive web page using JQUERY

Unit I Essentials of Responsive Web Design 9 Hours

Responsive Web Design Nutshell- Using Media Queries- Organizing and Authoring Media Queries-Media Queries Level 4- Converting a fixed pixel design to a fluid proportional layout-Introducing FlexBox- Getting Flexy-Responsive Images.

Unit II HTML 5 and CSS 3 for Responsive Web Design 10 Hours

New semantic elements in HTML5- Embedding media in HTML 5- Quick and useful CSS tricks-Word Wrapping- New CSS3 Selectors- Structural Pseudo classes. Custom properties and variables- Level4 selectors-Text and Box shadow CSS3- Background Gradients-Multiple Background Images-CSS Filters.

Unit III CSS3 for Responsive Web Design 8 Hours

Creating SVGS- Inserting SVGS in web page- Inserting SVG inline- SVG Capabilities and Oddities- Animating SVGs using javascript- Media Queries in SVGs- CSS3 Transitions- CSS3 2D transforms-CSS3 3D Transforms- Animating with CSS3.

Unit IV Approaching Responsive Web Design 8 Hours

HTML 5 Forms- Input Types- Styling HTML 5 Forms with CSS 3- Defining Browser Support Matrix- Tiering the user experience- Linking CSS breakpoints toJavascript- Coding Pragmatic solutions- Validators and linking tools.

UNIT V Responsive Web design using Bootstrap and JQUERY 10 Hours

Grid system- Button Groups- Button Dropdowns- Navigation Elements- Nav Bar- BreadCrumb- Pagination- Badges-Jumbatron- Thumbnails- Plugins- JQUERY: Elements Getters and Setters- Events- Animated Effects.

List of Exercises 30 Hours

1. Build a responsive web page with the following elements using HTML 5 and CSS 3
   - Fluid Grids
   - Responsive images
   - Responsive videos
   - Media Queries
   - Grid System

2. Build a responsive web page with the following elements using HTML 5 and CSS 3

   - Responsive website typography
   - Header layout
   - Responsive menus
   - Mobile-first strategy
   - View Port
   - Tables and Forms

3. Develop a responsive web page using bootstrap
   - Bootstrap Buttons
   - Image Handling
   - Creating a Jumbotron
   - Pagination
   - Progress bars
   - Breadcrumbs

4. Design a page with PLUGINs using Bootstrap

   - Transition Plugin
   - Modal Plugin
   - Dropdown Plugin
   - Tab Plugin
   - Tooltip Plugin

5. Develop a responsive web page using JQUERY
   - Element Getters and Setters
   - Event Handling
   - Animated Effects
6. Design responsive web pages for a real time application using HTML 5, CSS3, Bootstrap and JQUERY

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply various HTML5 tags for Responsive Web based User Interface Design for web application	Apply
CO2: Apply CSS3 for presentation of the web content for web application	Apply
CO3: Apply the latest HTML5 tags and CSS3 methods for graphics and interactive web design for web application	Apply
CO4: Design a responsive web page using Bootstrap for web application	Apply
CO5: Design a responsive web page using JQUERY for web application	Apply

Text Book(s):

T1. Ben Frain ,"Responsive Web Design with HTML5 and CSS3" , Second Edition, Packt Publishing Ltd, 2015 (Unit I- IV).

T2. Benjamin Jakobus, Jason Marah , "Mastering Bootstrap 4", Second Edition, Packt Publishing, 2018(Unit V) .

Reference Book(s):

R1. David Flanagan, "JQUERY Pocket Reference", O' Reilly 2010.

R2. Ricardo Zea, "Mastering Responsive Web Design using HTML5 and CSS3", First Edition, Packt Publishing Ltd, 2012.

Web References:

1. www.w3schools.com
2. www.tutorialspoint.com

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2;Low-1-

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN2006		Course Title: AngularJS	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Web Technology

Course Objectives

The course is intended to:

1. Determine the fundamental of AngularJS
2. Develop an application using AngularJS Tools
3. Apply AngularJS directives to develop an application
4. Design a web application using AngularJS jQuery, Filter and Files
5. Create the form and validate using AngularJS

Unit I Introduction to AngularJS 9 Hours

Introduction to AngularJS - Client-Side Templates - Model View Controller (MVC) - Data Binding - Dependency Injection – Directives - Anatomy of an AngularJS Application: Invoking Angular - Templates and Data Binding - Organizing Dependencies with Modules - Formatting Data with Filters - Changing Views with Routes and $location - Changing the DOM with Directives - Validating User Input.

Unit II AngularJS Development and App Analyze 9 Hours

Project Organization – Tools - Application - Testing with AngularJS - Unit Tests - End-to-End/Integration Tests – Compilation - Other Tools - Yeoman: Optimizing Your Workflow - Integrating AngularJS with RequireJS. The Application - Relationship Between Model, Controller, and Template - The Model - Controllers, Directives, and Services - The Templates - The Tests.

Unit III AngularJS Communication and Directives 9 Hours

Communicating Over $http - Unit Testing - Working with RESTful Resources - The $q and the Promise - Response Interception - Security Considerations. Directives and HTML Validation - API Overview: Naming Your Directive - The Directive Definition Object – Transclusion - Compile and Link Functions – Scopes - Manipulating DOM Elements – Controllers.

Unit IV AngularJS Methods, jQuery, Filter and Files 9 Hours

$location - AngularJS Module Methods - Communicating Between Scopes with $on, $emit, and $broadcast – Cookies - Internationalization and Localization- Sanitizing HTML & the Sanitize Module. Wrapping a jQuery Datepicker - The Teams List App: Filtering and Controller Communication - File Upload in AngularJS - Using Socket.IO - A Simple Pagination Service - Working with Servers and Login.

Unit V AngularJS Animations, Structures, Forms and Validation 9 Hours

Introduction to Animations – CSS Transitions and Animations – JavaScript – Animation Testing- Components of AngularJS routes – Parameters with routes – Resolve with routes – Route Events. AngularJS Form validation – Form validation Testing.

List of Exercises 30 Hours

1. Develop a web page by applying ng-model and ng-bind attribute to calculate the arithmetic operation using AngularJS
2. Apply the Modules of AngularJS to develop a web application
3. Develop a web application by applying Controllers and Directives using AngularJS
4. Apply different AngularJS methods and jQuery to develop an web application
5. Implement AngularJS filter and file upload in Web Application
6. Apply AngularJS service and form validation in web page

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the fundamental of AngularJS for a web page	Understand
CO2: Develop the application using AngularJS Tools for real world scenario	Apply
CO3: Apply AngularJS directives to develop an application for web application	Apply
CO4: Implement AngularJS jQuery, Filter and Files in web application	Apply
CO5: Implement the form and validate the web application using AngularJS	Apply

Text Book(s):

T1. Brad Green & Shyam Seshadri, “AngularJS”, 1st Edition, O’Reilly, 2018.

T2. Lukas Ruebbelke, “AngularJS in Action”, DreamTech Press, New Delhi,2015.

Reference Book(s):

R1. Valeri Karpov, Diego Netto , “Professional AngularJS”, Wiley, June 2015.

Web References:

1. https://angularjs.org/
2. https://www.w3schools.com/angular/angular_intro.asp

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	1	1	2	2	2	2	1	1
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN2007		Course Title: Machine Learning with Python	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Linear Algebra and Infinite Series
- Probability and Statistics
- Programming with Python Laboratory

Course Objectives

The course is intended to:

1. Explore supervised and unsupervised learning paradigms of machine learning
2. Understand various supervised machine learning algorithms and techniques
3. Proficiency in a preprocessing, scaling and feature extraction techniques
4. Apply binning , one hot encoding and liner model for select features
5. Summarize Cross-validation and Model evaluation techniques

Unit I Introduction 9 Hours

Introduction to machine learning - Types of machine learning-Supervised –Unsupervised-Semi supervised-Reinforcement learning - Scikit-learn - Essential libraries and tools - First application: Classifying iris species.

Unit II Supervised Learning 9 Hours

Classification- Regression –Generalization -Overfitting and Underfitting -Supervised Machine Learning Algorithms-k-Nearest Neighbor - k-Neighbors Classification - Linear models - Naive Bayes Classifiers - Decision trees - Ensembles of Decision Trees - Kernelized Support Vector Machines.

Unit III Unsupervised Learning 9 Hours

Types of unsupervised learning - Preprocessing and Scaling - Different kinds of preprocessing - Scaling training and test data - Dimensionality Reduction - Feature Extraction - Manifold Learning - Principal Component Analysis (PCA) – Clustering.

Unit IV Data and Engineering Features 9 Hours

Categorical Variables - One-Hot-Encoding (Dummy variables) - Binning, Discretization, Linear Models and Trees - Interactions and Polynomials - Univariate Non-linear transformations - Automatic Feature Selection - Univariate statistics - Model-based Feature

Selection - Iterative feature selection - Utilizing Expert Knowledge.

Unit V Model Evaluation and Improvement 9 Hours

Cross-validation: Cross-validation in scikit-learn - Stratified K-Fold cross-validation - Leave-One-Out cross-validation Shuffle-Split cross-validation - Cross-validation with groups, Grid Search : Simple Grid-Search - Grid-search with cross-validation Nested cross-validation - Parallelizing cross-validation and grid-search - Evaluation Metrics and scoring: Metrics for binary classification - Multi-class classification -Regression metrics.

List of Exercises 30 Hours

1. Create a machine learning application: classifying iris species
2. Implement the any three supervised machine learning algorithms
3. Write a Python program using Scikit-learn to split the iris dataset into 80% train data and 20% test data. Out of total 150 records, the training set will contain 120 records and the test set contains 30 of those records. Train or fit the data into the model and using the K Nearest Neighbor Algorithm and create a plot of k values vs accuracy
4. Implement the following machine learning concepts
   - Dimensionality Reduction,
   - Feature Extraction
   - Manifold Learning
5. Implement the following machine learning concepts
   - One-Hot-Encoding (Dummy variables)
   - One-Hot-Encoding and Column Transformer using Categorical Variables
   - Automatic Feature Selection
6. Implement different Cross-Validation techniques with Evaluation Metrics and Scoring

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe python scikit library including assigning variables, vectors, matrix and data arrays	Understand
CO2: Apply Classification & decision tree learning in real world problems	Apply
CO3: Design an application using strings and dictionary	Apply
CO4: Demonstrate proper model – feature selection and Train/Test Split	Apply
CO5: Apply Machine learning model using cross validation and Regression metrics	Apply

Text Book(s):

T1. Andreas C. Mueller and Sarah Guido, “Introduction to Machine Learning with Python” , 4th release , O’Reilly, 2018.

Reference Book(s):

R1. Sarkar, Dipanjan, Bali, Raghav, Sharma, Tushar, “Practical Machine Learning with Python” , 1st Edition Apress 2018.

R2. Luis Pedro Coelho , Willi Richert, “Building Machine Learning Systems with Python”, 2nd Edition Packt, 2015.

R3. John Paul Muelle, “Machine Learning For Dummies” , 1st Edition For Dummies, 2016.

R4. Aurelien Geron, “Hands–On Machine Learning with Scikit–Learn and TensorFlow”, 2nd Edition O′Reilly,2019.

Web References:

1. https://realpython.com/tutorials/machine-learning/
2. https://www.python-course.eu/machine_learning.php
3. https://scikit-learn.org/stable/
4. https://www.springboard.com/resources/learning-paths/machine-learning-python/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	1	1	2	2	2	2	1	1
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN2008	**Course Title: Data Analytics using R**		
Course Category: Professional Elective		**Course Level: Mastery**	
L:T:P(Hours/Week) 3: 0: 2	**Credits:4**	**Total Contact Hours:75**	**Max. Marks:100**

Pre-requisites

- Database Management Systems

Course Objectives

The course is intended to:

1. Build the dataset for importing the data for further processing
2. Apply data management operations for managing the data
3. Identify various statistics methods for better understanding of data
4. Predict the future for the upcoming new data using various regressions
5. Utilize the intermediate and advanced graphics operations for enhanced visualization

Unit I – R Fundamentals **9 Hours**

Introduction to R: Usage of R – Working with R – Packages. Creating a dataset: Understanding datasets – Data structures – Data input – Annotating datasets.

Unit II – Data Management **9 Hours**

Basic data management: Creating New Variables-Recoding Variables-Renaming Variables Variables – Missing values – Date values – Type conversions – Sorting data – Merging datasets – Subsetting datasets –SQL statements to manipulate dataframes. Advanced Data Management: Numerical and Character Functions – Control flow – Reshaping Data-Aggregating Data.

Unit III – Graphs and Statistics **9 Hours**

Basic Graphs: Bar plots – Pie charts – Histograms – Box plots-Dot plots. Basic statistics: Descriptive statistics – Frequency and contingency tables – Correlations-T-tests.

Unit IV – Linear Regression **9 Hours**

Regression: Many faces – OLS regression – Regression diagnostics – Unusual observations – Corrective measures – Selecting the best regression model- Generalized Linear Models-Logistics Regression – Poisson Regression.

Unit V – Intermediate and Advanced Graphics **9 Hours**

Intermediate Graphs: Scatter Plots-Line charts-Correlograms- Mosaic Plots-Advanced Graphics: Four graphics systems –ggplot2 Package-Plot Type-Grouping -Faceting- Modifying

the Appearance-Saving graphs.

List of Exercises **30 Hours**

1. Construct new data set by incorporating various data structures for importing the data set
2. Implement the data management operations like sort, merge, subset and aggregate
3. Create bar chart, pie charts, histogram and box plot
4. Visualize the statistics results using descriptive statistics method
5. Predict the result of new data using the regression methods
6. Experiment the different functions in ggplot2 to visualize the results

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Build the dataset for importing the data for further processing using data structures and various data importing options	Apply
CO2: Apply data management operations using sort, merge, subset and aggregate operations for managing the data	Apply
CO3: Discover various statistics methods for better understanding of data using functions in statistics packages	Analyze
CO4: Examine the future by using regression method for the upcoming new data using various regressions	Analyze
CO5: Categorize the intermediate and advanced graphics operations for enhanced visualization using ggplot2	Analyze

Text Book:

T1. Robert I.Kabacoff, “R in Action: Data analysis and graphics with R”, Dreamtech Press, Third Edition, 2019.

Reference Books:

R1. DT Editorial Services, “Big Data – Black Book”, Dreamtech Press, 2015.
R2. EMC Education Services, “Data Science and Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data”, Wiley, 2015.
R3. Roger D. Peng, “R Programming for Data Science”, Lean Publishing, 2015.

Web References:

1. https://cran.r-project.org/manuals.html
2. http://www.cyclismo.org/tutorial/R/
3. http://www.r-tutor.com/r-introduction

4. https://www.programiz.com/r-programming
5. https://www.w3schools.in/r/
6. https://vincentarelbundock.github.io/Rdatasets/datasets.html
7. https://www.r-bloggers.com/datasets-to-practice-your-data-mining/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	2	2	2	2	2	3	2
CO2	3	2	2	2	2	1	1	2	2	2	2	2	3	2
CO3	3	3	2	2	3	1	1	2	2	2	2	2	3	3
CO4	3	3	2	2	3	2	2	2	2	2	2	2	3	3
CO5	3	3	2	2	3	2	2	2	2	2	2	2	3	3

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN2009		Course Title: Advanced Problem Solving using C	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Problem Solving using C

Course Objectives

The course is intended to:

1. Build the various constructs of a programming language with conditional, iteration and recursion
2. Solve problems using control structures
3. Identify the user defined functions and strings
4. Implement collection of elements using arrays and structures
5. Apply dynamic memory management and to show the input and output of files using pointers and files

Unit I Expression Evaluation and Branching 9 Hours

Input type validation for primary constants - Problems on implicit type conversion and explicit type conversion - Hierarchy of operations - Condition checking for real time problems using if…else and nested if statements - Multiple option using switch statement.

Unit II Control Structures 9 Hours

Finite and infinite looping problems using ‘for’, ‘while’ and ‘do…while’ - Simulate the need for jumping and continue statement during iteration - Input and output formatting using iteration statements – Output pattern printing using iteration statements.

Unit III Functions and Strings 9 Hours

Function prototype in C - Return statement vs exit() in main() - Evaluation order of function parameters in C - Return multiple values from a function - Parameter Passing Techniques using derived data types - Backtracking using Recursion -N-queens -String operations for real time problems.

Unit IV Arrays and Structures 9 Hours

Arrays Data Structure in C- Expression evaluation: Postfix, Infix and Prefix - Solving Tower of Hanoi using arrays - Sort an array in ascending and descending order – Array merging -

Structure Member Alignment, Padding and Data Packing - Add two distances (in inch-feet) using structure -Calculate the difference between two time periods using structure.

Unit V Pointers and Files 9 Hours

Pointer operations - Permutation of a string using pointers - Addition of two list using pointers- Reversing of list - Merging of list - Remove duplicates from a sorted linked list -union and intersection two linked list - File operations - Reading and writing a content from file-– Remove specific content from a file-Encryption and decryption of a text file in C.

List of Exercises 30 Hours

1. Write a C program to print lowercase English word corresponding to number using decision making statements
2. Implement a C program to perform pattern printing of elements based on given condition
3. Compose C program to display abbreviation of first, middle except last name
4. Develop a C Program to add two complex numbers by passing structures to a function
5. Implement C program using dynamic memory allocation to sort the linked list
6. Implement program to merge contents of two files into a third file

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Build the various constructs of a programming language with conditional, iteration and recursion for solving real world problems	Apply
CO2: Solve problems using control structures for performing iteration	Apply
CO3: Identify the user defined functions and strings to solve real time problems	Apply
CO4: Implement collection of elements using arrays and structures for solving problems	Apply
CO5: Apply dynamic memory management and to show the input and output of files using pointers and files for real time applications	Apply

Text Book(s):

T1. Byron S. Gottfried, “Programming with C”, Fourth Edition, Schaum’s Outline Series McGraw –Hill, 2018

Reference Book(s):

R1. Yashwanth Kanethkar, “Let us C”, Thirteenth Edition, BPB Publications, 2015

R2. Herbert Schildt, “Complete Reference with C”, Fourth Edition, Tata McGraw Hill,2000

R3. Behrouz A. Forouzan, Richard F. Gilberg, “Computer Science: A Structured Programming Approach Using C”, Third Edition, Cengage Learning

R4. R.S. Salaria, “Problem Solving and Programming in C”, Fifth Edition, Khanna Publishing House, 2016

Web References:

1. https://www.geeksforgeeks.org/c-programming-language/
2. http://www.learntosolveit.com/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	20
	CCET 2	3,4	50	
	CCET 3	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN2010		Course Title: Advanced Problem Solving using Java	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Object Oriented programming using Java

Course Objectives

The course is intended to:

1. Apply the Arrays concept in Java
2. Select the appropriate string operations to solve the given problem
3. Illustrate how java program can be used to solve Stack and Queue Applications
4. Write java programs using recursion concepts
5. Examine the need for Java Collection

Unit I Arrays and Lists 9 Hours

Arrays: Introduction-Types-Applications of Arrays: Searching and Sorting. Problems using arrays: merge “K" sorted arrays, multiply left and right array sum, array conversion into zigzag type, Arranging elements orderly, Splitting an array, Rotating array, Searching in 2D Matrix, addition of submatrix, Finding distinct element, Rearranging an array based on given criteria, Identifying number of occurrences of given element.

