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Part of NIA Educational Institution

Curriculum and Syllabi

B.E. Computer Science and Engineering (Cyber Security)

Semesters I to VIII

Regulations 2019

(2022 Batch Onwards)

Programme : B.E. Computer Science and Engineering (Cyber Security)
Curriculum and Syllabi : Semesters I to VIII
Recommended by Board of Studies on :
Approved by Academic Council on :

Action	**Responsibility**	**Signature of Authorized Signatory**
Designed and Developed by	BoS Computer Science and Engineering(Cyber Security)	
Compiled by	Office of the Controller of Examinations	
Approved by	Principal	

Dr. Mahalingam College of Engineering and Technology, Pollachi-03

Department of Computer Science and Engineering

(Cybersecurity)

Vision

To develop competent professionals specialized in cyber security with global employability, entrepreneurship capability, research focus and social responsibility

Mission

• To develop proficient cyber security engineers by providing state of art academic environment and industry driven curriculum.

• Encourage students to become entrepreneurs and to take higher studies in the field of cyber security.

• To enrich the department through dedicated and technically sound faculty team with research focus in thrust areas cyber security.

• To provide technical solutions for cyber security problems and threats through technical innovations and projects in association with the industry, society and professional bodies.

Programme: B.E. Computer Science and Engineering (Cyber security)

Programme Educational Objectives (PEOs) - Regulations 2019

B.E. Computer Science and Engineering (Cyber Security) graduates will:

PEO1. Technical Skills: Have strong technical and foundation in the field of computer science specialized in cyber security

PEO2. Security Experts: Have the ability to address and provide feasible and viable solutions to security needs of modern computing industry

PEO3. Social awareness and ethics: Possess good ethical attitude, strong communication skills and greater awareness in social moral responsibilities.

Programme Outcomes (POs) - Regulations 2019

On successful completion of B.E. Computer Science and Engineering (Cyber Security) 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 for complex problems.

PO5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling 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, commit to professional ethics, 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 multi-disciplinary 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 & 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 in multi-disciplinary 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

On successful completion of B.E. Computer Science and Engineering (Cyber Security) programme, graduating-students/graduates will have the . .

PSO1. Security engineering: Ability to design and develop viable solution and systems to cater real world cyber attacks, issues and problems.

PSO2. Knowledge engineering: Ability to develop new products and services and perform research in the field of cyber security

Programme: B.E Computer Science and Engineering

(Cyber Security)

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, AM & SC
19ENHG2101	Communication Skills – I	2	0	2	3	100	All
19PHBC2002	Physics for Information Sciences	3	0	2	4	100	CS,IT,AD, AM & SC
19EESC2101	Introduction to Electrical and Electronics Engineering	3	0	2	4	100	CS,IT,AD, AM & SC
19CSSN2101	Fundamentals of Programming	3	0	2	4	100	-
19PSHG6001	Wellness for Students	0	0	2	1	100	All
Total		**14**	**1**	**10**	**20**	**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, AM & SC
19ENHG2201	Communication Skills – II	2	0	2	3	100	All
19ECSC2201	Digital System Design	2	0	2	3	100	CS,IT,AD, AM & SC
19CSSN2201	Programming with C	3	0	3	4.5	100	-
19MESC4001	Engineering Drawing	1	0	3	2.5	100	AU, CS, EC, EI, IT,ME, AD, AM & SC
19CSSC4001	IT Practices Lab	1	0	4	3	100	CS, IT, AD, AM & SC
19CHMG6201	Environmental Sciences	1	0	0	-	100	All
19PSHG6003	தமிழர் மரபு / Heritage of Tamils**	1	0	0	1	100	All
Total		**14**	**1**	**14**	**21**	**800**	

****** Applicable only for 2022 Batch

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, AM & SC
19SCCC2301	Data Structures and Algorithm Analysis	3	0	2	4	100	SC & AM
19SCCC1301	Computer Organization and Architecture	3	0	0	3	100	SC & AM
19SCCN1301	Principles of Communication and Cyber Attacks	3	0	0	3	100	-
19SCCC2302	Database Design	3	0	2	4	100	SC & AM
19SCCC3301	Programming using Java Laboratory	0	0	3	1.5	100	SC & AM
19SCCC3302	Programming using Python Laboratory	0	0	3	1.5	100	SC & AM
19PSHG6002	Universal Human Values 2: Understanding Harmony	2	1	0	3	100	All
XXXXXXXXXX	One Credit Course	0	0	2	1	100	-
19PSHG6004	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology**	1	0	0	1	100	All
Total		**18**	**2**	**12**	**26**	**1000**	