Unit II Strings 9 Hours

Introduction: String, String Buffer, Built-in string handling functions of String and String Buffer, Stringtokenizer. Problems using Strings: removing characters, rearrange characters, searching a substring in a string, Reversing Binary numbers, longest common subsequence of two strings, Removing duplicates, sorting of strings specific to case, sum of numbers in a string, checking for pangram, pattern printing, counting substring, rearranging a string, splitting a string, Counting Anagrams, reversing each word in a string.

Unit III Stack and Queue 9 Hours

Stack: Introduction, Stack operations. Problems using stack: Reverse string , sort the elements ,check for balanced parenthesis, convert infix to postfix notation, check elements in a stack are pairwise consecutive, remove repeated digits in a number

Queue: Introduction, Queue Operations. Problems using Queue: Reverse k elements in Queue, Compress the string when lower and upper case are same, Generating binary numbers.

Unit IV Recursion 9 Hours

Introduction, Benefits of Recursion. Problems in Recursion: Count the possible paths from top left to bottom right of matrix, Pattern Printing, Express as sum of power of natural numbers, printing elements in Recaman"s sequence, print N bit binary numbers, print all N digit numbers in increasing order, permutations of a given string, Replace O's with X's.

Unit V Java Collections 9 Hours

Count occurrences of elements - Sort elements by frequency-Maximum Odd Number in Array - Duplicate Words in a Regular Expression- Count number of Distinct Substring- Duplicate characters in a string - Convert a List of String to a comma separated String-Clone an ArrayList to another ArrayList-Convert HashMap to TreeMap- deletion in singly linked list- Reverse a linked list -Operations on PriorityQueue.

List of Exercises 30 Hours

1. Write a java program to merge K sorted arrays and rearrange an array based on given criteria
2. Write a java program to perform various string operations using String class and StringBuffer class
3. Write java program to perform various Stack and Queue operations
4. Compose java program to perform different types of pattern printing and permutations of a string using Recursion
5. Implement java program to perform various operations using Set, List and Queue
6. Implement java program to perform various operations using Collection classes such as ArrayList, HashSet, TreeSet and TreeMap

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Apply the Arrays concept in Java to solve problems	Apply
CO2: Select the appropriate string operations to solve the given concepts	Apply
CO3: Illustrate how Java program can be used to solve Stack and Queue Applications	Apply
CO4: Demonstrate the concepts of Recursion with the given example	Apply
CO5: Examine the need for Java Collection for efficient programming	Apply

Text Book(s):

T1. Herbert Schildt, “Java The Complete Reference”, McGrawHill, Eleventh Edition, 2020 (Unit-I, II & V).

T2. Frank M. Carrano, Janet J. Prichard, “Data Abstraction and Problem solving with Java”, Pearson Education, First Edition, 2005. (Unit III & IV).

Reference Book(s):

R1. Nell Dale,Chip Weems,Mark Headington, “Programming and Problem Solving with Java”, 2nd Edition, Jones and Bartlett Publishers,2008.

R2. Kenneth Alfred Lambert, Martin Osborne , “Java: A Framework for Programming and Problem Solving” ,PWS Pub,1999.

Web References:

1. https://www.w3schools.com/java/
2. https://www.tutorialspoint.com/java/index.htm
3. https://www.geeksforgeeks.org/Java/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN2011	**Course Title: Malware Analysis**		
Course Category: Professional Elective		**Course Level: Mastery**	
L:T:P(Hours/Week) **3: 0: 2**	**Credits: 4**	**Total Contact Hours: 75**	**Max. Marks: 100**

Pre-requisites

- Computer Networks

The course is intended to:

1. Explain the characteristics of Malware
2. Implement Static Analysis of Software
3. Implement Dynamic Analysis of Software
4. Implement code analysis to determine the malware functionality
5. Recognize code constructs

Unit I Introduction to Malware Analysis 9 Hours

Introduction to Malware-Malware Analysis-Need of Malware Analysis-Types of Malware Analysis-Setting Up the Lab Environment.

Unit II Static Analysis 9 Hours

Determining the File Type-Finger Printing the Malware-Multiple Anti-virus scanning-Extracting Strings-Determining File obfuscation-Inspecting PE Header Information-Comparing and Classifying the Malware.

Unit III Dynamic Analysis 9 Hours

Dynamic Analysis Lab Environment – System and Network Monitoring - Dynamic Analysis(Monitoring) tools – Dynamic Analysis steps- Analysis of Malware Execution-Dynamic Link Library Analysis.

Unit IV Assembly Language and Disassembly Primer 9 Hours

Computer Basics-CPU Registers-Data Transfer Instructions- Arithmetic operations- Bitwise Operations- Branching and Conditional Operations - Loops - Functions – Arrays and Strings.

Unit V Disassembly using IDA 9 Hours

Code Analysis tools – Static code Analysis(Disassembly) using IDA – Disassembling Windows API – Patching Binary Using IDA- IDA Scripting and Plugins.

List of Experiments: 30 Hours

1. Comparative study of various malware analysis tools
2. Set up a safe virtual environment to analyze malware
3. Packet sniffing through Wire shark
4. Generation of host based attacks using Hping3
5. Analyze host based attacks traces using Wireshark
6. Capturing intruders through packet inspection

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the characteristics of Malware and its effects on Computing systems	Apply
CO2: Implement Static Analysis of Software including obfuscated malware, to fully understand the software's functionality	Apply
CO3: Implement Dynamic Analysis of Software using Dynamic Analysis monitoring tools	Apply
CO4: Implement code analysis to determine the malware functionality using Assembly Language	Apply
CO5: Recognize code constructs in the disassembly using IDA Pro	Apply

Text Book(s):

T1. Monnappa K A, “Learning Malware Analysis”, Packt Publishing, 1st edition, 2018.

Reference Book(s):

R1. Michael Sikorski and Andrew Honig, “ Practical Malware Analysis”, No Starch Press,2012
R2. Dang, Gazet and Bachaalany, “Practical Reverse Engineering”,Wiley,2014

Web References:

1. https://learning.oreilly.com/library/view/practical-malware-analysis/9781593272906/
2. https://www.udemy.com/course/malware-analysis-course-for-it-security/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN2012		Course Title: Advanced Problem Solving using Python	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Object Oriented programming using Java
- Programming with Python Laboratory

Course Objectives

The course is intended to:

1. Compute expressions and perform tasks using variables, looping and control structures
2. Utilize data structures and perform searching, sorting using modules queue and classes
3. Apply searching and sorting on strings using dictionaries to remove duplications and perform concatenation
4. Solve use cases using Functions, Lambda Functions and Classes
5. Construct an application using time, OS and file Objects

Unit I Problem Solving using Operator, Looping and Control Structures 9 Hours

Implement multi-way selection in Python- Basic Euclidean algorithms - unique prime factors of a number –Armstrong number- Fibonacci Sequence- area of a Tetrahedron- cube sum of first n natural numbers- convert time from 12 hour to 24-hour format- Tower of Hanoi.

Unit II Problem Solving using List and Tuple 9 Hours

Searching the element in the data structure –Identify Positive number – list traversal- sequence operations common to lists, tuples, and strings in Python- Calendar Year Program-Linear Search-Binary Search-Selection Sort-Bubble Sort-Merge sort.

Unit III Problem Solving using Strings and Dictionary 9 Hours

String Palindrome- String Slicing- matching characters in a pair of string- split and join a string- close matches of input string from a list- Permutation of a given string using inbuilt function- Eliminating duplicate characters in string- Sort python dictionaries by Key or Value- Dictionary and counter in Python to find winner of election- Scraping and Finding Ordered Words in a Dictionary using Python.

Unit IV Problem Solving using Functions and Classes 9 Hours

Programming functions – Arguments & return types - Use cases: (String Uppercase to Lowercase, Unique List of Values from List, String anagram Test)- Lambda Functions usage with List, Tuple, Dictionary, String - Use Cases: (Sorted Elements in List, Tuple & Dictionary) Classes – Usage of classes Use cases: (Number to Roman conversion, Parentheses check, possible Subsets of an element set)

Unit V Modules: Time, OS, File Operations 9 Hours

Time objects using time Module: Use Cases (Date formatting, n days from current date, week number, Date of specific Day in a year, Days between)- OS objects using OS Module (List Current Working Directory, Files in Directory, run system commands) Working with Files: Use Cases (Read / Write Data in Files, count no of lines, words, Copy one file content to another)

List of Exercises 30 Hours

1. Implement multi-way selection concept for basic Euclidean algorithm and Tower of Hanoi
2. Implement Binary Search and Merge sort concept using list data structure
3. Implement to find winner of election and eliminating duplicate characters in string using dictionary data structure
4. Implement to find sorted elements in List, Tuple using functions and classes
5. Implement the basic functions in Time module
6. Implement the basic operations in file and functions in OS module

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Build a console application using operators, looping and control Structures	Apply
CO2: Develop an application using list and tuple concepts	Apply
CO3: Design an application using strings and dictionary	Apply
CO4: Apply functions and classes to develop a console application	Apply
CO5: Construct an application using time, OS modules and File operations for real world application	Apply

Text Book(s):

T1. Allen Downey, “Think Python” ,2nd Edition, Green Tea Press, 2012.

Reference Books:

R1. Thareja Reema, “Python Programming: Using Problem Solving Approach”, Oxford University Press, 2017.

R2. Michael H. Gold wasser, Michael T. Goodrich, and Roberto Tamassia, “Data Structures and Algorithms in Python”, 1st Edition , Wiley india Pvt. Ltd, 2013.

R3. Jeffrey Elkner, Chris Meyers Allen Downey, “Learning with Python” , 4th Edition Dream Tech Press Publication, 2015.

R4. Jeffrey Elkner, Chris Meyers Allen Downey, “Learning with Python” , 4th Edition Dream Tech Press Publication, 2015.

R5. Mark Summerfield, “A Complete Introduction to the Python Language”, 2nd Edition Addison-Wesley Professional, 2014.

Web References:

1. https://w3resource.com/python-exercises/
2. https://www.coursera.org/learn/python
3. https://www.w3schools.com/python/
4. https://www.geeksforgeeks.org/python-programming-examples/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Professional Electives (3 Credits)

Course Code: 19ITEN1001	**Course Title: Object Oriented Analysis and Design**		
Course Category: Professional Elective		**Course Level: Mastery**	
L:T:P(Hours/Week) 3: 0: 0	**Credits:3**	**Total Contact Hours:45**	**Max. Marks:100**

Pre-requisites

- Software Engineering

Course Objectives

The course is intended to:

1. Construct the requirement specification document
2. Apply the structural modeling tool
3. Classify use cases into object oriented software realizations
4. Develop the advanced behavioral model
5. Formulate the Architectural model of the system

Unit I Analysis 9 Hours

Overview of Analysis: Problem Statement – Object Modeling – Dynamic Modeling – Functional Modeling – An Overview of the UML. Case Study: ATM System.

Unit II Structural Modeling 9 Hours

Classes – Relationships – Notes, Stereotypes-Tagged Values- Constraints - Class Diagrams – Advanced Classes – Advanced Relationships – Interfaces, Types, And Roles – Packages – Instances - Object Diagrams. Case Study: Static Model For ATM System.

Unit III Use Case and Basic Behavioral Modeling 9 Hours

Interactions – Use Cases – Use Case Diagrams - Interaction Diagrams – Activity Diagrams. Case Study: Interaction Model for Online Registration System.

Unit IV Advanced Behavioral Modeling 9 Hours

Events and Signals - State Machines – Processes and Threads - Modeling Inter Process Communication – Time and Space - Modeling Timing Constraints and Distribution of Objects – State Chart Diagrams - Case Study: Modeling Interprocess Communication.

Unit V Architectural Modeling 9 Hours

Component –Deployment – Collaborations –- Component Diagrams – Deployment Diagrams – Systems and Models -Case Study: Modeling a Client/Server System.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Construct the requirement specification document for specific software in line with the standard formats	Understand
CO2: Apply the structural modeling tool for the construction of advanced class diagram with the appropriate notations	Apply
CO3: Classify use cases into object oriented software realizations through UML tools for the real time applications	Apply
CO4: Develop the advanced behavioral model for specific application using state chart diagrams	Apply
CO5: Formulate the architectural model for the selected software	Apply

Text Book(s):

T1. Grady Booch, James Rumbaugh, Ivar Jacobson., "The Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2015.(Unit II,III,IV,V)

T2. James Rumbaugh, Michael Blaha, William Premeralani, Frederick Eddy and William Lorenson, "Object-Oriented Modeling and Design", 2nd Edition, Pearson Education, 2007. (Unit I)

Reference Book(s):

R1. Martin Fowler, "UML Distilled", 3rd Edition, Pearson Education, 2008.

R2. Grady Booch, "Object Oriented Analysis and Design with Applications", 3rd Edition, Addison Wesley, New Delhi, 2009.

Web References:

1. http://c2.com/cgi-bin/wiki?CategoryPattern
2. http://www.nptel.ac.in/courses/122105022/27
3. http://www.creativeworld9.com/2011/02/study-videos-of-object-oriented_24.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	2	2	2	2	2	1	1
CO2	3	2	2	2	2	2	2	2	2	2	2	2	3	2
CO3	3	2	2	2	2	2	2	2	2	2	2	2	3	2
CO4	3	2	2	2	2	3	3	2	2	2	2	2	3	2
CO5	3	2	2	2	2	3	3	2	2	2	2	2	3	2

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1002		Course Title: Mobile Communication	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Computer Networks

Course Objectives

The course is intended to:

1. Comprehend the elementary concepts of communication systems
2. Recognize the cellular and wireless systems
3. Outline the Architecture of Wireless LAN technologies
4. Determine the functionality of Network layer
5. Identify the functionality of Transport layer

Unit I Wireless Transmission and Medium Access Control 9 Hours

Frequencies for Radio Transmission - Antennas – Signal Propagation – Multiplexing – Modulation – Media Access Control Techniques: SDMA, FDMA, TDMA and CDMA-Comparison of S/F/T/CDMA – Spread Spectrum Techniques.

Unit II Mobile Communication Systems 9 Hours

Introduction to Cellular Systems – Frequency Reuse – Channel Assignment Strategies-Handoff Strategies – Interference and System Capacity– Improving Coverage and Capacity in Cellular Systems - GSM.

Unit III Wireless LAN 9 Hours

Introduction – IEEE 802.11: System Architecture – Protocol Architecture – Physical Layer-MAC Layer – MAC Management – HIPERLAN: HYPERLAN1 – WATM – BRAN- HIPERLAN2 - Bluetooth: Architecture-Radio Layer – Broadband Layer-Link Manager Protocol – L2CAP - Security

Unit IV Mobile Network Layer 9 Hours

Mobile IP Packet Delivery – Agent Discovery – Registration, Tunneling and Encapsulation – Optimization – Reverse Tunneling – DHCP – Mobile Adhoc Networks: Routing- Destination Sequenced Distance Vector Routing– Dynamic Source Routing.

Unit V Mobile Transport Layer 9 Hours

Traditional TCP – Congestion control – Slow start – Fast Retransmit/Fast Recovery – TCP Improvements: Indirect TCP- Snooping TCP-Mobile TCP-Transmission / Timeout Freezing – Selective Retransmission- Transaction Oriented TCP.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Comprehend the elementary concepts of communication systems using wireless transmission schemes	Apply
CO2: Recognize the cellular and modern wireless systems using various Mobile communication technologies	Apply
CO3: Outline the Architecture of Wireless LAN technologies including HIPERLAN, WATM, BRAN and Bluetooth	Apply
CO4: Determine the functionality of Network layer and identify a routing protocol for a given adhoc network	Apply
CO5: Identify the functionality of transport layer for congestion control	Apply

Text Book(s):

T1. Jochen H. Schiller, “Mobile Communications”, 2nd Edition, Pearson Education, New Delhi, 2012.(Units I, III, IV,V)

T2. T.S.Rappaport, “Wireless Communications Principles and Practices”, Pearson Education, Asia, NewDelhi, 2nd Edition, 2010. (Unit II)

Reference Book(s):

R1. William Stallings, “Wireless Communications and Networks”, 2nd Edition, Pearson Education, 2012.

R2. Raj Kamal, “Mobile Computing”, 2nd Edition, Oxford University Press, New Delhi, 2012.

R3. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, “Mobile Computing: Technology, Applications and Service Creation”, 2nd Edition, Tata McGraw Hill, 2010.

R4. Frank Adelstein, Sandeep K S Gupta, Golden G Richard, Loren Schwiebert, “Fundamentals of Mobile and Pervasive Computing”, Tata Mc-Graw Hill Education Pvt Ltd.,

Web References:

1. https://www.iith.ac.in/~tbr/teaching/docs/introduction.pdf
2. www.cs.uml.edu/~glchen/cs414-564/.../C02-Wireless_Transmission.ppt
3. neerci.ist.utl.pt/neerci_shelf/MERC/…?Mobile_Communications.pdf
4. http://web.cs.wpi.edu/~emmanuel/courses/cs525m/S06/slides/mobile_routing.pdf
5. wiki.icmc.usp.br/images/d/d0/C08-Network_Protocols.pdf
6. https://www.iith.ac.in/~tbr/teaching/docs/transport_protocols.pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	1	1	2	3	2	2	3	2
CO2	3	2	2	2	2	1	1	1	2	3	2	2	3	2
CO3	3	2	2	2	2	1	1	1	2	3	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	3	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	3	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1003		Course Title: Software Project Management Concepts	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Software Engineering

Course Objectives

The course is intended to:

1. Evaluate the selection of appropriate software project approach
2. Formulate the sequence of project scheduling and risk management activities
3. Create project plans and risk analysis activities
4. Compose the need of software estimation techniques and resource allocation
5. Analyze the ways to monitor and manage people

Unit I Introduction 9 Hours

Introduction- Need for Software Project Management – Software Project Versus Other Projects –Contract Management – Activities - Project Life Cycle Models for Software – Product Versus Process Quality Management –Programme Management - Overview of Project Planning.

Unit II Project Evaluation 9 Hours

Introduction - Strategic Assessment - Technical Assessment - Cost Benefits Analysis – Cash Flow Forecasting - Cost Benefit Evaluation Techniques - Selection of Appropriate Project Approach.

Unit III Activity Planning 9 Hours

Objectives - Project Schedules – Project and Activities - Sequencing and Scheduling Activities - Network Planning Models – Formulating Network Models - Using Dummy Activities - Identifying Critical Path - Identifying Critical Activities – Activity –on –Arrow Networks - Risk Management: Risk Identification - Risk Assessment – Risk Planning- Evaluating the Risks - PERT Technique.

Unit IV Software Effort Estimation 9 Hours

Problems with Over and Under Estimate - The Basis for Software Estimation – Software Estimation Techniques – Bottom-Up & Top-Down Approach - Expert Judgments - Estimating by Analogy - Function Point Analysis - Resource Allocation: Nature – Identifying Resource Requirements - Scheduling Resources –Publishing Schedule – Cost Schedules.

Unit V Monitoring, Managing People and Organizing Teams 9 Hours

Creating Framework – Collecting the Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring. Working in Teams: Becoming a team- decision making - Organization and team structures-Coordination- dependencies-Communication plan

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Evaluate the selection of appropriate software project approach for a real time application.	Apply
CO2: Formulate the sequence of project scheduling and risk management activities for the development of software.	Apply
CO3: Create project plans and risk analysis activities that address the real-world management challenges.	Apply
CO4: Compose the need of software estimation techniques and resource allocation for a real world scenario.	Apply
CO5: Analyze the ways of monitoring and managing people in an organization.	Apply

Text Book(s):

T1. Bob huges, Mike cotterell,Rajib Mall, “Software Project Management”, 6th Edition, Tata McGraw Hill, New Delhi, 2017.

Reference Book(s):

R1. Roger S Pressman, “Software Engineering, A Practitioner’s Approach”, 7th Edition, McGraw-Hill Higher Education, 2010.

R2. Kamna Malik, Praveen Choudary, “Software Quality, a practitioner’s Approach”, Tata McGraw-Hill Education, 2008.

R3. Walker Royce,“Software Project Management : a unified framework”, Pearson Education, New Delhi, 2005.

R4. Pankaj Jalote , “Software Project Management in practice”, Pearson Education, New Delhi, 2009.

Web References:

1. http://nptel.ac.in/courses/106101061/29
2. http://freevideolectures.com/Course/2318/Software-Engineering/29
3. http://www.scribd.com/doc/7150545/Software-Project-Study-Material#scribd

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	3	3	2	2	2-	2	3	3	2
CO2	3	2	2	2	2	3	3	2	2	2	2	3	3	2
CO3	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO4	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO5	3	2	2	2	2	2	2	2	2	2	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1004		Course Title: TCP/IP Protocols	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Computer Networks

Course Objectives

The course is intended to:

1. Categorize the networking protocols
2. Apply TCP/IP troubleshooting commands
3. Determine the TCP state transition
4. Classify the functionalities of application layer protocols
5. Examine the network management and multimedia services

Unit I TCP / IP Layering 9 Hours

Protocol Layers - TCP/IP Protocol Suite - Wired LANs - Wireless LANs - Point to Point WANs - Switched WANs - Connecting Devices.

Unit II Internet Protocol 9 Hours

Internet Protocol Version 4: Datagrams - Fragmentation - Options - IP Over ATM - Security - IP Package - Address Mapping - ARP Protocol - ICMPv4: Messages - Mobile IP.

Unit III Transmission Control Protocol 9 Hours

TCP Services - TCP Features - Segment - TCP Connection - State Transition Diagram - Windows in TCP - Flow control - Error Control - Congestion Control - TCP Timers - Options.

Unit IV Application Layer 9 Hours

DHCP Operations - Host Configuration - TFTP - Electronic Mail: Architecture - User Agent - Message Transfer Agent: SMTP - POP and IMAP - MIME.

Unit V Network Management and Multimedia 9 Hours

Network Management: SNMP Management Component - SMI - MIB - Multimedia: RTP - RTCP - Voice over IP - Quality of Service - Integrated Services - Differentiated Services.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Categorize the networking protocols for the TCP/IP layering	Analyze
CO2: Apply TCP/IP troubleshooting commands namely arp, ping, ipconfig, and tracert for solving the network problems	Apply
CO3: Determine the TCP state transition using finite state machine	Analyze
CO4: Classify the functionalities of application layer protocols for the real time data transmission	Analyze
CO5: Examine the network management and multimedia services for the network	Analyze

Text Book(s):

T1. Behrouz A. Forouzan “TCP/IP protocol suite”, 4th Edition, Published by McGraw-Hill, 2017.

Reference Book(s):

R1. W. Richard Stevens “TCP/IP Illustrated”, Volume 1, Pearson Education, 2003.

R2. Kevin R. Fall, W. Richard Stevens, “TCP/IP Illustrated”, Volume 1: The Protocols, Pearson Education, 2nd Edition, 2014.

Web References:

1. http://highered.mheducation.com/sites/0073376043/index.html
2. http://ptgmedia.pearsoncmg.com/images/9780321336316/samplepages/0321336313.pd
3. http://www.cs.newpaltz.edu/~pletcha/NET_PY/the-protocols-tcp-ip-illustrated-volume-

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	1	1	1	2	2	1	3	3	3
CO2	3	2	2	2	2	1	1	1	2	2	1	3	3	2
CO3	3	3	2	2	3	1	1	1	2	2	1	3	3	3
CO4	3	3	2	2	3	1	1	1	2	2	1	3	3	3
CO5	3	3	2	2	3	1	1	1	2	2	1	3	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1005	Course Title: Distributed Databases		
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Database Management Systems

Course Objectives

The course is intended to:

1. Determine the data in distributed database
2. Select a data model for data storage
3. Design the distributed database
4. Choose the appropriate querying techniques
5. Examine suitable concurrency control for distributed database

Unit I Introduction 9 Hours

Distributed Data Processing - Distributed Database System - Promises of DDBSs – Problem Areas - Overview of Relational DBMS - Relational Data Base Concepts – Integrity Rule.

Unit II Distributed DBMS Architecture 9 Hours

Review of Computer Networks – DBMS Standardization – Architectural Models for Distributed DBMSs - Distributed DBMS Architecture - Global Directory Issues.

Unit III Distributed Data Base Design 9 Hours

Top Down Design Process - Bottom Up Design Process - Distribution Design Issues - Fragmentation – Allocation – View Management – Data Security – Semantic Integrity Control.

Unit IV Query Processing and Decomposition 9 Hours

Query Processing Problem - Objectives of Query Processing - Characterization of Query Processors - Layers of Query Processing - Query Decomposition - Localization of Distributed Data.

Unit V Distributed Concurrency Control 9 Hours

Serializability Theory – Locking Based Concurrency Control Algorithms – Timestamp Based Concurrency Control Algorithms - Optimistic Concurrency Control Algorithms - Deadlock Management - Relaxed Concurrency Control.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Determine the data in distributed database for the given problem	Understand
CO2: Select a data model for distributed data storage using distributed database architecture	Apply
CO3: Design the distributed database for real world application	Analyze
CO4: Choose the appropriate querying techniques to extract the information from database	Apply
CO5: Examine suitable concurrency control for distributed database to store data	Analyze

Text Book(s):

T1. M.Tamer Ozsu, Patrick Valduriez, “Principles of Distributed Database Systems”, Second Edition, Pearson Education, 2019.

Reference Book(s):

R1. Stefano Ceri, Giuseppe Pelagatti, “Distributed Databases: Principles and Systems”, First Edition, McGraw-Hill, 2017.

R2. Kristina Chodorow and Michael Dirolf, “MongoDB: The Definitive Guide”, First Edition, O’Reilly books, 2015.

Web References:

1. https://www.mongodb.com
2. http://www.gocit.vn/files/MongoDB-www.gocit.vn.pdf
3. https://www.tutorialspoint.com/mongodb/index.htm

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	1	1	1	1	2	2	2	2	1	1
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	3	2	2	3	1	1	1	2	2	2	2	3	3
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	3	2	2	3	1	1	1	2	2	2	2	3	3

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1006		Course Title: Quantum Computing	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Understand the basics of quantum computing
2. Discuss the details of quantum mechanics and the relation to Computer Science
3. Apply the knowledge about the basic hardware and mathematical models of quantum computation
4. Identify the principles and Guidelines for quantum computation
5. Utilize the knowledge of Quantum noise and quantum operations

Unit I Introduction 9 Hours

Global Perspectives – Quantum Bits – Quantum Computation – Quantum Algorithms – Experimental Quantum Information Processing – Quantum Information.

Unit II Quantum Mechanics and Computational Models 9 Hours

Linear Algebra – Postulates of Quantum Mechanics – Application: Superdense Coding – Density Operator –Turing Machines – Circuits – Analysis of Computational Problems.

Unit III Quantum Computation 9 Hours

Quantum Circuits: Quantum Algorithms – Universal Quantum Gates – Quantum Circuit Model of Computation – Simulation – Quantum Search Algorithms.

Unit IV Quantum Computers 9 Hours

Quantum Computers: Guiding Principles-Conditions for quantum computation-Harmonic Oscillator quantum computer-Optical photon quantum computer-Optical cavity quantum electrodynamics-Ion traps-Nuclear magnetic resonance.

Unit V Quantum Information 9 Hours

Quantum noise and quantum operations: Classical Noise-Quantum Operations-Examples of quantum noise and quantum operations-Applications of quantum operations-Limitations-Quantum error correction: Introduction-Quantum error correction-Constructing quantum codes-

Stabilizer codes-Fault-tolerant quantum computation.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the background of classical computing and quantum computing	Understand
CO2: Discuss the details of quantum mechanics and the relation to Computer Science using quantum mechanics and computational models	Understand
CO3: Apply the knowledge about the basic hardware and mathematical models of quantum computation for any real time application	Apply
CO4: Identify the principles and Guidelines for quantum computation using quantum computers	Apply
CO5: Utilize the knowledge of Quantum noise and quantum operations for computing	Apply

Text Book(s):

T1. Michael A. Nielsen, “Quantum Computation and Quantum Information”, Cambridge University Press, 2010.

Reference Book(s):

R1. David McMahon, “Quantum Computing Explained”, Wiley,2007.

Web References:

1. IBM Experience:https://quantumexperience,ng,bluemix.net
2. Microsoft Quantum Development Kit https://www.microsoft.com/en-us/quantum/development-kit
3. Forest SDK PyQuil:https://pyquil.readthedocs.io/en/stable/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	1	1	2	2	2	2	1	1
CO2	1	1	1	1	1	1	1	1	2	2	2	2	1	1
CO3	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1007	Course Title: Block Chain Technologies		
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Data Structures using C
- Cryptography and Network Security

Course Objectives

The course is intended to:

1. Understand the basic of block chain
2. Explain the architecting block chain solutions
3. Describe the models in block chain solutions
4. Introduce the Ethereum Block Chain Implementation
5. Introduce the Hyperledger Block Chain Implementation

Unit I Introduction to Block Chain Concepts 9 Hours

Block Chain Characteristics – Chaining of Blocks - Hashing - Merkle Tree - Consensus - Mining and Finalizing Blocks - Currency Aka Tokens - Security on Block chain - Data Storage on Block chain - Wallets - Coding on Block chain: Smart Contracts - Peer-to-Peer Network - Types of Block chain Nodes - Risk Associated with Block chain Solutions - Life Cycle of Block chain Transaction.

Unit II Architecting Block Chain Solutions 9 Hours

Obstacles for Use of Block chain – Block chain Relevance Evaluation Framework – Block chain Solutions Reference Architecture - Types of Block chain Applications - Cryptographic Tokens - Typical Solution Architecture for Enterprise Use Cases - Types of Block chain Solutions - Architecture Considerations - Architecture with Block chain Platforms - Approach for Designing Block chain Applications.

Unit III Permission Less Model and Permissioned Model 9 Hours

Bitcoin Basics – Wallet – Decentralized Consensus – Aggregate Transactions – Mining the Blocks – Validating new blocks – Assembling and selecting chains of the blocks – Introduction to Permissioned Model.

Unit IV Ethereum Block Chain Implementation 9 Hours

Ethereum Ecosystem - Ethereum Development - Ethereum Tool Stack - Ethereum Virtual

Machine - Smart Contract Programming - Integrated Development Environment - Truffle Framework - Ganache - Unit Testing - Ethereum Accounts - MyEtherWallet - Ethereum Networks/Environments - Infura - Etherscan - Ethereum Clients - Decentralized Application - Metamask - Tuna Fish Use Case Implementation - OpenZeppelin Contracts - Best Practices for Ethereum Smart Contract Development.

Unit V Hyperledger Block Chain Implementation 9 Hours

Introduction - Use Case – Car Ownership Tracking - Hyperledger Fabric - FabCar Use Case Implementation - Invoking Chain code Functions Using Client Application - Best Practices for Chaincode Development – Block chain with IoT and AI/ML - Quantum Computing and Block chain – Block chain Cloud Offerings – Block chain and its Future Potential.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the basic principles behind Block Chain	Understand
CO2: Explain the concepts behind the implementation of Block Chain	Understand
CO3: Describe the architecture for the Block Chain Solutions	Understand
CO4: Apply the Ethereum for Block Chain Implementation	Apply
CO5: Introduce the Hyperledger for Block Chain Implementation	Understand

Text Book(s):

T1. Choudhari Ambadas Tulajadas; Ariff Arshad Sarfarz, Sham M R “Blockchain for Enterprise Application Developers” Wiley Indi Pvt. Ltd., 2020(Unit I,II,IV,V).

T2. Andreas M. Antonopoulos, “Mastering Blockchain” 2nd edition O’Reilly Media 2017 (Unit III).

Reference Book(s):

R1. Melanie Swan, "Blockchain - Blueprint for a New Economy", O’Reilly Media, New Delhi, 2015.

R2. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Second Edition, Packt Publishing, 2018.

Web References:

1. https://nptel.ac.in/courses/106/105/106105184/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	1	2	2	2	2	1	1
CO2	1	1	1	1	1	2	2	1	2	2	2	2	1	1
CO3	1	1	1	1	1	2	2	1	2	2	2	2	1	1
CO4	3	2	2	2	2	2	2	1	2	2	2	2	3	2
CO5	1	1	1	1	1	2	2	1	2	2	2	2	1	1

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1008		Course Title: Information Storage and Management	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Prerequisites

- Database Management Systems
- Computer Networks

Course Objectives

The course is intended to:

1. Apply the suitable RAID levels
2. Design storage networking technologies
3. Design business continuous plan and replication techniques
4. Develop the different security solutions and implementation
5. Create an management activity plan

Unit I Storage System 9 Hours

Introduction to Information Storage and Management – Storage System Environment – Data Protection: RAID – Intelligent Storage System – Components

Unit II Storage Networking Technologies 9 Hours

Direct Attached Storage and Introduction to SCSI – Storage Area Networks – Fiber Channel Network Attached Storage – IP SAN – Content Addressed Storage. Storage Virtualization : NIA storage Taxonomy, configurations, challenges, Types of Virtualization

Unit III Business Continuity 9 Hours

Introduction to Business Continuity – Backup and Recovery – Local Replication: Host Based-Storage Array Based – Remote Replication – Network Infrastructure

Unit IV Storage Security and Management 9 Hours

Securing the Storage Infrastructure – Storage Security Framework – Risk Triad – Storage Security Domains – Security Implementations in Storage Networking: SAN- NAS- IP SAN

Unit V Managing the Storage Infrastructure 9 Hours

Monitoring the Storage Infrastructure – Challenges - Storage Management Activities – Developing an Ideal Solution – Enterprise Management Platforms

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO1: Apply the suitable RAID levels for the given applications	Apply
CO2: Design storage networking technologies for user needs.	Apply
CO3: Design business continuous plan and replication techniques for end user need	Create
CO4: Develop the different security solutions and implementation for the storage in an organization	Create
CO5:Create management activity plan for storage in an organization	Create

Text Book:

T1. EMC Education Services, "Information Storage and Management: Storing, Managing and Protecting Digital Information", 2nd Edition, Wiley Publishing, Inc., India, 2012.

Reference Books:

R1. Nigel Poulton "Data Storage Networking", 2nd Edition,Wiley Publishing, 2015

R2. Hitachi Data Systems Academy "Storage Concepts: Storing and Managing Digital Data", HDS Academy, 2012.

R3. Volker Herminghaus and Albrecht Scriba, "Storage Management in Data Centers: Veritas Storage Foundation", Springer-Verlag Publishers, Berlin Heidelberg, 2009

R4. Christopher Poelker and Alex Nikitin, "Storage Area Networks for Dummies", Wiley Publishing, Inc., India, 2009.

Web References:

1. http://www.open.ac.uk/postgraduate/modules/m816
2. https://catalog.middlesex.mass.edu/preview_course_nopop.php?catoid=17&coid=21480
3. http://www.pitt.edu/~peterb/2140-003/tools.html
4. https://www.netcomlearning.com/training/information-storage-management-ism/selangor-malaysia.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO2	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO3	3	3	3	3	3	2	2	2	2	2	2	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	2	3	3	3
CO5	3	3	3	3	3	3	3	2	2	2	2	3	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1009		Course Title: Service Oriented Architecture	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Prerequisites

- Web Technology

Course Objectives

The course is intended to:

1. Explain the fundamentals of SOA
2. Interpret the service level functionalities.
3. Apply multiple channel access SOA concepts.
4. Classify the meta data Management.
5. Analyze the impact of web service transactions.

Unit I Introduction to SOA with Web Services 9 Hours

SOA and Web Services - SOA Concepts – Service Governance, Processes, Guidelines, and Tools – Key Service Characteristics - SOA: Technical and Business Benefits.

Unit II SOA and Web Services 9 Hours

Web Services Platform – Service Contracts – Service Level Data Model – Service Level Security – Service Level Interaction Patterns – Service Level Communication.

Unit III SOA and Multi-channel Access 9 Hours

Business Benefits of SOA and Multi-Channel Access - SOA for Multi-Channel Access-Client/Presentation and Channel Access Tier – Business Process Management Concepts – Combining BPM, SOA and Web Services – Orchestration and Choreography Specifications –Web Services Composition.

Unit IV Metadata Management 9 Hours

Approach to Metadata Management - Metadata Specifications – Policy – Ws meta data exchange – Web Services Security: Core Concepts – Summary of Challenges, Threats and Remedies – Securing the Communications Layer – Message Level Security.

Unit V Advanced Messaging 9 Hours

Advanced Messaging: Reliable Messaging – Notification - Transaction Processing: Impact of Web Services on Transactions – Protocols and Coordination - Transaction Specifications.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the fundamentals and benefits of web services.	Understand
CO2: Interpret the service level functionalities in SOA and Web.	Understand
CO3: Apply SOA concepts in multiple channel access for real world application	Apply
CO4: Classify the meta data management in web community.	Understand
CO5: Analyze the impact of transactions in web services for the real world scenario	Analyze

Text Book:

T1. Eric Newcomer, Greg Lomow,"Understanding SOA with Web Services", 4th Edition, Pearson Education, New Delhi, 2011.