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
19SCCC2401	Basics of Operating Systems	3	0	2	4	100	SC & AM
19SCCN1401	Computer Networks and Attacks	3	0	0	3	100	-
19SCCN1402	Cryptography and Security	3	0	0	3	100	-
19SCCN3401	Computer Network & Cyber Laboratory	0	0	4	2	100	-
19SCCN3402	Cryptography and Security Laboratory	0	0	4	2	100	-
19SCPN6401	Mini – Project	0	0	4	2	100	-
XXXXXXXXXX	One Credit Course	0	0	2	1	100	-
Total		**12**	**1**	**16**	**21**	**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

****** Applicable only for 2022 Batch

Semester V

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19SCCN1501	Applied Cryptography	3	0	0	3	100	-
19SCCN1502	System Security	3	0	0	3	100	-
19SCCN1503	Distributed Computing	3	0	0	3	100	
XXXXXXXXXX	Professional Elective – I	3	0	0	3	100	-
XXXXXXXXXX	Professional Elective - II	3	0	0	3	100	-
XXXXXXXXXX	Open Elective - I	3	0	0	3	100	-
19SCCN3501	Applied Cryptography Laboratory	0	0	3	1.5	100	-
19SCCN3502	System Security Laboratory	0	0	3	1.5	100	-
19PSHG6501	Employability Skills 1: Teamness and Interpersonal Skills	0	0	2	1	100	All
Total		**18**	**0**	**8**	**22**	**900**	

Semester VI

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19SCCN1601	Cyber Forensics	3	0	0	3	100	-
19SCCN1602	Network Security	3	0	0	3	100	-
XXXXXXXXXX	Professional Elective – III	3	0	0	3	100	-
XXXXXXXXXX	Professional Elective – IV	3	0	0	3	100	-
XXXXXXXXXX	Open Elective - II	3	0	0	3	100	-
19SCCN3601	Advanced Protocol Engineering and Security Laboratory	0	0	3	1.5	100	-
19SCCN3602	Network Security Laboratory	0	0	3	1.5	100	
19SCPN6601	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**	**12**	**21**	**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			
19SCCN1701	Web Technology	3	0	0	3	100	-
19SCCN1702	Cloud Computing and Security	3	0	0	3	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	-
19SCCN3701	Web Application Security Laboratory	0	0	3	1.5	100	-
19SCCN3702	Cloud Computing and Security Laboratory	0	0	3	1.5	100	-
Total		**15**	**0**	**6**	**18**	**700**	

Semester VIII

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19SHVG6001	Entrepreneurship Development	1	0	0	1	100	All
19SCPN6801	Project	0	0	16	8	200	-
Total		**0**	**0**	**16**	**9**	**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 (2022 Batch): 164

Vertical wise Electives

Vertical I Full stack Development Electives							
Course Code	**Course Title**	**Hours/Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
19SCEN1001	App Development	3	0	0	3	100	-
19SCEN1002	Principles of Management	3	0	0	3	100	AIML
19SCEN1003	UI and UX Design	3	0	0	3	100	-
19SCEN1004	Web Application Security	3	0	0	3	100	-
19SCEN1005	Principles of Programming languages	3	0	0	3	100	-
19SCEN1006	DevOps	3	0	0	3	100	AIML
19SCEN1007	Compiler Design	3	0	0	3	100	-

Vertical II Machine Learning							
Course Code	**Course Title**	**Hours/Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
19SCEN1008	Digital Image Processing	3	0	0	3	100	-
19SCEN1009	Machine Learning Techniques for Cyber Security	3	0	0	3	100	-
19SCEN1010	Deep Learning and AI	3	0	0	3	100	-
19SCEN1011	Optimization Techniques	3	0	0	3	100	-
19SCEN1012	Artificial Intelligence and Neural Networks	3	0	0	3	100	-
19SCEN1013	Natural Language Processing	3	0	0	3	100	-
19SCEN1014	Expert Systems	3	0	0	3	100	-
19SCEN1015	Cognitive Sciences	3	0	0	3	100	-