Reference Books:

R1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Prentice Hall Publication, 2011.

R2. Eric Pulier, Hugh Taylor, "Understanding Enterprise SOA", Dreamtech press, New Delhi, 2005.

R3. Dan Woods, Thomas Mattern "Enterprise SOA: Designing it for Business Innovation", Shroff publishers, 2006.

Web References:

1. http://www.open.ac.uk/postgraduate/modules/m816
2. https://catalog.middlesex.mass.edu/preview_course_nopop.php?catoid=17&coid=21480
3. http://www.pitt.edu/~peterb/2140-003/tools.html
4. https://www.netcomlearning.com/training/information-storage-management-ism/selangor-malaysia.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	1	2	2	2	2	2	1	1
CO2	1	1	1	1	1	1	1	2	2	2	2	2	1	1
CO3	3	2	2	2	2	1	1	2	2	2	2	2	3	2
CO4	1	1	1	1	1	1	1	2	2	2	2	2	1	1
CO5	3	3	2	2	3	1	1	2	2	2	2	2	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1010		Course Title: Cyber Security Concepts	
Course Category: Professional Elective		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Cryptography and Network Security

Course Objectives

The course is intended to:

1. Explain the concepts of cybercrime and its legal aspects
2. Describe the different tools and methods in cybercrime
3. Explain the concepts of Computer Forensics
4. Describe the concept of Cybercrime and Cyber Terrorism
5. Interpret the real time case study relevant to cybercrime

Unit I Introduction to Cybercrime and Information Technology Act 9 Hours

Introduction to cybercrime, Classifications of cybercrimes, Cybercrime: legal perspectives, Indian perspectives, Cybercrime and the Indian ITA 2000, Global perspective on cybercrimes, Cyber offences: Social engineering, Cyberstalking, Cybercafe and cybercrimes.

Unit II Tools and Methods used in Cybercrime 9 Hours

Introduction, Proxy servers and anonymizers, Phishing, Password cracking, Key loggers and spywares, virus and worms, Trojen Horses and Backdoors, Stegnography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

Unit III Understanding Computer Forensics 9 Hours

Historical background of cyber forensics, Digital Forensics science, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Network Forensics, Computer Forensics and Steganography, Forensics and Social Networking sites, Challenges in computer Forensics, Forensics Auditing, Anti forensics.

Unit IV Cybercrime and Cyber Terrorism 9 Hours

Intellectual Property in the Cyberspace, Ethical Dimension of Cybercrimes, Psychology, Mindset and Skills of Hackers and Other Cybercriminals, Sociology of Cybercriminals, Information Warfare, Cyber security : Organizational Implications, Introduction, Cost of Cybercrimes and IPR Issues, Web Threats for organizations, Security and Privacy Implications from Cloud Computing, Social Media marketing.

Unit V Cybercrime Case Study 9 Hours

Indian Case of Online Gambling, Indian case of Intellectual Property Crime, Case of Counterfeit Computer Hardware, Internet used for Murdering, Case of Cyber defamation, Cybersquatting, Financial Frauds in Cyber domain, Digital Signature related Crime Scenarios.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the various concepts of cybercrime , cyber offences and its legal aspects	Understand
CO2: Describe the various tools and methods in cybercrime and various attacks in wireless networks	Understand
CO3: Explain the concepts of Computer Forensics and digital evidences	Understand
CO4: Describe the cyber terrorism and clarify the Intellectual Property Issues in the Cyberspace	Understand
CO5: Interpret the real time case study relevant to cybercrime and Intellectual Property.	Understand

Text Book(s):

T1. Nina Godbole, Sunit Belapure, “Cyber security: Understanding Cybercrime, Computer Forensics and Legal perspectives”, Wiley India Pvt.Ltd, 2019.

Reference Book(s):

R1. Aparna Viswanatha , “Cyber Law- Indian And International Perspectives On Key Topics Including Data Security, E-Commerce, Cloud Computing and Cyber Crimes”, LexisNexis Publishers, 2012.

R2. Rodney D. Ryder, " Guide to Cyber Laws", Second Edition, Wadhwa and Company, 2007.

Web References:

1. http://www.cyberlawsindia.net/internet-crime.html
2. http://www.computerforensicsworld.com

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	1	2	2	2	2	1	1
CO2	1	1	1	1	1	2	2	1	2	2	2	2	1	1
CO3	1	1	1	1	1	2	2	1	2	2	2	2	1	1
CO4	1	1	1	1	1	2	2	1	2	2	2	2	1	1
CO5	1	1	1	1	1	2	2	1	2	2	2	2	1	1

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1011		Course Title: Augmented and Virtual Reality	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Problem Solving using C

Course Objectives

The course is intended to:

1. Explain the concept and type of Virtual and Augmented Reality
2. Identifying and comparing current & future options in VR and AR
3. Explore the knowledge in writing, compiling, running and building application in C#
4. Display a data with UI elements using unity3D tool
5. Design a 2D scene with sound and animation effects

Unit I Introduction to Virtual and Augmented Reality 9 Hours

Introduction - Types of Virtual and Augmented Reality – History of VR/AR - Evaluating the Technology Hype Cycle - Current State of VR: Features – Controllers - Current Issues with VR - Current State of AR: AR Available Form Factors - Controllers - Current Issues with AR.

Unit II Content in Virtual and Augmented Reality 9 Hours

Consumer Grade Virtual Reality - Identifying Near Future Hardware in VR - Comparing Current and Future Options in VR - Exploring Consumer Grade Augmented Reality - Identifying Near Future Hardware in AR - Comparing Current and Future Options in AR.

Unit III C# Basics 9 Hours

C# and .NET Architecture – CLR – Assemblies – Classes – Namespaces – C# Basics – Variables – Data Types – Statements – Preprocessor Directives – Objects and Types – Inheritance – Arrays – Operators and Casts.

Unit IV Displaying Data with Core UI Elements and Inventory UIs 9 Hours

Displaying a "Hello World" UI text message - Displaying a digital clock - digital countdown timer - Perspective 3D Text Mesh - Displaying an image-Creating UIs with the Fungus open source

dialog system - Creating a Fungus character dialog with images – Inventory UIs - Displaying single object pickups with carrying and not-carrying text.

Unit V Manipulating Sound and Animation 9 Hours

Playing different one-off sound effects with a single AudioSource component - Creating the basic scene using camera - Creating a picture-in-picture effect - Lights and Effects - Environment lighting - Emissive materials – Projector – 2D Animation - Flipping a sprite horizontally using Animator State Chart and Transitions - Animating body parts for character movement events.

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Explain the concept and type of Virtual and Augmented Reality	Understand
CO2: Identify the current & future options in VR and AR	Apply
CO3: Describe the basics functionality in C# language	Understand
CO4: Create a data with UI elements using unity3D tool	Apply
CO5: Design a 2D scene with sound and animation effects using unity3D	Apply

Text Book(s):

T1. Paul Mealy, “Virtual & Augmented Reality”, John Wiley & sons, 2018(Unit I,II).

T2. Nagel Christion, “Professional C# 2012 And .Net 4.5”, John Wiley & sons,2018(Unit III).

T3. Matt Smith, “Unity 2018 Cookbook”, Packt Publication, 2018(Unit IV & V).

Reference Book(s):

R1. Grigore C. Burdea, Philippe Coiffet, “Virtual Reality Technology”, John Wiley & Sons, Inc., Second Edition, 2008.

Web References:

1. Build Virtual Worlds – URL:https://developers.google.com/vr/
2. Quick Start for Unity3d - URL: https://docs.unity3d.com/Manual/index.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	1	1	2	2	2	2	1	1
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	1	1	1	1	1	1	1	1	2	2	2	2	1	1
CO4	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO5	3	2	2	2	2	1	1	1	2	2	2	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1012		Course Title: Principles of Management	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Software Engineering

Course Objectives

The course is intended to:

1. Describe social responsibilities as engineers & managers
2. Classify Planning process and decision making.
3. Examine the ways and means of managing the organization process
4. Analyze various organizations and motivation strategies
5. Categorize various controlling techniques and tools

Unit I Overview of Management 9 Hours

Organization - Management - Role of Managers - Evolution of Management Thought – Organization and the Environmental Factors - Managing Globally - Strategies for International Business. Case Study: Flight Plans, Out of Control.

Unit II Planning 9 Hours

Nature and Purpose of Planning - Planning Process - Types of Plans – Objectives - Management by Objective (MBO) Strategies - Types of Strategies - Policies - Decision Making - Types of Decision– Decision Making Process - Rational Decision Making Process - Decision Making Under Different Conditions. Case Study: Underwater Chaos, Icelandic Volcano, Global Commerce.

Unit III Organizing 9 Hours

Nature and Purpose of Organizing - Organization Structure - Formal and Informal Groups Organization - Line and Staff Authority - Departmentation - Span of Control - Centralization and Decentralization - Delegation of Authority - Staffing - Selection and Recruitment - Orientation – Career Development - Career Stages – Training - Performance Appraisal. Case Study: The Virus Hunters.

Unit IV Directing 9 Hours

Creativity and Innovation - Motivation and Satisfaction - Motivation Theories Leadership -

Leadership Theories- Communication - Hurdles to Effective Communication -Organization Culture - Elements and Types of Culture - Managing Cultural Diversity. Case Study: Delivery Disaster, Master and Commander.

Unit V Controlling 9 Hours

The Control Process – Controlling for Organizational Performance – Budgetary and Non-Budgetary Control Techniques - Tools for Measuring Organizational Performance – Contemporary Issues in Control. Case Study: Deep Water in Deep Trouble, Smooth Ride.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe Social responsibilities as engineers & managers for future managers	Understand
CO2: Classify Planning process and decision making for an organization	Understand
CO3: Examine the ways and means of managing the organization process for staffing.	Analyze
CO4: Analyze various organizations and motivation strategies to develop self-motivation among the engineers	Analyze
CO5: Categorize various controlling techniques and tools for measuring organizational performance	Analyze

Text Book(s):

T1. Stephen P. Robbins and Mary Coulter, 'Management', 13th Edition, Pearson Edition, 2016.

Reference Book(s):

R1. Charles W L Hill, Steven L McShane, 'Principles of Management', Mcgraw Hill Education, Special Indian Edition, 2007.
R2. Hellriegel, Slocum & Jackson, ' Management - A Competency Based Approach', ThomsonSouth Western, 10th Edition, 2007.
R3. Harold Koontz, Heinz Weihrich and Mark V Cannice, ‘Management - A Global & Entrepreneurial Perspective’, Tata Mcgraw Hill, 12th Edition, 2007.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	2	2	2	2	2	2	3	3	3
CO2	3	3	3	3	3	3	3	2	2	2	2	3	3	3
CO3	3	3	3	3	3	3	3	2	2	2	2	3	3	3
CO4	3	3	3	2	3	3	3	2	2	2	2	3	3	3
CO5	3	3	3	3	3	3	3	2	2	2	2	3	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1013		Course Title: Information Security	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Computer Networks
- Cryptography and Network Security

Course Objectives

The course is intended to:

1. Describe the basics of Information Security
2. Illustrate the legal, ethical and professional issues in Information Security
3. Identify the aspects of risk management
4. Analyze the various standards in the Information Security System
5. Determine the technological aspects of Information Security

Unit I Introduction 9 Hours

Information Security Concepts - Critical Characteristics of Information - CNSS Security Model - Components of an Information System - Balancing Information Security and Access - The SDLC - The Security SDLC.

Unit II Security Investigation 9 Hours

Need for Security - Business Needs - Threats - Attacks - Secure Software Development – Law and Ethical in Information Security - International Laws and Laws Bodies - Ethics and Information Security

Unit III Security Analysis 9 Hours

Risk Management - Risk Identifying - Risk Assessing - Risk Controlling Strategies – Selecting a Risk Control Strategy – Quantatitive versus Qualitative Risk Control Practices – Business Impact Analysis – Incident Response Planning.

Unit IV Security Plan 9 Hours

Information Security Planning and Governance – Information Security Policy, Standards and Practices - The Information Security Blueprint.

Unit V Physical Design 9 Hours

Access Control – Firewalls - Protecting Remote Connections – Intrusion Detection and Prevention Systems - Honeypots, Honeynets and Padding Cell Systems.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Discuss the basics of information security for an industry	Understand
CO2: Illustrate the legal, ethical and professional issues in information security for real time problem	Understand
CO3: Identify the aspects of risk management in IT industry	Apply
CO4: Analyze the various standards in the Information Security System for security plan	Analyze
CO5: Determine the design and implementation of Security Techniques	Analyze

Text Book(s):

T1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Cengage Learning, 2018

Reference Book(s):

R1. Nina Godbole, “Information Systems Security: Security Management, Metrics, Frameworks and Best Practices”, Wiley, Second edition, 2017.
R2. Stuart McClure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw-Hill, 2012
R3. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2018.

Web References:

1. http://index-of.es/EBooks/Hacking-Exposed/Hacking%20Exposed-Network%20Security%20-%20Secrets%20&%20Solutions,%202nd%20Ed..pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	2	2	-	1	3	1	1
CO2	1	1	1	1	1	2	2	2	2	-	1	3	1	1
CO3	3	2	2	2	2	2	2	2	2	-	1	3	3	2
CO4	3	3	2	2	3	2	2	2	2	-	1	3	3	3
CO5	3	3	2	2	3	2	2	2	2	-	1	3	3	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1014	Course Title: Cyber Physical Systems		
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Cryptography and Network Security

Course Objectives

The course is intended to:

1. Understanding various concepts and challenges in cyber physical system
2. Modeling various tools and languages for cyber physical system
3. Analyze the cyber physical concepts
4. Classify the appropriate civilian application of cyber system
5. Categorize various application of cyber physical system

Unit I Introduction 9 Hours

Concepts - Design challenges - Mobile cyber physical systems - Design principles – Physical system controls - Intelligence application of HDP - HMM in recognition of dynamic hand gestures.

Unit II Modeling 9 Hours

Introduction to models of computation - Languages and tools for system design - Physical System Modeling on cognitive Unmanned Aerial vehicle - Concurrent models of computation - Continuous time model – A causal model - Mixed model - Hybrid systems.

Unit III Sensor Based Cyber Physical Systems 9 Hours

Wireless Sensor and Actuator Networks for Cyber Physical Systems - Applications - Community Sensing - Wireless Embedded/Implanted Micro Systems - Architecture and Security - Application of Machine Learning in monitoring – Robotics – Case studies on network management.

Unit IV Civilian Applications 9 Hours

Energy efficient building Cyber Physical System for Smart Grid Applications – Cyber Physical System for transportation applications - Video communications - Drones - Digital Manufacturing/Industry 4.0 – Case studies on infrastructure management.

Unit V Health Care Applications 9 Hours

CPS to improve health care - Augmented cognition for Intelligent Rehabilitation - Using Wiimote and Kinect for Cognitive Rehabilitation - Functional near - IR Spectroscopy for Auto rehabilitation – Case studies on medical applications.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the challenges and design principles in cyber physical system	Understand
CO2: Model various tools and languages for designing appropriate cyber physical system	Apply
CO3: Examine the cyber physical concepts in AI based applications	Analyze
CO4: Classify the appropriate civilian application of cyber system	Analyze
CO5: Categorize various application of cyber physical system in Health care	Analyze

Text Book(s):

T1. Fei Hu, "Cyber-Physical Systems: Integrated Computing and Engineering Design", CRC Press, London, 2013 (Unit I-III).

T2. Rajeev Alur, "Principles of Cyber Physical Systems", MIT Press, Cambridge, 2015 (Unit IV, V).

Reference Book(s):

R1. E. A. Lee and S. A. Seshia, "Introduction to Embedded Systems, A Cyber -Physical Systems Approach", 2nd Edition, MIT Press, Cambridge, 2017.

R2. Maya Dimitrova and Hiroaki Wagatsuma, "Cyber-Physical Systems for Social Applications", IGI Global, Japan, 2019.

Web References:

1. https://ptolemy.berkeley.edu/projects/cps/
2. https://www.nsf.gov/news/special_reports/cyber-physical/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	1	1	2	2	2	2	1	1
CO2	3	2	2	2	2	1	1	1	2	2	2	2	3	2
CO3	3	3	2	2	3	1	1	1	2	2	2	2	3	3
CO4	3	3	2	2	3	1	1	1	2	2	2	2	3	3
CO5	3	3	2	2	3	1	1	1	2	2	2	2	3	3

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1015		Course Title: Big Data and Analytics	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Database Management Systems
- Data Mining

Course Objectives

The course is intended to:

1. Describe the basic concepts of statistics
2. Explain the concept and challenge of big data analytics and technologies
3. Design a database for the big data applications
4. Summarize the various forms of integrated data
5. Build the reliable, scalable and distributed systems

Unit I – Introduction to Statistics **9 Hours**

Introduction: Nature and scope of Statistics, limitations of statistics - Types of data: Concept of population and sample, primary and secondary data, quantitative and qualitative data, discrete and continuous data, cross-sectional and time series data. Scales of measurement: Nominal, Ordinal, Ratio and Interval.

Unit II - Introduction to Big Data Analytics **9 Hours**

Introduction - Classification of Analytics - Greatest Challenges that Prevent Businesses from Capitalizing on Big Data - Top Challenges Facing Big Data – Importance of Big Data Analytics - Data Science - Terminologies Used in Big Data Environment - Other Analytics Tools.

Unit III - Introduction to Mongodb **9 Hours**

Introduction – Features of MongoDB - Terms used in RDBMS and MongoDB - Data Types in MongoDB - CRUD (Create, Read, Update and Delete).

Unit IV - Introduction to Hive **9 Hours**

Features of Hive - Integration and Work Flow – Architecture - Data Types - File Format - Hive Query Language - RCFILE Implementation – SERDE – UDF.

Unit V - Introduction to Pig **9 Hours**

Pig on Hadoop - Pig Latin Overview - Data Types in Pig - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Type - Word Count Example - Pig versus Hive.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Describe the basic concepts of statistics for data analysis	Understand
CO2:Explain the concept and challenge of big data analytics and technologies used to analyze the big data	Understand
CO3: Design a database for the big data applications by incorporating the MongoDB query language	Apply
CO4: Summarize the various forms of integrated data using Hive	Analyze
CO5: Build the reliable, scalable and distributed systems with apache Hadoop	Apply

Text Books:

T1. S.P.Gupta, "Statistical Methods", Sultan Chand and sons, 2019 (Unit I).
T2. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", 1st Edition, Wiley India, 2015 (Unit II, III, IV, V).

Reference Books:

R1. EMC Education Services, "Data Science and Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data", Wiley, 2015.
R2. DT Editorial Services, "Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization", Dreamtech Press, 2016.
R3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2013.
R4. Jure Leskovec, Anand Rajaraman, Jeffery David Ullman, "Mining of Massive Datasets", 2nd Edition, Cambridge University Press, 2014.

Web References:

1. https://bigdatauniversity.com/
2. https://www-01.ibm.com/software/data/infosphere/hadoop/what-is-big-data-analytics.html
3. https://www.tutorialspoint.com/big_data_tutorials.htm

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	2	2	1	2	3	1	1
CO2	1	1	1	1	1	2	2	2	2	1	2	3	1	1
CO3	3	2	2	2	2	2	2	2	2	1	2	3	3	2
CO4	3	3	2	2	3	2	2	2	2	1	2	3	3	3
CO5	3	2	2	2	2	2	2	2	2	1	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1016		Course Title: Business Intelligence and its Application	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3:0:0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Database Management Systems

Course Objectives

The course is intended to:

1. Explain the different types of digital data.
2. Describe the data models for On-Line Transaction Processing and On-Line Analytical Processing
3. Apply the data warehouse implementation methodologies and project life cycle
4. Identify the metrics, indicators and make recommendations to achieve the business goal
5. Design an enterprise dashboard

Unit I Introduction to Business Intelligence 8 Hours

Business View of Information Technology Applications – Case Studies – Types of Digital Data: Introduction – Getting into “Good Life Database” – Structured Data – Unstructured Data – Semi Structured Data – Difference between Semi Structured Data and Structured Data.

Unit II Introduction To OLTP And OLAP 9 Hours

On-Line Transaction Processing – On-Line Analytical Processing – Different OLAP Architectures – OLTP and OLAP – Data Models for OLTP and OLAP – Role of OLAP Tools in BI Architecture – OLAP Operations on Multidimensional Data – Leveraging ERP Data Using Analytics – Getting Started with Business Intelligence.

Unit III Data Integrations 10 Hours

BI Concepts: BI Component Framework – Who is BI for? – BI Users – BI Applications – BI Roles and Responsibilities. Basics of Data Integration: Need for Data Warehouse – Data Mart – Ralph Kimball’s vs. W.H. Inmon’s Approach – Goals of Data Warehouse – Constitutes of Data Warehouse – Extract, Transform, Load – Constitutes of Data Integration – Data Integration Technologies – Data Quality – Data Profiling – Case Study.

Unit IV Multidimensional Data Modeling 9 Hours

Data Modeling Basics – Types of Data Model – Data Modeling Techniques – Fact Table – Dimension Table – Typical Dimensional Models – Dimensional Modeling Life Cycle – Measures, Metrics, KPIs and Performance Management.

Unit V Enterprise Reporting 9 Hours

Reporting Perspectives – Reporting Standardization and Presentation Practices – Enterprise Reporting Characteristics – Balanced Scorecards – Dashboards – Dashboard Creation – Scorecards vs. Dashboards – The Buzz Behind Analysis.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Illustrate the different types of digital data and their differences	Apply
CO2: Describe the data models for On-Line Transaction Processing and On-Line Analytical Processing	Apply
CO3: Demonstrate understanding of Data Warehouse implementation methodology and project life cycle	Apply
CO4: Identify the metrics, indicators and make recommendations to achieve the business goal for the given business scenario	Apply
CO5: Design an enterprise dashboard that depicts the key performance indicators which helps in decision making	Apply

Text Book(s):

T1. R.N.Prasad and Seema Acharya “Fundamentals of Business Analytics”, 2nd Edition, Wiley India, 2018.

Reference Book(s):

R1. Minelli Michael, Chambers Michael, Dhiraj Ambiga, “Big Data Big Analytics: Emerging Business Intelligence and Analytic Trends for Today’s Business”, Wiley India, 2014.
R2. Turban Efrain, Sharda Ramesh, Delen Dursun, “Decision Support and Business Intelligence Systems”, Pearson, 2014.
R3. Leblanc Patrick, “Applied Microsoft Business Intelligence”, Wiley, 2015.

Web References:

1. https://www.tutorialspoint.com/management_information_system/business_intelligence_system.html
2. http://businessintelligencetutorial.blogspot.in/
3. https://www.ibm.com/support/knowledgecenter/en/SSZJPZ_11.5.0/com.ibm.swg.im.iis.mdbbr.doc/topics/c_BI_metadata.html
4. https://docs.oracle.com/cd/E21764_01/bi.1111/e16364/soa_overview.htm#BIEIT137

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	1	2	3	2	3	3	2
CO2	3	2	2	2	2	2	2	1	2	3	2	3	3	2
CO3	3	2	2	2	2	2	2	1	2	3	2	3	3	2
CO4	3	2	2	2	2	2	2	1	2	3	2	3	3	2
CO5	3	2	2	2	2	2	2	1	2	3	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1017		Course Title: Data Visualization Techniques	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Data Mining

Course Objectives

The course is intended to:

1. Describe the principles of visual perception
2. Design systems to visualize spatial and geospatial data
3. Design systems to visualize multivariate data and tree, graph, networks data
4. Apply interaction visualization techniques
5. Design an effective visualization techniques

Unit I Foundations for Data Visualization 9 Hours

Visualization – visualization process – role of cognition – Pseudocode conventions – Scatter plot - Data foundation: Types of data - Structure within and between records - Data preprocessing – Human perceptions and information processing.

Unit II Spatial and Geospatial Data 9 Hours

Visualization foundations- One, two, three dimensional data – Dynamic data – Combining techniques-Visualization of spatial data – Visualization of point data – Visualization of line data – Visualization of area data – Issues in Geospatial data Visualization

Unit III Multivariate Data and Tree, Graph, Networks 9 Hours

Visualization Techniques for Multivariate Data: Point, Line and region based techniques for multivariate data. Visualization Techniques for Trees, Graphs, and Networks: Displaying hierarchical structure – Displaying Arbitrary Graphs/Networks.

Unit IV Interaction Techniques 9 Hours

Text and Document Visualization - Interaction Operands and Spaces-Screen space-Object space-Data space-Attribute space-Data structure space-Visualization structure space-Animating transformations-Interaction control.

Unit V Designing Effective Visualizations 9 Hours

Steps in Designing Visualization – problems in Designing Effective Visualization –User Tasks-

User Characteristics – Data Characteristics- Visualization Characteristics- Structures for Evaluating Visualizations- Visualization Systems.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the principles of visual perception to carry out preprocessing in real time data	Understand
CO2: Design systems to visualize spatial and geospatial data for various data analysis tasks	Apply
CO3: Design systems to visualize multivariate data and tree, graph, networks data for multivariate analysis and displaying hierarchical/graph structure	Apply
CO4: Apply interaction visualization techniques for different spaces	Apply
CO5: Design an effective visualization techniques for the given problems	Apply

Text Book(s):

T1. Matthew O. Ward. , Georges Grinstein and Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC Press, 2015.

Reference Book(s):

R1. Matthew Ward, Georges Grinstein and Daniel Keim, “Interactive Data Visualization Foundations, Techniques, Applications”, 2010

R2. Colin Ware, “Information Visualization Perception for Design”, Third Edition, Morgan Kaufmann Publishers, 2012

R3. Robert Spence, “Information Visualization An Introduction”, Third Edition, Pearson Education, 2014.

Web References:

1. http://digilib.stmik-banjarbaru.ac.id/data.bc/15.%20Information%20Retrieval/2013%20Information%20Visualization%20Perception%20for%20Design.pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	1	2	1	2	1	3	1	1
CO2	3	2	2	2	2	1	1	2	1	2	1	3	3	2
CO3	3	2	2	2	2	1	1	2	1	2	1	3	3	2
CO4	3	2	2	2	2	1	1	2	1	2	1	3	3	2
CO5	3	2	2	2	2	1	1	2	1	2	1	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1018		Course Title: Robotic Process Automation	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:4	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Object Oriented Programming using Java

Course Objectives

The course is intended to:

1. Describe the basic programming concepts and the underlying logic/structure in RPA
2. Develop RPA programs using control flow, loop, data manipulation and file operation
3. Construct programs using Text and Data Tables Automation in Studio
4. Implement programs using various events and exception handling
5. Apply various functionalities of orchestrator

Unit I Introduction to RPA **9 Hours**

Introduction to RPA – Components – RPA Platforms – UiPath Stack: Studio – Types of Robot – Orchestrator. UiPath Studio: User Interface – Task recorder

Unit II Programming Workflow **9 Hours**

Activities – Control flow – Various types of loops and decision making. Data Manipulation: Variables and scope – Collections – Arguments – Data table usage – Clipboard management – File operation

Unit III Controls and Plugin **9 Hours**

Finding the Control – Techniques for waiting for a control – Act on control – Mouse and Keyboard Activities – Working with UiExplorer – Handling events – SAP Automation – Java plugin – Citrix automation – Mail and PDF plugin – Web integration – Excel and word plugins – Credential management.

Unit IV Monitoring Events and Exception Handling **9 Hours**

Monitoring system event triggers – Monitoring image and element triggers – Common exceptions and way to handle them – Logging and taking screenshots – Debugging techniques – Collecting crash dumps – Error reporting

Unit V Managing, Maintaining & Deploying Code Project **9 Hours**

Layout for each workflow – Nesting workflows – Reusability workflows – State Machine – Publishing – Orchestration Server: Overview – Control bots – deploy bots – License management – Publishing and managing updates

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Describe RPA , where it can be applied and how its implemented	Understand
CO2: Develop understanding and application of Data Manipulation techniques	Apply
CO3: Construct programs using Text and Data Tables Automation in Studio	Apply
CO4: Implement programs using various types of Exceptions and strategies	Apply
CO5: Implement various module using orchestrator	Apply

Text Book(s):

T1. Alok Mani Tripathi, “Learning Robotic Process Automation”, First Edition, Packt Publishing, 2018.

Reference Book(s):

R1. Kelly Wibbenmeyer, “The Simple Implementation guide to Robotic Process Automation”, Kindle Edition, 2018.
R2. Richard Murdoch, “Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant”, Kindle Edition, 2018.

Web References:

1. https://www.uipath.com/rpa/robotic-process-automation
2. https://www.guru99.com/robotic-process-automation-tutorial.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	1	1	2	1	1	1	3	1	1
CO2	3	2	2	2	2	1	1	2	1	1	1	3	3	2
CO3	3	2	2	2	2	1	1	2	1	1	1	3	3	2
CO4	3	2	2	2	2	1	1	2	1	1	1	3	3	2
CO5	3	2	2	2	2	1	1	2	1	1	1	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1019		Course Title: Natural Language Processing	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Probability and Statistics

Course Objectives

The course is intended to:

1. Identify the performance of Language models.
2. Inspect vector semantics to model word as a vector.
3. Parse the given Context Free Grammar.
4. Examine semantic role labels and selectional restriction of words.
5. Develop a rule based chatbots to map user sentences.

Unit I Basics of NLP 9 Hours

Regular Expression - Text Normalization - Minimum Edit Distance - N-Grams – Language Models-Smoothing – Kneser-Ney Smoothing– Naïve Bayes classifiers – Optimizing for Sentiment Analysis.

Unit II Regression, Vector Semantics and Embedding 9 Hours

Logistic Regression – Lexical Semantics – Vector Semantics- Words and Vectors- cosine for measuring similarity- TF-IDF Weighting terms in the vector- PMI- Word2Vec- Visualizing Embedding.

Unit III Syntactic Analysis 9 Hours

Context-Free Grammars – Grammar Rules – Treebanks - Grammar Equivalence and Normal Form - Lexicalized Grammars – Ambiguity- CKY Parsing - Span-Based Neural Constituency Parsing - Evaluating Parsers – Partial parsing - CCG Parsing.

Unit IV Information Extraction & Semantic Role Labeling 9 Hours

Relation Extraction – Relation Extraction Algorithms- Word Senses- Relation between senses- WordNet- Word Sense Disambiguation- Semantic Roles – The Preposition Bank-Frame Net- Semantic Role Labeling.

Unit V Question Answering & Chatbots 9 Hours

Information Retrieval- IR-based Factoid Question Answering- Entity Linking- Knowledge-based Question Answering- Classic QA Models- Chatbots- GUS: Simple Frame-based Dialogue Systems- The Dialogue-State Architecture- Dialogue System Design.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Identify the performance of Language models in an application.	Apply
CO2: Inspect vector semantics to model word as a vector using vector semantics models.	Analyze
CO3: Parse the given Context Free Grammar using different parsing algorithms.	Analyze
CO4: Examine semantic role labels and selectional restriction of words based on predicate event.	Analyze
CO5: Develop rule based chatbots to map user sentences into system responses	Apply

Text Book(s):

T1. Daniel Jurafsky, James H. Martin, “Speech and Language Processing”, 3rd Edition, Prentice Hall, December, 2008.

Reference Book(s):

R1. Nitin Indurkhya, Fred J.Damerau , Hinrich Schuetze, “Handbook of Natural Language Processing”, 2nd Edition, CRC Press, 2010.

R2. Tanveer Siddiqui, U.S. Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.

R3. Alexander Clark, Chris Fo and Shalom Lappin, “The Handbook of Computational Linguistics and Natural Language Processing”, 1st Edition, Wiley-Blackwell, 2013.

Web References:

1. https://www.nltk.org/
2. https://nlp.stanford.edu/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	1	1	1	1	1	2	3	2
CO2	3	3	2	2	3	2	1	1	1	1	1	2	3	3
CO3	3	3	2	2	3	2	1	1	1	1	1	2	3	3
CO4	3	3	2	2	3	2	1	1	1	1	1	2	3	3
CO5	3	2	2	2	2	2	1	1	1	1	1	2	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1020		Course Title: Computer Vision	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Introduction to Electrical and Electronics Engineering

Course Objectives

The course is intended to:

1. Explain the fundamental image concepts
2. Analyze images in the spatial and frequency domain
3. Interpret image segmentation and representation techniques
4. Describe different methods in object detection and recognition.
5. Enunciate the applications of computer vision.

Unit I Fundamentals of Image Processing 9 Hours

Introduction - Fundamentals steps in Digital Image Processing - Components of an Image Processing System- Elements of Visual Perception - Image sensing and Acquisition - Sampling and Quantization-Pixel Relationships.

Unit II Image Transformation 9 Hours

Spatial Domain Gray Level Transformations – Histogram Processing - Spatial Filtering - Smoothing and Sharpening. Frequency Domain: Discrete Fourier Transform - Properties of DFT - Smoothening and Sharpening Filters

Unit III Segmentation and Feature Extraction 9 Hours

Introduction – Point, Line and Edge Detection – Thresholding - Region-Based Segmentation - Feature extraction: Boundary Preprocessing - Boundary Feature Descriptors - Boundary Feature Descriptors - Region Feature Descriptors

Unit IV Object detection and Recognition 9 Hours

The Sliding Window Method: Face Detection, Detecting Humans, Detecting Boundaries - Detecting Deformable Objects - Object Recognition: Introduction - Current Strategies for Object Recognition – Categorization - Selection

Unit V Applications 9 Hours

Image-Based Modeling and Rendering: Initial Feature Matching – Expansion – Filtering - Image Search and Retrieval: Applications - User Needs - Types of Image Query - Basic

Technologies from Information Retrieval - Word Counts- Approximate Nearest Neighbors and Hashing-Ranking image search result-Predicting correlated words with classifiers.

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Explain the fundamental concepts of Image processing system	Understand
CO2: Analyze Images in the spatial and frequency domain using various transforms	Understand
CO3: Describe the segmentation and feature extraction techniques	Understand
CO4: Explain the various techniques in Object detection and Recognition	Understand
CO5: Describe the applications of image and computer vision	Understand

Text Book(s):

T1. Rafael C Gonzalez and Richard E Woods, "Digital Image Processing", 4th Edition, Addition - Wesley, New Delhi, 2018, (Unit I,II,III).

T2. D. A. Forsyth, J. Ponce ,"Computer Vision: A Modern Approach", 2nd Edition, Pearson Education, 2015, (Unit IV,V).

Reference Book(s):

R1. Richard Szeliski, "Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2020

R2. Rafael C Gonzalez, Richard E.woods and Steven L. Eddins, "Digital Image Processing Using MATLAB", Tata McGraw Hill,New Delhi, 2010

Web References:

1. http://cs.brown.edu/courses/csci1430/2013/

2 http://www.cse.iitm.ac.in/~vplab/computer_vision.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	1	2	1	1	3	1	1
CO2	1	1	1	1	1	2	2	1	2	1	1	3	1	1
CO3	1	1	1	1	1	2	2	1	2	1	1	3	1	1
CO4	1	1	1	1	1	2	2	1	2	1	1	3	1	1
CO5	1	1	1	1	1	2	2	1	2	1	1	3	1	1

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1021		Course Title: Industry 4.0	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Internet of Things

Course Objectives

The course is intended to:

1. Exhibit Industry 4.0 and scope for Indian Industry
2. Inspect conceptual framework of Industry 4.0
3. Examine Technology Roadmap and Product development phase of Industry 4.0
4. Demonstrate Robotic technology and Augmented reality for Industry 4.0
5. Examine obstacle and framework conditions for Industry 4.0

Unit I Introduction 9 Hours

Introduction, core idea of Industry 4.0,origin concept of industry 4.0,Industry 4.0 production system, current state of industry 4.0, Technologies, How is India preparing for Industry 4.0.

Unit II A Conceptual Framework 7 Hours

Introduction, Main Concepts and Components of Industry 4.0, State of Art, Supportive Technologies, Proposed Framework for Industry 4.0.

Unit III Technology Roadmap 7 Hours

Introduction, Proposed Framework for Technology Roadmap, Strategy Phase, New Product and Process Development Phase.

Unit IV Advances in Robotics and Role of Augmented Reality 11 Hours

Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Robotic Things, Cloud Robotics, and Cognitive Architecture for Cyber-Physical Robotics, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly- AR Hardware and Software Technology, Industrial Applications of AR.

Unit V Obstacles and Framework Conditions 11 Hours

Lack of a Digital Strategy alongside Resource Scarcity, Lack of standards and poor data security, Financing conditions, availability of skilled workers, comprehensive broadband infra-structure, state support, legal framework, protection of corporate data, liability, handling personal data.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Exhibit Industry 4.0 and scope	Apply
CO2: Inspect conceptual framework	Apply
CO3: Examine Technology Roadmap and Product development phase	Apply
CO4: Demonstrate Robotic technology and Augmented reality	Apply
CO5: Examine obstacle and framework conditions in the real world scenario	Apply

Text Book(s):

T1. Alp Ustundag, Emre Cevikcan, “Industry 4.0: Managing The Digital Transformation”, Springer, 2018.