Vertical III Cloud Computing and Data Center Technologies							
Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19SCEN1016	Cloud Computing	3	0	0	3	100	-
19SCEN1017	Edge Computing	3	0	0	3	100	-
19SCEN1018	Cloud Services Management	3	0	0	3	100	-
19SCEN1019	Storage Technologies	3	0	0	3	100	-
19SCEN1020	Software Defined Networks	3	0	0	3	100	-
19SCEN1021	Security and Privacy in Cloud	3	0	0	3	100	-
19SCEN1022	Stream Processing	3	0	0	3	100	-

Vertical IV Cyber Security and Data Privacy							
Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19SCEN1023	Secure coding	3	0	0	3	100	-
19SCEN1024	Malware and Reverse Engineering	3	0	0	3	100	-
19SCEN1025	Social Network Security	3	0	0	3	100	-
19SCEN1026	Wireless Sensor Network Security	3	0	0	3	100	-
19SCEN1027	Digital and Mobile Forensics	3	0	0	3	100	-
19SCEN1028	Block Chain Technology	3	0	0	3	100	-
19SCEN1029	Ethical Hacking Penetration Testing	3	0	0	3	100	-

Vertical V Emerging Technologies							
Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19SCEN1030	Augmented Reality / Virtual Reality	3	0	0	3	100	-
19SCEN1031	Robotic Process Automation	3	0	0	3	100	-
19SCEN1032	Neural Networks and Deep Learning	3	0	0	3	100	-
19SCEN1033	Quantum Computing	3	0	0	3	100	-
19SCEN1034	Real Time Cyber Security	3	0	0	3	100	-
19SCEN1035	Game Development	3	0	0	3	100	-
19SCEN1036	3D printing and Design	3	0	0	3	100	-
19SCEN1037	Embedded system and IoT	3	0	0	3	100	-

Open Electives (Offered to other Programmes

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
19SCOC1001	Cyber Laws	3	0	0	3	100
19SCOC1002	5G Technologies	3	0	0	3	100
19SCOC1003	Digital Watermarking and Steganography	3	0	0	3	100
19SCOC1004	Criminal psychology and Behavior Intelligence	3	0	0	3	100
19SCOC1005	Biometric and Security	3	0	0	3	100
19SCOC1006	Security audit and Risk Assessment	3	0	0	3	100
19SCOC1007	Software Engineering	3	0	0	3	100
19SCOC1008	Theory of Computing	3	0	0	3	100
19SCOC1009	Android Programming	3	0	0	3	100
19SCOC2010	Cyber Security	2	0	2	3	100

Diversified Electives

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19ITEC1001	Intellectual Property Rights	3	0	0	3	100	-
19MEEC1025	Fundamentals of Entrepreneurship	3	0	0	3	100	-
19MEEC1026	Design Thinking and Innovation	3	0	0	3	100	AIML
19MEEC2002	PLM for Engineers	2	0	2	3	100	All
19AMIC2001	AWS and Devops Essentials	3	0	2	4	100	AM & SC
19ITIC1001	Integrated Big data Solutions	3	0	0	3	100	AD,AM,CS,IT & SC

Regulations 2019
(2022 Batch onwards)

Syllabi for Semesters I to VIII

Course Code: 19SHMG6101	Course Title: INDUCTION PROGRAM (common to all B.E/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

Unit I Intellectual Property: An Introduction 9 Hours

Intellectual Property Law: Patent Law-Copyright Law-Trademark Law- Trade secret Law-Right of Publicity-Paralegal tasks in Intellectual Property Law-Ethical obligations of the paralegal in Intellectual Property Law-Trade secrets: Protectible as a trade secret-Maintaining trade secrets-Protecting an Idea

Unit II Patents: Rights and Limitations 9 Hours

Sources of patent law-Subject matter of Patents: Utility Patents-Plant Patents-Design Patents-Design Patents and copyright-Design Patents and trademarks-Computer Software, Business methods and Patent Protection-Rights under Patent Law-Patent Requirements-Limitations on Patent Rights-Patent Ownership

Unit III Patents: Research, Applications, Disputes, and International Considerations 9 Hours

Patent Search Process-Patent Application Process-Patent Infringement-Patent Litigation, International Patent laws

Unit IV Principles of Trademark **9 Hours**

Trademarks and Unfair Competition-Acquiring Trademark Rights-Types of Marks, Strong Marks Versus Weak Marks-Selecting and Evaluating a Trademark-International Trademark Laws