Reference Book(s):

R1. Bartodziej, Christoph Jan,”The Concept Industry 4.0”, Springer, 2017

R2. Klaus Schwab,”The Fourth Industrial Revolution”, 2016

Web References:

1. https://www.i-scoop.eu/industry-4-0/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	1	1	1	2	3	3	2
CO2	3	2	2	2	2	2	2	1	1	1	2	3	3	2
CO3	3	2	2	2	2	2	2	1	1	1	2	3	3	2
CO4	3	2	2	2	2	2	2	1	1	1	2	3	3	2
CO5	3	2	2	2	2	2	2	1	1	1	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1022		Course Title: Software Quality and Testing	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Software Engineering

Course Objectives

The course is intended to:

1. Identify the suitable software process model
2. Compare the different testing methods
3. Examine the ways and means of managing, controlling and monitoring testing activity
4. Apply the testing tools and techniques
5. Assess the software testing techniques

Unit I Principles of Testing and Quality Control 9 Hours

Context of Testing in Producing Software-Basic Principles of Testing with Examples-Software Development Life Cycle Models: Phases of Software Project- Quality Assurance and Quality Control-Testing-Verification and Validation- Process Model- Life Cycle Models.

Unit II Testing Methods 9 Hours

White Box Testing: Static Testing- Structural Testing and Challenges in White Box Testing-Black Box Testing: Requirements Based Testing- Equivalence Partitioning-State Based Testing- Compatibility Testing- User Documentation Testing and Domain Testing. System Testing: Functional System Testing and Non Functional Testing.

Unit III Test Management, Control and Monitoring 9 Hours

Test Planning-Test Management-Test Process- Test Reporting-Test Process- Best Practices. Test Metrics and Measurements: Progress Metrics-Productivity Metrics- Release Metrics.

Unit IV System Testing & Tool 9 Hours

System Testing: Process- Commencement and Planning- Test Design- Execution and Reporting & Defect Tracking. Winrunner 8.0: Introduction to Winrunner - Checkpoints in Winrunner- Data Driven and Batch Testing- Improve Test Automation in Winrunner-GUI Mapping

Unit V Test Automation Tools 9 Hours

QTP 8.2: Introduction - Edit Test Scripts– Improving Test Automation in QTP-Data Driven and Batch Testing-Web Test Options in QTP. Loadrunner 8.0: Introduction to Performance Testing-Vuserscript Creation using Loadrunner- Vuserscript Execution and Results Analysis.

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Identify the suitable software process model for specific scenario and quality control	Understand
CO2: Compare the different testing methods for performing software testing	Understand
CO3: Examine the ways and means of managing, controlling and monitoring testing activity involved in the software development	Understand
CO4: Apply the testing tools and techniques for developing test cases and conduct investigations in system based testing	Apply
CO5: Assess the software testing techniques using automation tools	Understand

Text Book(s):

T1. Srinivasan Desikan , Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Prentice Hall, 2007 (Unit I, II, III).

T2. Nageshwar Rao Pusuluri, “Software Testing Concepts And Tools”, Dream tech Press, 2014(Unit IV, V).

Reference Book(s):

R1. Limaye M G, "Software Testing – Principles, Techniques and Tools", Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 2009.

R2. Mark Fewster, Dorothy Graham, "Software Test Automation: Effective Use of Test Execution Tools", Addison Wesley, New Delhi, 1999.

R3. William E Perry, "Effective Methods of Software Testing", 3rd Edition, John Wiley &sons, Singapore 2009.

R4. Ilene Burnstein, “Practical Software Testing: A Process-Oriented Approach”, Springer International Edition, 2003.

Web References:

1. https://www.en.wikibooks.org/wiki/...to_Software.../Process/Life_Cycle
2. https://www.softwaretestingfundamentals.com
3. https://www.softwareqatest.com/qatweb1.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	2	2	2	2	3	1	1
CO2	1	1	1	1	1	2	2	2	2	2	2	3	1	1
CO3	1	1	1	1	1	2	2	2	2	2	2	3	1	1
CO4	3	2	2	2	2	3	3	2	2	2	2	3	3	2
CO5	1	1	1	1	1	3	3	2	2	2	2	3	1	1

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1023		Course Title: Agile Project Development	
Course Category: Professional Electives		Course Level: Mastery	
L:T:P (Hours/Week) 3:0:0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Software Engineering

Course Objectives

The course is intended to:

1. Describe the concepts involved in agile project development
2. Define the benefits of using SCRUM
3. Identify various roles and responsibilities in SCRUM
4. Analyze the scrum team structure with their responsibilities
5. Apply the SCRUM requirements effectively

Unit I – Fundamentals of Agile **9 Hours**

Agile Development – Agility – Cost of Change – Agile Process – Principles and Human Factors – Extreme Programming (XP): Values, XP Process, and Industrial XP – Agile Process Models: Adaptive Software Development (ASD) – Scrum – DSDM – Crystal – Feature Driven Development – LSD – Agile Modeling – Agile Unified Process.

Unit II - SCRUM **9 Hours**

Advantages of Agile Development: Higher Productivity, Lower Costs, Faster Time to Market, Higher Quality – Introduction to SCRUM – Adapting to SCRUM – Awareness – Desire – Ability – Promotion – Transfer – Integrating all Together.

Unit III - SCRUM Practices and Individuals **9 Hours**

Individual Roles – Scrum Master – Product Owner – Changed Roles: Analysts, Project Managers, Architects, Functional Managers, Programmers, DB Administrators, Testers, User Experience Designers - Technical Practices: Strive for Excellence - Test-driven development – Refactoring – Collective Ownership – Continuous Integration – Pair Programming.

Unit IV - SCRUM Teamwork **9 Hours**

Team Structures – Small Team Productivity – Feature Teams – Component Teams – Guidelines for Good Team Structure – Team Responsibility – Foster Team Learning –

Self-Organizing Team – Influencing Evolution: Selecting Environment, Defining Performance, Manage Meaning, Energizing the System.

Unit V SCRUM Specification 9 Hours

Product Backlog – Documents to Discussions – Written Documentation Disadvantages – User Stories -Progressively Refine Requirements – Emergent Requirements – Backlog Iceberg – Refining User Stories – Specify by Example.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the various concepts and activities involved in the Agile Project Development process	Understand
CO2: Define SCRUM and illustrate the benefits of using SCRUM	Understand
CO3: Identify various individual roles and explain their responsibilities / activities in SCRUM	Understand
CO4: Analyze the SCRUM Team Structures along with their responsibilities and performances for effective project management	Analyze
CO5: Apply the SCRUM requirements and specifications effectively	Apply

Text Book(s):

T1. Roger S.Pressman, “Software engineering- A practitioner’s Approach”, McGraw-Hill International Edition, 7th Edition, 2010 (Unit I).

T2. Mike Cohn, “Succeeding with Agile: Software Development Using Scrum”, Addison-Wesley, 2009 (Unit II,III,IV,V).

Reference Book(s):

R1. Ken Schwaber, “Agile Project Management with Scrum (Microsoft Professional)”, Microsoft Press, 2004.

Web References:

1. http://highered.mcgraw-hill.com/sites/0073375977/information_center_view0/
2. http://www.succeedingwithagile.com/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	2	2	2	2	3	1	1
CO2	1	1	1	1	1	2	2	2	2	2	2	3	1	1
CO3	1	1	1	1	1	2	2	2	2	2	2	3	1	1
CO4	3	3	2	2	3	3	3	2	2	2	2	3	3	3
CO5	3	2	2	2	2	3	3	2	2	2	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1024		Course Title: Building Enterprise Applications	
Course Category: Professional Electives		Course Level: Mastery	
L:T:P (Hours/Week) 3:0:0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Object Oriented Programming using Java
- Database Management Systems

Course Objectives

The course is intended to:

1. Apply the concept of Enterprise Analysis and Business Modeling
2. Apply requirements validation, planning and estimation
3. Design and document the application architecture.
4. Identify the importance of application framework
5. Develop the different testing solution layers

Unit I Introduction 7 Hours

Introduction to enterprise applications and their types - Software engineering methodologies - Life cycle of raising an enterprise application - Introduction to skills required to build an enterprise application - Key determinants of successful enterprise applications - Measuring the success of enterprise applications.

Unit II Requirements and Applications 8 Hours

Inception of enterprise applications - Enterprise analysis - Business modeling - Requirements elicitation - Use case modeling - Prototyping - Nonfunctional requirements - Requirements validation - Planning and estimation.

Unit III Enterprise Architecture 12 Hours

Concept of architecture - Views and viewpoints - Enterprise architecture - Logical architecture - Technical architecture and design - Different technical layers - Best practices - Data architecture and design – Relational, XML, and other structured data representations - Infrastructure architecture and design elements.

Unit IV Enterprise Construction 9 Hours

Construction readiness of enterprise applications - defining a construction plan - Defining a package structure - Setting up a configuration management plan - Setting up a development environment - Introduction to the concept of Software Construction Maps - Construction of technical solutions layers - Methodologies of code review - Static code analysis - Build and testing - Dynamic code analysis – Code profiling and code coverage.

Unit V Testing 9 Hours

Types and methods of testing an enterprise application - Testing levels and approaches - Testing environments - Integration testing - Performance testing - Penetration testing - Usability testing - Globalization testing and interface testing - User acceptance testing - Rolling out an enterprise application.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply the concept of Enterprise Analysis and Business Modeling for real time applications	Apply
CO2: Apply requirements validation, planning and estimation for an enterprise application	Apply
CO3: Design and document the application architecture.	Apply
CO4: Identify the importance of application framework for designing application components.	Apply
CO5: Develop the different solution layers for testing	Apply

Text Book(s):

T1. Anubhav Pradhan, Satheesha B. Nanjappa, Senthil K. Nallasamy, Veerakumar Esakimuthu, “Raising Enterprise Applications”, John Wiley, 2010

Reference Book(s):

R1. Soren Lauesen “Software Requirements: Styles & Techniques”, Addison-Wesley Professional

R2. Brain Berenbach & Daniel J.Paulish, “Software System Requirements: In Practice”, McGraw-Hill/Osborne Media

R3. Brett McLaughlin, “Building Java Enterprise Applications” O'Reilly Media, 2002

Web References:

1.http://java.sun.com/blueprints/guidelines/designing_enterprise_applications_2e/https://www.odoo.com/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO2	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO3	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO4	3	2	2	2	2	3	3	2	2	2	2	3	3	2
CO5	3	2	2	2	2	3	3	2	2	2	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1025		Course Title: Total Quality Management Techniques	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Software Engineering

Course Objectives

The course is intended to:

1. Describe the fundamentals of total quality management.
2. Choose the appropriate TQM methodologies.
3. Apply traditional tools and techniques.
4. Apply the various performance measures.
5. Identify the quality system standards.

Unit I Introduction 9 Hours

Introduction - Need for Quality - Evolution of Quality - Definition of Quality - Dimensions of Manufacturing and Service Quality - Basic Concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

Unit II TQM Principles 9 Hours

Leadership – Strategic Quality Planning, Quality Statements - Customer Focus – Customer Orientation-Customer Satisfaction- Customer Complaints- Customer Retention - Employee Involvement – Motivation- Empowerment-Team and Teamwork- Recognition and Reward, Performance Appraisal – Continuous Process Improvement – PDSA Cycle, 5s, Kaizen - Supplier Partnership – Partnering- Supplier Selection-Supplier Rating.

Unit III TQM Tools & Techniques I 9 Hours

The Seven Traditional Tools of Quality – New Management Tools – Six-Sigma: Concepts-Methodology-Applications to Manufacturing-Service Sector Including IT – Bench Marking – Reason to Bench Mark-Bench Marking Process – FMEA – Stages-Types

Unit IV TQM Tools & Techniques II 9 Hours

Quality Circles – Quality Function Deployment (QFD) – Taguchi Quality Loss Function – TPM – Concepts- Improvement Needs – Cost of Quality – Performance Measures.

Unit V Quality Systems 9 Hours

Need for ISO 9000- ISO 9000-2000 Quality System – Elements-Documentation-Quality Auditing- QS9000 – ISO 14000 – Concepts-Requirements and Benefits – Capability Maturity Model for Software Industry.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the fundamentals of total quality management based on the TQM principles for the modern organizations.	Apply
CO2: Choose the appropriate methods from the TQM principles for managing the organization.	Apply
CO3: Apply traditional tools and techniques for identifying customer needs in the software industry.	Apply
CO4: Apply the various performance measures for quality improvement.	Apply
CO5: Identify the quality system standards for software industry.	Apply

Text Book(s):

T1. Dale H. Besterfield, Carol Besterfield-Michna,Glen Besterfield, Mary Besterfield- Sacre, "Total Quality Management", 3rd Edition, Pearson Education Asia, Indian Reprint, 2011.

Reference Book(s):

R1. James R. Evans, William M. Lindsay, "The Management and Control of Quality", 6th Edition ,South-Western (Thomson Learning), 2005.

R2. Oakland J.S., "TQM – Text with Cases", Butterworth – Heinemann Ltd., 3rd Edition, Oxford, 2003.

R3. Suganthi L, Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.

R4. Janakiraman B, Gopal R.K, "Total Quality Management – Text and Cases", Prentice Hall (India)Pvt. Ltd, 2015.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO2	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO3	3	2	2	2	2	2	2	2	2	2	2	3	3	2
CO4	3	2	2	2	2	3	3	2	2	2	2	3	3	2
CO5	3	2	2	2	2	3	3	2	2	2	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITEN1026		Course Title: Deep Learning	
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Artificial Intelligence and Machine Learning

Course Objectives

The course is intended to:

1. Understand the fundamentals of Neural Networks and Deep Learning.
2. Explain the basic concepts of deep networks.
3. Design Convolutional Networks.
4. Construct recurrent and recursive nets.
5. Appreciate the use of deep learning applications.

Unit I Introduction 9 Hours

Neural networks – The Perceptron - The perceptron learning algorithm - Feed-Forward Neural Networks - Training Neural Networks: Backpropagation Learning – Activation Functions – Loss Functions: Loss functions for regression, Loss functions for classification, Loss functions for reconstruction - Hyper parameters: Learning rate, Regularization, Momentum, Sparsity – Definition of Deep Learning.

Unit II Deep Networks 10 Hours

Example: Learning XOR - Gradient-Based Learning - Architecture Design –Other Differentiation Algorithms – Parameter Norm Penalties - Norm Penalties as Constrained Optimization – Regularization and Under-Constrained problems – How Learning Differs from Pure Optimization – Challenges in Neural Network Optimization – Basic Algorithms.

Unit III Convolutional Networks 9 Hours

The Convolution Operation – Motivation - Pooling – Convolution and Pooling as an Infinitely Strong Prior - Variants of the Basic Convolution Function - Structured Outputs - Data Types - Efficient Convolution Algorithms - Random Unsupervised Features – The Neuroscientific Basis for Convolutional Networks – Convolutional Networks and the History of Deep Learning.

Unit IV Recurrent and Recursive Nets 9 Hours

Unfolding Computational Graphs – Recurrent Neural Networks – Bidirectional RNNs – Encoder-Decoder Sequence-to-Sequence Architectures – Deep Recurrent Networks – Recursive Neural Networks – The Challenge of Long-Term Dependencies – Echo State Networks – Leak Units and Other Strategies for Multiple Time Scales – The Long Short-Term Memory and Other Gated RNNs

– Optimization for Long-Term Dependencies – Explicit memory.

Unit V Applications of Deep Learning 8 Hours

Large Scale Deep Learning - Computer Vision - Speech Recognition - Natural Language Processing: n-grams – Neural Language Models – High-Dimensional Outputs – Combining Neural Language Models with n-grams – Neural Machine Translation - Other Applications: Recommender Systems – Knowledge Representation, Reasoning and Question Answering.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the fundamentals of the fundamentals of Neural Networks and Deep Learning	Understand
CO2: Describe the basic concepts of deep networks for real world application	Understand
CO3: Design suitable Convolutional Network for any specific problems.	Apply
CO4: Design Recurrent and Recursive Nets for any specific problems.	Apply
CO5: Apply the deep learning techniques in real world problems.	Apply

Text Book(s):

T1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, USA, 2017. (Unit II, III, IV, V)

T2. Josh Patterson and Adam Gibson, "Deep Learning: A practitioner's approach", O'Reilly, USA, 2019. (Unit I)

Reference Book(s):

R1. Francois Chollet, "Deep Learning using Python", Manning Publications, USA, 2017.

R2. Josh Patterson and Adam Gibson, "Deep Learning: A practitioner's approach", O'Reilly,2019.

Web References:

1. http:// neuralnetworksanddeeplearning.com/index.html
2. https:// colah.github.io/posts/2015-08- Understanding-LSTMs/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	1	2	2	2	3	1	1
CO2	1	1	1	1	1	2	2	1	2	2	2	3	1	1
CO3	3	2	2	2	2	2	2	1	2	2	2	3	3	2
CO4	3	2	2	2	2	2	2	1	2	2	2	3	3	2
CO5	3	2	2	2	2	2	2	1	2	2	2	3	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CSEC6701		**Course Title: Professional Readiness for Innovation, Employability and Entrepreneurship (common to CS, IT & EC)**	
Course Category: Professional Elective		**Course Level: Mastery**	
L:T:P(Hours/Week) 0: 0: 6	**Credits:3**	**Total Contact Hours: 96**	**Max. Marks:100**

OBJECTIVES:

- To empower students with overall Professional and Technical skills required to solve a real world problem.
- To mentor the students to approach a solution through various stages of Ideation, Research, Design Thinking, workflows, architecture and building a prototype in keeping with the end-user and client needs.
- To provide experiential learning to enhance the Entrepreneurship and employability skillsof the students.

This course is a four months immersive program to keep up with the industry demand and to havecritical thinking, team based project experience and timely delivery of modules in a project that solves world problems using emerging technologies.

To prepare the students with digital skills for the future, the Experiential Project Based Learning is introduced to give them hands-on experience using digital technologies on open-source platforms with an end-to-end journey to solve a problem. By the end of this course, the student understands the approach to solve a problem with team collaboration with mentoring from Industry and faculties. **This is an EEC category course offered as an elective, under the type,"Experiential Project Based Learning".**

Highlights of this course:

- Students undergo training on emerging technologies
- Students develop solutions for real-world use cases
- Students work with mentors to learn and use industry best practices
- Students access and use Self-Learning courses on various technologies, approachesand methodologies.
- Collaborate in teams with other students working on the same topic
- Have a dedicated mentor to guide

OUTCOMES:

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

- Upskill in emerging technologies and apply to real industry-level use cases
- Understand agile development process
- Develop career readiness competencies, Team Skills / Leadership qualities
- Develop Time management, Project management skills and Communication Skills
- Use Critical Thinking for Innovative Problem Solving
- Develop entrepreneurship skills to independently work on products

The course will involve 40-50 hours of technical training, and 40-50 hours of project development.The activities involved in the project along with duration are given in Table 1.

TABLE 1: ACTIVITIES

Activity Name	Activity Description	Time (weeks)
Choosing a Project	Selecting a project from the list of projects categorized various technologies & businessdomains	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, ProjectDoc 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 evaluationmetrics	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 DesignThinking	10	Teamwork	5
Innovation & Problem Solving	10	Time Management	10
Requirements Analysis usingCritical Thinking	10	Attendance and Punctuality	5
Project Planning using AgileMethodologies	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			

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	3	3	3	3	3	3	3	3	3
CO2	1	1	1	1	1	3	3	3	3	3	3	3	3	3
CO3	2	2	2	2	2	3	3	3	3	3	3	3	3	3
CO4	2	2	2	2	2	3	3	3	3	3	3	3	3	3
CO5	2	2	2	2	2	3	3	3	3	3	3	3	3	3
CO6	2	2	2	2	2	3	3	3	3	3	3	3	3	3

High-3; Medium-2; Low-1

Open Electives

Course Code: 19ITOC1001		**Course Title: Open Source Technologies**	
Course Category: Open Elective		**Course Level: Introductory**	
L:T:P(Hours/Week) 3: 0: 0	**Credits:3**	**Total Contact Hours:45**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain the fundamental concepts of open source software
2. Understand the command line usage in real time application
3. Summarize the open source software packages
4. Illustrate a shell script for an application
5. Explain the database usage for storing date in real time scenario

Unit I Introduction To Open Source 9 Hours

Looking into the Linux Kernel- GNU Operating System- The Linux desktop environment- Licenses - Starting with Linux Shells: Linux-Linux Distribution.

Unit II Linux Command Line 9 Hours

Getting to the Shell: Reaching the Command Line- Accessing CLI via a Linux Console Terminal- Accessing CLI via Graphical Terminal Emulation- Using the GNOME Terminal Emulator- Using the Konsole Terminal Emulator- Using the xterm Terminal Emulator-Basic bash shell Command.

Unit III Shell Scripting I 9 Hours

Basic Script Building: Using Multiple Commands-Creating a Script File-Displaying Messages-Using Variables-Redirecting Input and Output-Pipes-Performing Math-Exiting the Script. Using Structured Commands: Condition Statement-looping Statements.

Unit IV Shell Scripting II 9 Hours

Handling user input- Creating Functions: Basic Script Functions- Returning a Value- Using Variables in Functions- Array Variables and Functions- Function Recursion- Creating a Library- Using Functions on the Command Line.

Unit V Producing Scripts 9 Hours

Using a MySQL Database: Using MySQL- Using the database in scripts. Using the Web: Installing Lynx- The lynx command line- The Lynx configuration file- Capturing data from Lynx; Using E-Mail; Creating Little Shell Scripts.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the fundamental concepts of open source software for a real world problem	Understand
CO2: Describe the command line usage in real time application using linux commands	Understand
CO3: Summarize the open source software packages for real time problems	Understand
CO4: Illustrate a shell script for an application using functions	Understand
CO5: Explain the database usage for storing date in real time scenario using MySQL	Understand

Text Book(s):

T1. Richard Blum, Christine Bresnahan, “Linux Command Line and Shell Scripting Bible”, Wiley 2015.

Reference Book(s):

R1. Kailash Vadera , Bhavyesh Gandhi, “Open Source Technology”, University Science press, 2009.
R2. Andrew M. St. Laurent, “Understanding Open Source & Free Software Licensing: Guide to Navigating Licensing Issues in Existing & New Software”, O“Reilly Publication, 2016.
R3. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, “Linux in a nutshell”, 6th Edition, OReilly media, September 2009.

Web References:

1. http://www.gnu.org/philosophy/
2. http://distrowatch.com/dwres.php?resource=major
3. http://tldp.org/guides.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	2	2	2	2	2	2	2
CO2	1	1	1	1	1	2	2	2	2	2	2	2
CO3	1	1	1	1	1	2	2	2	2	2	2	2
CO4	1	1	1	1	1	2	2	2	2	2	2	2
CO5	1	1	1	1	1	2	2	2	2	2	2	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITOC1002		Course Title: Enterprise Resource Planning	
Course Category: Open Elective		Course Level: Practice	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Describe the basic of ERP along with its benefits and risks
2. Identify the ERP related technologies for business process
3. Apply the Enterprise resource management technology
4. Examine the implementation strategies & methodologies of ERP
5. Analyze the various ERP related business modules

Unit I Introduction 9 Hours

Introduction to ERP – Basic ERP Concepts – Justifying ERP Investments: Quantifiable benefits, Intangible Benefits, Risks of ERP: People Issues, Process Risk, Technological Risks, Implementation Issues, Operation & Maintenance Issues, Managing Risks on ERP Projects.

Unit II ERP and Technologies 9 Hours

ERP and Related Technologies: Business Process Reengineering (BPR), Data Warehousing & Data Mining - On-line Analytical Processing (OLAP) - Product Life Cycle Management (PLCM) - Supply Chain Management (SCM) - Customer Relationship Management (CRM) - Advanced Technology and ERP Security.

Unit III ERP Market 9 Hours

ERP Marketplace and Marketplace Dynamics: Overview – Marketplace Dynamics– The changing ERP Market – Function Modules: Function Modules of ERP Software – Integration of ERP, Supply Chain and Customer Relationship Application.

Unit IV ERP Implementation 9 Hours

Implementation Challenges – Implementation life cycle – Implementation Strategies - Implementation Process - Project team.

Unit V Present and Future 9 Hours

ERP and eBusiness: Introduction of ERP and eBusiness – eBusiness – supply chain integration – The eBusiness Process Model – Components of the eBusiness supply chain – ERP, Internet and WWW – Introduction of ERP II: ERP, Internet and WWW – ERP to ERP II – Bringing ERP to the Entire Enterprise – Future Directions and Trends in – ERP to ERP II – Bringing ERP to the Entire Enterprise – Future Directions and Trends ERP: New Markets – New Channels.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the basic of ERP along with its benefits and risks for different projects	Apply
CO2: Identify the ERP related technologies for business process from heterogeneous database	Apply
CO3: Apply the Enterprise resource management technology for handling the ERP related security issues	Apply
CO4: Examine the implementation strategies & methodologies of ERP for the different project team	Apply
CO5: Analyze the various ERP related business modules for ERP Maintenance and management	Apply

Text Book(s):

T1. Alexis Leon, “Enterprise Resource Planning”, Third Edition Tata McGraw-Hill, 2011.

Reference Book(s):

R1. Vinod Kumar Grag and N.K. Venkitakrishnan, “ERP- Concepts and Practice”, Second Edition Prentice Hall of India, 2011.

R2. Sinha P. Magal and Jeffery Word, “Essentials of Business Process and Information System”, Wiley India, 2012.

Web References:

1. https://www.infosys.com/industries/high-technology/case-studies/Pages/oracle-implementation-global.aspx
2. https://www.odoo.com/
3. https://www.top10erp.org/Case-Study-Library.aspx

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	2	2	2	2	2	3
CO2	3	2	2	2	2	2	2	2	2	2	2	3
CO3	3	2	2	2	2	2	2	2	2	2	2	3
CO4	3	2	2	2	2	2	2	2	2	2	2	3
CO5	3	2	2	2	2	2	2	2	2	2	2	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITOC1003		Course Title: Multimedia Systems and Applications	
Course Category: Open Elective		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain the concepts of multimedia and its elements
2. Explain the process involved in adding sound and animation
3. Summarize the video usage, hardware and software requirements
4. Illustrate the process of making of multimedia project
5. Explain the usage of internet in multimedia application

Unit I Introduction to Multimedia 9 Hours

Multimedia-Introduction, Multimedia Applications, Text-Fonts and Faces, Hypermedia and Hypertext. Images-Making Still Images, Color, Image file formats.

Unit II Sound and Animation 9 Hours

Sound-The power of Sound, Digital Audio, MIDI Audio, MIDI vs Digital Audio, Multimedia system sounds, Audio file formats, Adding Sound to Multimedia Project. Animation-The power of Motion, Principles of Animation, Animation by Computer, Animation Techniques.

Unit III Video and Making Multimedia 9 Hours

Video-Using Video, Working of Video, Digital Video Containers. Making Multimedia- Stages of Multimedia Project, Intangibles, Hardware, Software, Authoring Systems.

Unit IV Process of Making Multimedia 9 Hours

Multimedia Skills, Planning and Costing-The process of Making Multimedia, Scheduling, Estimating. Designing and Producing.

Unit V Internet and Multimedia 9 Hours

Internet and Multimedia-Internetworking, Multimedia on the Web, Designing for the World Wide Web-Developing for the Web, Delivering-Testing.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the concepts of multimedia and its elements for various applications.	Understand
CO2: Explain the process involved in adding sound and animation using multimedia software.	Understand
CO3: Summarize the video usage, hardware and software requirements for creating multimedia projects.	Understand
CO4: Illustrate the skills and process involved in making of multimedia project at various levels.	Understand
CO5: Explain the internet usage in multimedia project development.	Understand

Text Book(s):

T1. Tay Vaughan, “Multimedia: Making it work”, 10th Edition, McGraw Hill, 2019.

Reference Book(s):

R1. Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols and Standards”, Fifth Impression, Pearson Education, Asia, 2011.

R2. K.R.Rao, Zoran.S.Bojkovic, Dragorad A. Milovanovic, “Multimedia Communication systems Techniques, Standards and networks”, Eastern Economy Edition, 2002.

Web References:

1. www.cse.wustl.edu/~jain/refs/mul_refs.htm
2. http://guides.lib.umich.edu/c.php?g=282762&p=1884093
3. www.eduproindia.in/ multimedia-communications.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	2	2	2	2	2	2	2
CO2	1	1	1	1	1	2	2	2	2	2	2	2
CO3	1	1	1	1	1	2	2	2	2	2	2	2
CO4	1	1	1	1	1	2	2	2	2	2	2	2
CO5	1	1	1	1	1	2	2	2	2	2	2	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITOC1004		Course Title: Cyber Law and Information Security	
Course Category: Open Elective		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain the cybercrime vulnerabilities and its laws
2. Describe the cyber-attacks
3. Analyze the cybercrime
4. Explain the fundamentals concepts of security
5. Explain the secure application development

Unit I Introduction to Cybercrime 9 Hours

Classifications of cybercrimes - Cybercrime: legal perspectives - Indian perspectives - Cybercrime and the Indian ITA 2000 - Global perspective on cybercrimes - Cyber offences: Criminals Plan the Attacks - Social engineering, Cyberstalking.

Unit II Cybercrime: Mobile and Wireless Devices 9 Hours

Mobile and Wireless Devices - Trend mobility - Authentication Service Security - Attacks on Mobile Phones - Mobile Devices: Security Implications for Organizations - Organizational Measurement for Handling Mobile – Organizational Security Policies and Measures in Mobile Computing Era – Laptops.

Unit III Tools and Methods Used in Cybercrime 9 Hours

Introduction - Proxy servers and anonymizes - Phishing, Password cracking - Key loggers and spywares, virus and worms - Trojan Horses and Backdoors – Steganography - DoS and DDoS attacks - Attacks on Wireless Networks.

Unit IV Information Security 9 Hours

Information Security Concepts - Critical Characteristics of Information - CNSS Security Model - Components of an Information System - Balancing Information Security and Access - The SDLC - The Security SDLC.

Unit V Security Investigation 9 Hours

Need for Security - Business Needs - Threats - Secure Software Development – Law and

Ethical in Information Security - International Laws and Laws Bodies - Ethics and Information Security

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the cybercrime vulnerabilities for a networks and its laws	Understand
CO2: Describe the cyber-attacks on mobile and wireless devices	Understand
CO3: Analyze the cybercrime using tools and methods	Analyze
CO4: Explain the fundamentals concepts of information security against cyber-attacks	Understand
CO5: Explain the secure application development using information security	Understand

Text Book(s):

T1. Nina Godbole, Sunit Belapure, “Cyber security: Understanding Cybercrime, Computer Forensics and Legal perspectives”, Wiley India Pvt.Ltd, 2019.(Unit I, II, III)
T2. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Cengage Learning, 2018. (Unit IV, V)

Reference Book(s):

R1. Aparna Viswanatha, “Cyber Law- Indian And International Perspectives On Key Topics Including Data Security, E-Commerce, Cloud Computing and Cyber Crimes”, LexisNexis Publishers, 2012.
R2. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2018.

Web References:

1. http://www.cyberlawsindia.net/internet-crime.html
2. http://www.computerforensicsworld.com

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	2	2	1	1	1	2	2
CO2	1	1	1	1	1	2	2	1	1	1	2	2
CO3	3	3	2	2	3	2	2	1	1	1	2	2
CO4	1	1	1	1	1	2	2	1	1	1	2	2
CO5	1	1	1	1	1	2	2	1	1	1	2	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITOC1005		Course Title: E-Commerce	
Course Category: Open Elective		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Outline the establishment and foundations of E-commerce
2. Summarize the specifications and determinations of electronic payment systems
3. Explain the structure of transferring the business information
4. Determine the importance of Software Agents
5. Recognize the applications of Mobile commerce and its capabilities

Unit I Introduction 9 Hours

Electronic Commerce - Overview of Electronic Commerce Framework - Electronic Commerce and Media Convergence - Applications; Network Infrastructure - Components of the I-Way - Network Access Equipment; Client Server Network Security- Client Server Security Threats- Firewalls and Network Security.

Unit II World Wide Web and Electronic Payment Systems 9 Hours

E- Commerce and World Wide Web- Architecture- Technology Behind the Web- Security and Web; Building an E-commerce Presence: Websites, Mobile Sites, and Apps - Consumer Oriented Applications - Mercantile Process Models; Electronic Payment Systems - Digital Token Based EPS - Smart Cards - Credit Cards - Risks - Designing EPS.

Unit III Organizational Commerce and EDI 9 Hours

Electronic Data Interchange - EDI Applications in Business - Legal, Security and Privacy Issues - EDI and Electronic Commerce - EDI Standardization and Implementation - EDI Envelope for Message Transport - Value Added Networks - Internet Based EDI.

Unit IV Advertising, Marketing and Software Agents 9 Hours

Advertising and Marketing on the Internet - Information Based Marketing-Advertising -on- Line

Marketing Process; History of Software Agents - Characteristics and Properties of Agents-Technology -Telescript Agent Language-Safe – TcI - Applets, Browsers and Software Agents-Software Agents in Action.

Unit V Mobile Commerce 9 Hours

Introduction - Wireless Device for Mobile Commerce - Location Based Services - Classification Framework - Wireless Application Protocol-Mobile Business Services - Mobile Portals.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Outline the establishment and foundations of E-commerce in business application	Understand
CO2: Summarize the specifications and determinations of electronic payment systems for Consumer Oriented Applications	Understand
CO3: Explain the structure of transferring the business information using Electronic Data Interchange	Understand
CO4: Determine the significance of Software Agents in Internet Security standards for Advertising and Marketing	Apply
CO5: Explain the applications of Mobile commerce and its capabilities in intelligent agents and web-based Marketing	Understand

Text Book(s):

T1. Ravi Kalakota ,Andrew B Whinston, “Frontiers of Electronic Commerce" , Pearson Education Asia, 2013.(Unit I,II,III,IV)

T2. E.Brian Mennecke, J Troy Strader, “Mobile Commerce: Technology, Theory and Applications", Idea Group mo., IRM press, 2003. (Unit V)

Reference Book(s):

R1. Kenneth C. Laudon,Carol Guercio Traver, "E-Commerce-Business, Technology, Society", Pearson India, Thirteenth edition, 2017.

R2. Brenda Kienan , “ Managing e Commerce Business" , PHI,2001.

R3. P. J. Louis, "MCommerce Crash Course ’, McGraw Hill Companies February 2001.

Web References:

1. http://www.techtutorials.info/ecommerce. html
2. http://en.wikipedia.org/wiki/Electronic_data_interchange
3. http://cs.anu.edu. au/student/comp3 4 10/lectures/security/symmetric-4up.pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	1	1	1	1	1
CO2	1	1	1	1	1	1	1	1	1	1	1	1
CO3	1	1	1	1	1	1	1	1	1	1	1	1
CO4	3	2	2	2	2	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	1	1	1	1	1

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITOC1006		Course Title: Graphical User Interface Design	
Course Category: Open Elective		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Outline the different user interfaces
2. Apply the knowledge to design user interface
3. Develop graphical interface controls
4. Examine multimedia interface components
5. Explain different layout test

Unit I Introduction 9 Hours

Introduction-Importance-Human-Computer Interface-Characteristics of Graphics Interface-Direct Manipulation Graphical System - Web User Interface-Popularity-Characteristic & Principles.

Unit II Human Computer Interaction 9 Hours

User Interface Design Process- Obstacles-Usability-Human Characteristics in Design - Human Interaction Speed-Business Functions-Requirement Analysis-Direct-Indirect Methods-Basic Business Functions-Design Standards-System Timings - Human Consideration in Screen Design - Structures of Menus - Functions of Menus-Contents of Menu-Formatting -Phrasing the Menu - Selecting Menu Choice-Navigating Menus-Graphical Menus.

Unit III Windows 9 Hours

Characteristics-Components-Presentation Styles-Types-Managements-Organizations-Operations-Web Systems-Device-Based Controls: Characteristics-Screen -Based Controls: Operate Control - Text Boxes-Selection Control-Combination Control-Custom Control-Presentation Control.

Unit IV Multimedia 9 Hours

Text for Web Pages - Effective Feedback-Guidance & Assistance-Internationalization-Accesssibility-Icons-Image-Multimedia -Coloring.

Unit V Windows Layout 9 Hours

Prototypes - Kinds of Tests - Retest – Case Study: Information Search - Visualization - Hypermedia -WWW - Software Tools: Lumzy, Flat UI Pro, and Cacoo.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Outline the different user interfaces for graphics and web systems	Understand
CO2: Apply the knowledge to design user interface using business functions and menus	Apply
CO3: Develop graphical interface controls for window based applications	Apply
CO4: Explain multimedia interface concepts with user interface design	Understand
CO5: Compare different layout tests for window based applications	Understand

Text Book(s):

T1. Wilbent. O. Galitz ,“The Essential Guide to User Interface Design”, 2nd Edition, John Wiley& Sons, New Delhi, 2014.

Reference Book(s):

R1. Alan Cooper, “The Essential of User Interface Design”, Wiley – Dream Tech Ltd., New Delhi, 2007.

R2. Ben Sheiderman, “Design the User Interface”, Pearson Education, New Delhi, 1998.

R3. Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell Bealg, “Human – Computer Interaction”, 3rd Edition, Pearson Education, New Delhi, 2004.