Unit V Principles of Copyrights **9 Hours**

Sources of Copyright Law- The Eight Categories of Works of Authorship-Derivative Works and Compilations- Rights and Limitations :Grant of Exclusive Rights–Copyrights Ownership-International Copyright Laws

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the basics of Intellectual Property Law	Apply
CO2: Identify the Rights and Limitations of various patents	Apply
CO3: Apply the process of patent search and application filling process	Apply
CO4: Explain the concept of trademark and its types	Apply
CO5: Classify the concepts of copyrights and its limitations	Apply

Text Book(s):

T1. Richard Stim, “Intellectual Property: Copyrights, Trademark and Patents”, Cengage learning, 2nd edition 2012.

Reference Book(s):

R1. Deborah E. Bouchoux, “Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets”, Cengage Learning, Third Edition, 2013.

R2. Prabuddha Ganguli,”Intellectual Property Rights: Unleashing the Knowledge Economy”, McGraw Hill Education, 2017.

Web References:

https://ipindia.gov.in/writereaddata/Portal/ev/sections-index.html

Course Articulation Matrix

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

High-3; Medium-2; Low-

Semester I

Course Code: 19MABC1102	Course Title: LINEAR ALGEBRA AND INFINITE SERIES (COMMON TO CS, IT, AD, AM & SC)		
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 orthogonalprocess	Apply
CO4: Determine the canonical form of a quadratic form using orthogonaltransformation	Apply
CO5: Use different testing methods to check the convergence of infinite series	Apply

Text Book(s):

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

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

T3. Howard Anton, Chris Rorres, “Elementary Linear Algebra Applications version”, 9th Edition.

Reference Book(s):

R1. T.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, Re-print 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
CO1	3	2	1	1	-	1	-	1	1	1	1	2
CO2	3	2	1	1	-	1	-	1	1	1	1	2
CO3	3	2	1	1	-	1	-	1	1	1	1	2
CO4	3	2	1	1	-	1	-	1	1	1	1	2
CO5	3	2	1	1	-	1	-	1	1	1	1	2

High-3; Medium-2; Low

Course Code: 19ENHG2101	Course Title: COMMUNICATION SKILLS – I (Common to all B.E/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

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**

WritingSimple 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.	Apply
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”, CUP Publications, 2nd Edition, 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, CUP, 3rd Edition, 2013.

Web References:

http://www.grammarinenglish.com -Jan 23, 2018

https://www.northshore.edu/support_centre /pdf/listen-notes.pdf

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

Course Code: 19PHBC2002	Course Title: PHYSICS FOR INFORMATION SCIENCES (common to CS, IT, AD, AM & SC)		
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	**Cognitive Level**
At the end of this course, students will be able to:	
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”, Wiley Publications, 10th Edition, 2014
R2. Ajoy Ghatak,“Optics”,Tata McGraw-Hill Education, New Delhi, 5th Edition, 2012.

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

R4. Dr. Jayaraman, V.Umadevi, S.Maruthamuthu and B. Saravanakumar, “Engineering Physics Laboratory Manual”, Pearson Publishers, 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	-	1	-	-
CO2	2	1	1	-	-	-	1	2	3	2	-	1	-	-
CO3	2	1	1	-	-	-	1	2	3	2	-	1	-	-
CO4	2	1	1	-	-	-	1	2	3	2	-	1	-	-
CO5	2	1	1	-	-	-	1	1	-	1	-	1	-	-

High-3; Medium-2; Low-1

Course Code: 19EESC2101	Course Title: INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING (common to CS, IT, AD, AM & SC)		
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 Machines3 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”, 2nd 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	-	-	-	-
CO2	2	1	-	-	-	-	-	2	3	2	-	-	-	-
CO3	2	1	-	-	-	-	-	2	3	2	-	-	-	-
CO4	2	1	-	-	-	-	-	1	-	1	-	-	-	-
CO5	2	2	-	-	-	-	-	1	-	1	-	-	-	-
CO6	3	2	1	1	-	-	-	2	3	2	-	-	-	-

High-3; Medium-2; Low-1

Course Code: 19CSSN2101	Course Title: FUNDAMENTALS OF PROGRAMMING		
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. Develop solutions using problem solving techniques.