R4. Theo Mandel,”Elements of User Interface Design”, John Wiley & Sons, New Delhi.1997.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	2	1	1	1	3	2
CO2	3	3	3	3	3	2	2	1	1	1	3	2
CO3	3	3	3	3	3	2	2	1	1	1	3	2
CO4	3	3	3	3	3	2	2	1	1	1	3	2
CO5	3	2	2	2	2	2	2	1	1	1	3	2

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITOC1007		Course Title: Disaster Management	
Course Category: Open Elective		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max.Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Describe basic concepts of disaster and hazards in India
2. Classify the various natural and manmade disasters
3. Discuss the engineering and environmental aspects of disasters
4. Explain the various approaches to disaster management principles
5. Analyze the modern techniques used in disaster mitigation and management

Unit I Introduction 9 Hours

Definition – Types of Disasters – Relationship between disasters and human development – Disaster management cycle – A case study of a successful reconstruction after flood and community based disaster preparedness program.

Unit II Causes And Types of Disasters 9 Hours

Water and climate related disasters – Geoscience related disasters – Industrial, nuclear and chemical disasters – Accident related disasters – Biological disasters – Disaster caused due to social, ethnic and religious conflicts.

Unit III Engineering and Environmental Aspects of Disasters 9 Hours

Disaster due to Engineering and Technical Failure – Earth quake and coastal Engineering – Technology and Disaster management – Pollution control and monitoring – A case study on arsenic contaminant in West Bengal.

Unit IV Approaches in Disaster Management 9 Hours

Pre- disaster stage (preparedness) - Preparing hazard zonation maps, Predictability/ forecasting & warning - Preparing disaster preparedness plan - Land use zoning - Preparedness through Information, education. Emergency Stage - Rescue training for search & operation - Immediate relief – Assessment surveys. Post Disaster stage – Rehabilitation - Social Aspect - Economic Aspect and Environmental Aspect –Case Study –Chennai Floods - IT Disaster Recovery.

Unit V Disaster Mitigation 9 Hours

Temporary shelter – Food and nutrition – Safe drinking water – Rehabilitation after cyclone –

Response to drought and earthquake – Response after Tsunami – IT Disaster Recovery.

Course Outcomes	**Cognitive Level**
At the end of the course students will be able to:	
CO1: Extend an exposure to disasters, their significance and types	Understand
CO2: Identify the relationship between various disasters.	Understand
CO3: Survey the Various aspects of Disasters	Analyze
CO4: Identify the awareness of various approaches to disaster management	Understand
CO5: Develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity	Apply

Text Book(s):

T1. Tushar Bhattacharya, “Disaster Science and Management”, Tata McGraw Hill, 2012.

Reference Books:

R1. Sharma.S.R, “Disaster management”, A P H Publishers, 2011.
R2. VenuGopalRao.K, “Geoinformatics for Disaster Management”, Manglam Publishers and Distributors, 2010.
R3. Singh.R.B, “Natural Hazards and Disaster Management: Vulnerability and Mitigation”, Rawat Publications, 2006.
R4. Muthusamy Seenirajan, Muthusamy Natarajan, Ramasamy Thangaraj, Murugesan Bagyaraj, Study and Analysis of Chennai Flood 2015 Using GIS and Multicriteria Technique, Scientific Research Publishing,2017.

Web References:

1. http://nidm.gov.in
2. http://cwc.gov.in
3. http://ekdrm.net
4. https://education.alberta.ca/media/3272747/2-it-disaster-recovery-planning-guide.pdf
5. https://cdn.ttgtmedia.com/rms/pdf/Disaster%20RecoveryTemplate%20Download%20Final.pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	1	1	1	1	1
CO2	1	1	1	1	1	1	1	1	1	1	1	1
CO3	3	3	2	2	2	1	1	1	1	1	1	1
CO4	1	1	1	1	1	1	1	1	1	1	1	1
CO5	3	2	2	2	2	1	1	1	1	1	1	1

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITOC1008		Course Title: Software Modeling-Principles and Practices	
Course Category: Open Elective		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Identify the suitable software process model
2. Examine the ways of people management
3. Determine Software Quality and various cost estimation models
4. Compare various software modeling techniques
5. Describe models in User Interface Design and reusability dimensions

Unit I Introduction and SLC Models 9 Hours

Software Engineering – Phases – Maintenance – Software Engineering Ethics – Planning - Controlling a Software Development Project – Waterfall – Agile – Prototyping – Incremental Development – RAD – DSDM – XP.

Unit II Configuration Management and People Management 9 Hours

Tasks and Responsibilities - Configuration Management Plan – Team Organization - Hierarchical Organization - Matrix Organization - Chief Programmer Team - SWAT Team - Agile Team - Open Source Software Development - General Principles for Organizing a Team.

Unit III Software Quality and Cost Estimation 9 Hours

Quality Attributes - The Quality System - Software Quality Assurance – Capability Maturity Model (CMM) - Algorithmic Models - Walston–Felix – COCOMO – Putnam - Function Point Analysis - COCOMO 2 - Use-Case Points.

Unit IV Modeling 9 Hours

Classic Modeling Techniques - Entity–Relationship Modeling - Finite State Machines - Data Flow Diagrams - CRC Cards - The Unified Modeling Language - Class Diagram - State Machine Diagram - Sequence Diagram - Communication Diagram - Component Diagram - Use Case.

Unit V User Interface Design and Software Reusability 9 Hours

Introduction - Role of Models in Human Computer Interaction - Mental Models of Information

Systems - Conceptual Models in User Interface Design – Design of Interactive Systems - Task Analysis – Evaluation - Reuse Dimensions - Reuse and the Software Life Cycle - Reuse Tools and Techniques.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the suitable software process model for specific scenario	Understand
CO2: Examine the ways of people management involved in Software Development	Apply
CO3: Determine Software Quality and various cost estimation models for Quality Assurance	Apply
CO4: Compare various software modeling techniques for developing software models	Understand
CO5: Describe models in User Interface Design and reusability dimensions to develop software	Understand

Text Book(s):

T1. Hans van Vliet, “Software Engineering: Principles and Practice”, 3rd Edition, John Wiley & sons, 2010.

Reference Book(s):

R1. Rohit Khurana, “Software Engineering: Principles and Practices, 2nd Edition, Vikas Publishing, 2011.

R2. Roger S. Pressman, “Software Engineering A Practitioner's Approach, 9th Edition, Indian Edition, 2020.

Web References:

1. https://nptel.ac.in/courses/106/105/106105087/
2. https://www.javatpoint.com/software-engineering-tutorial
3. https://www.geeksforgeeks.org/software-engineering/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	1	1	1	1	1	1
CO3	3	2	2	2	2	1	1	1	1	1	1	1
CO4	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	1	1	1	1	1

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITOC1009		Course Title: Machine Learning using Python	
Course Category: Open Elective		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Learn the basics concepts of Machine Learning.
2. Study about various data structures and object oriented concepts in Python.
3. Describe various Python packages related to machine learning concepts.
4. Learn the Data Collection and Visualization Concepts.
5. Describe the real-world case studies in Machine Learning.

Unit I Introduction to Machine Learning Concepts 9 Hours

The Need for Machine Learning - Understanding Machine Learning - Machine Learning Methods - Supervised Learning - Unsupervised Learning - Semi-Supervised Learning - Reinforcement Learning - Batch Learning - Online Learning - Instance Based Learning - Model Based Learning.

Unit II Python Data Structures for Machine Learning 9 Hours

Lists: Operations, Slices, Methods - Tuples: Operations and Methods - Dictionaries: Operations and Methods - Strings and its methods - Classes - Creating Instance Objects - Built-In Class Attributes - Inheritance.

Unit III Python Packages for Machine Learning 9 Hours

Jupyter : Installation and Execution - NumPy : Accessing Array Elements, Linear Algebra Using numpy - Pandas : Data Structures of Pandas, Data Retrieval, Data Access, Data Operations - Scikit-learn : API, Regression Models.

Unit IV Data Processing and Visualization 9 Hours

Data Collection - Data Description - Data Wrangling - Data Summarization - Data Visualization: Visualizing with Pandas - Visualizing with Matplotlib - Python Visualization Ecosystem - Feature selection - Feature Extraction and Engineering.

Unit V Real-World Applications 9 Hours

Analyzing Bike Sharing Trends: The Bike Sharing Dataset - Problem Statement - Exploratory Data Analysis - Preprocessing - Distribution and Trends - Outliers - Analyzing Movie Reviews Sentiment - Problem Statement - Setting Up Dependencies - Getting the Data - Text Pre-Processing and Normalization.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Describe the various machine learning concepts and methods.	Understand
CO2: Explain the concepts of list, tuple and dictionary and class.	Understand
CO3: Enumerate the various python packages used to implement the machine learning concepts.	Understand
CO4: Demonstrate about data collection, selection and visualization concepts in machine learning.	Understand
CO5: Explore various case studies scenario in Machine Learning relevant to real-world scenario.	Understand

Text Book(s):

T1. Dipanjan Sarkar, Raghav Bali, Tushar Sharma, “Practical Machine Learning with Python”, Apress, 2016. (Unit I, III, IV, V)

T2. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016. (Unit II)

Reference Book(s):

R1. Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and programming”, 1st Edition, BCS Learning & Development Limited, 2017.

R2. Andreas C. Müller, Sarah Guido, “Introduction to Machine Learning with Python”, O'Reilly home, 2016.

Web References:

1. https://www.w3schools.com/python/python_ml_getting_started.asp#:~:text=Machine%20Learning%20is%20making%20the,learns%20to%20predict%20the%20outcome.
2. https://pythonprogramming.net/machine-learning-tutorial-python-introduction/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	2	-	1	2	2	2	3
CO2	1	1	1	1	1	2	-	1	2	2	2	3
CO3	1	1	1	1	1	2	-	1	2	2	2	3
CO4	1	1	1	1	1	2	-	1	2	2	2	3
CO5	1	1	1	1	1	2	-	1	2	2	2	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITOC1010		Course Title: Big Data Management and Analytics	
Course Category: Open Elective		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Understand the importance of data management
2. Design a methods for statistical analysis and rule induction
3. Familiarize with the statistical and bayesian methods
4. Understand the concept of time series and search methods
5. Identify the appropriate visualization techniques and tools

Unit I Data Management 9 Hours

Age of Information Pioneered Product-Analytics Revolution-Big Data Management and Architecture-Big Data Ethics: Stakeholders-Industry-Ethics Elements-Ethical Framework-Ethics Test-Audit and Case Studies.

Unit II Statistical Inference and Rule Induction 9 Hours

Probability- Sampling and Sampling Distributions- Statistical Inference. Rule Induction: Propositional Rule Learning-Rule Learning as Search-Evaluating the Quality of Rules-Propositional Rule Induction at Work

Unit III Statistical and Bayesian Methods 9 Hours

Introduction- Generalized Linear Models- Regression Modelling: Multivariate Analysis of Variance - Classical Multivariate Analysis- Bayesian Paradigm- Bayesian Inference- Bayesian Modeling- Bayesian Networks

Unit IV Time Series and Search Methods 9 Hours

Linear Systems Analysis- Nonlinear Dynamics Basics- Delay-Coordinate Embedding-Simulated Annealing- Adaptive Search by Evolution- Evolution Strategies- Genetic Algorithms

Unit V Visualization and Tools 9 Hours

Classification of Visual Data Analysis Techniques-Data Type to be Visualized-Visualization Techniques-Interaction Techniques-Specific Visual Data Analysis Techniques. Tools: Statistical Analysis-Exploration/Modeling-Text and Web Mining-Data Analysis Suites

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Identify the need for data management for a domain	Apply
CO2: Apply statistical inference and rule induction to predict a data model	Apply
CO3: Design efficient statistical and bayesian methods for mining the data from large volumes	Apply
CO4: Predict an application database using various search and time series methods	Apply
CO5: Examine the data using visualization techniques and tools	Analyze

Text Book(s):

T1. Nitin Upadhyay, "Big Data Management and Analytics",Cengage India,1st Edition, 2018 (Unit I).

T2. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2nd Edition, 2007 (Unit II,III,IV,V).

Reference Book(s):

R2. Jason Bell, "Machine Learning for Big Data", Wiley, First Edition, 2015.

R3. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014.

R4. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics",John Wiley & sons, 2012.

R5. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Third Edition, 2014.

Web References:

1. http://www.real-statistics.com/
2. https://ocw.mit.edu/courses/6-867-machine-learning-fall-2006/pages/lecture-notes/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	-	-	2	1	2	-	3
CO2	3	2	2	2	2	-	-	2	1	2	-	3
CO3	3	2	2	2	2		-	2	1	2	-	3
CO4	3	2	2	2	2	-	-	2	1	2	-	3
CO5	3	3	2	2	3	-	-	2	1	2	-	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITOC1011		Course Title: Database Technology	
Course Category: Open Elective		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Classify the architecture and uses.
2. Design the relational databases.
3. Illustrate database system architecture.
4. Examine the object based databases.
5. Inspect the transaction processing.

Unit I Introduction **9 Hours**

Database System Applications - Purpose of Database Systems - View of Data - Database Languages - Relational Databases - Database Architecture: Data Storage and Querying - Transaction Management - Database Users and Administrators - Overview of the Design Process - The Entity Relationship Model – Entity Relationship Diagrams

Unit II Relational Databases **9 Hours**

Structure of Relational Databases - Database Schema – Keys - Schema Diagrams - Overview of the SQL Query Language: SQL Data Definition - Basic Structure of SQL Queries - Additional Basic Operations - Set Operations - Modification of the Database – Views - SQL Data Types and Schemas - Integrity Constraints

Unit III System Architecture **9 Hours**

Database System Architectures: Centralized and Client Server Architectures - Server System Architectures - Parallel Systems - Distributed Systems - Network Types - Homogeneous and Heterogeneous Databases - Distributed Data Storage - Distributed Transactions

Unit IV Specialty Databases **9 Hours**

Object Based Databases - Complex Data Types - Structured Types and Inheritance in SQL - Table Inheritance - Object-Oriented versus Object-Relational - Structure of XML Data - XML Document Schema - Multimedia Databases - Mobility and Personal Databases

Unit V Advanced Transaction Processing & Case Studies **9 Hours**

Transaction Processing Monitors – Transactional Workflows – Ecommerce – Main Memory Databases - CASE STUDIES - PostgreSQL: Storage and Indexing – System Architecture –

Oracle: Database Design and Querying Tools - SQL Variations and Extensions - Replication, Distribution, and External Data - Database Administration Tools.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Classify the architecture and uses of databases technology.	Apply
CO2: Design the relational databases using SQL queries.	Apply
CO3: Illustrate the different types of database system architecture.	Apply
CO4: Examine the object based databases for multimedia application.	Analyze
CO5: Inspect the transaction processing for real time transaction	Analyze

Text Book(s):

T1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —Database System Concepts, Seventh Edition, Tata McGraw Hill, March 2019.

Reference Book(s):

R1. Ramez Elmasri & Shamkant B.Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, New Delhi, 2015.

R2. Thomas M. Connolly, Carolyn E. Begg, “Database Systems - A Practical Approach to Design, Implementation, and Management”, Sixth Edition, Pearson Education, New Delhi, 2019.

Web References:

1. www.tutorialspoint.com

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	-	-	2	1	2	-	3
CO2	3	2	2	2	2	-	-	2	1	2	-	3
CO3	3	2	2	2	2		-	2	1	2	-	3
CO4	3	3	2	2	3	-	-	2	1	2	-	3
CO5	3	3	2	2	3	-	-	2	1	2	-	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ITOC1012		Course Title: Software Engineering and Design	
Course Category: Open Elective		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Identify the suitable software process model
2. Understand the design process of a software
3. Apply the structural modeling tool
4. Develop the behavioral model
5. Formulate the advanced behavioral model of the system

Unit I Introduction 9 Hours

Introduction to Software Engineering - Process Framework-Process Models: Waterfall model-Incremental model-Evolutionary model- Object Oriented Model- Introduction to Agility-Agile process - model: scrum.

Unit II Design Engineering 8 Hours

Introduction to design Engineering- Design process and quality – Design Concepts-Design Model–Architectural Styles- Architectural Design - Component level Design: Designing Class based components, Designing traditional Components

Unit III Structural Modeling and Use Case 10 Hours

Classes – Relationships – Notes, Stereotypes-Tagged Values- Constraints - Class Diagrams – – Interfaces – Packages - Use Cases - Use Case Diagrams- Case Study: Class Diagram and Use Case diagram for ATM System.

Unit IV Behavioural Modeling 9 Hours

Interaction Diagrams: Sequence Diagrams – Collaboration diagrams – Modeling Flows of Control by Time Ordering - Modeling Flows of Control by Organization - Forward and Reverse Engineering- Case Study: Interaction Model for Online Registration System.

Unit V Advanced Behavioural Modeling **9 Hours**

Activity diagrams: Action States and Activity States - Transitions- Branching- Forking and Joining-Swimlanes-Object flow- Modeling a Workflow- Events and Signals - State Machines - State Chart Diagrams - Case Study: Modeling Interprocess Communication.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1:Describe the suitable software process model for specific scenario	Understand
CO2: Build the software architecture using appropriate design Models.	Apply
CO3:Apply the structural modeling tool for the construction of class diagram and use case diagram with the appropriate notations	Apply
CO4: Develop the behavioral model for specific application using Interaction diagrams	Apply
CO5: Formulate the advanced behavioural model for the selected software	Apply

Text Book(s):

T1. Roger S.Pressman, Bruce.R.Maxim, “Software Engineering – A Practitioner‘s Approach”, 8th Edition, McGraw-Hill International Edition, New Delhi, 2015. (Units I,II)

T2. Grady Booch, James Rambaugh, Ivar Jacobson, “The Unified Modeling Language User Guide” 2nd Edition, Pearson Education, 2015.(Units III, IV,V)

Reference Book(s):

R1.Ian Sommerville, “Software Engineering”, 10th Edition, Pearson Education Asia, 2015.

R2.Martin Fowler, “UML Distilled”, 3rd Edition, Pearson Education, 2008.

R3.Grady Booch, “Object Oriented Analysis and Design with Applications”, 3rd Edition, Addison Wesley, New Delhi, 2009.

Web References:

1.http://freevideolectures.com/Course/2318/Software-Engineering

2.http://www.nptel.ac.in/courses/122105022/27

3.http://www.creativeworld9.com/2011/02/study-videos-of-object-oriented_24.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	2	1	2	2	3
CO2	3	2	2	2	2	1	1	2	1	2	2	3
CO3	3	2	2	2	2	1	1	2	1	2	2	3
CO4	3	2	2	2	2	1	1	2	1	2	2	3
CO5	3	2	2	2	2	1	1	2	1	2	2	3

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO .No.**	**Marks**	**Total**
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	CCET 3	5	50	
	TQA	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100