2. Design pseudo code using suitable selection and repetition structures

3. Choose appropriate data types, variables and I/O statements

4. Develop programs using selection and iteration statements

5. Construct programs using arrays

Unit I Introduction to Programming 9 Hours

General Problem Solving Strategy – Program Development Cycle – Basic Programming Concepts: A Simple Program, Data Input, Program Variables and Constants – Data Types – Data Processing and Output – Problem solving techniques: Algorithm, flowchart, pseudocode.– Case study: RAPTORS

Unit II Program Development and Control Structures 9 Hours

Program Development: Program Design, Coding, Documenting and Testing a Program – Control Structures: Sequential Structure – Decision structure: single-alternative, dual-alternative, multiple-alternative structure – Loop structure: repeat-until, while, do-while, for.

Unit III Data Types and Operators In C 9 Hours

Overview of C – Structure of C program – Executing a C program – C Character set – keywords- Identifier – Variables and Constants – Data types – Type conversion – Operators and Expressions – Managing formatted and unformatted Input & Output operation.

Unit IV Control Structures 9 Hours

Statements: Selection statements: if, if-else, nested if-else, if-else-if ladder, switch – Jump statements: break, continue, goto, return – Iteration statements: for, nested for, while, do-while-

exit – Storage classes.

Unit V Arrays **9 Hours**

Declaration – Initialization – Characteristics of Array – One-dimensional array – Two-dimensional array – Array Operations – Applications: Linear search, Binary search, Selection sort, Bubble sort, Matrix Operations.

List of Exercises **30 Hours**

1. Solve simple problems using RAPTOR

2. Generate flowchart using control structures using RAPTOR

3. Create C Program to process data types, operators and expression evaluation

4. Develop C Program using formatted and unformatted I/O operations

5. Develop C Program using formatted and unformatted I/O operations

6. Construct C Program using selection and iteration statements

7. Develop C Program using arrays and array applications such as searching, sorting and matrix operations

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1.Develop solutions using problem solving techniques	Apply
CO2. Write pseudo code using suitable selection and repetition structures for a real time application	Apply
CO3. Choose appropriate data types, variables and I/O statements for solving problems	Apply
CO4: Develop programs using selection and iteration statements for a given scenario	Apply
CO5: Construct programs using arrays for various real time applications	Apply

Text Book(s):

T1.Venit S, and Drake E, “Prelude to Programming Concepts and Design”, 6th Edition, Pearson Education, 2015.
T2.Ajay Mittal, “Programming in C – A Practical Approach”, Pearson Education, 2010

Reference Book(s):

R1.R.G.Dromey, “How to Solve it by Computer”, 2nd Edition, Pearson Education, India, 2008
R2.Yashavant. P. Kanetkar “Let Us C”, 16th Edition, BPB Publications, 2018

R3. PradipDey, ManasGhosh, “Computer Fundamentals and Programming in C”, 2nd Edition, Oxford University Press, 2013

Web References:

http://raptor.martincarlisle.com/

http://www.cprogramming.com/

http://www.c4learn.com/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3	2	2	2	2	1	1	2	3	2	-	2	3	-
CO2	3	2	2	2	2	1	1	2	3	2	-	2	3	-
CO3	3	2	2	2	2	1	1	2	3	2	-	2	3	-
CO4	3	2	2	2	2	1	1	2	3	2	-	2	3	1
CO5	3	2	2	2	2	1	1	2	3	2	-	2	3	1

High-3; Medium-2; Low-1

Course Code: 19PSHG6001	Course Title: WELLNESS FOR STUDENTS		
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	**Cognitive Level**
At the end of this course, students will be able to:	
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. Richard Stim, “Intellectual Property: Copyrights, Trademark and Patents”, Cengage learning, 2nd edition 2012.

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, “Valueeducation 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	PSO2
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

Semester II			
Course Code: 19MABC1202	**Course Title: CALCULUS AND TRANSFORMS (common to CS, IT, AD, AM & SC)**		
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”, 3rd Edition, Tata McGraw-Hill, New Delhi, 2010.

R2. Srimanta Pal &Subodh C. Bhunia. “Engineering Mathematics”, 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
CO1	3	2	1	1	-	1	-	1	1	1	1	2
CO2	3	2	1	1	-	1	-	1	1	1	1	2
CO3	3	2	1	1	-	1	-	1	1	1	1	2
CO4	3	2	1	1	-	1	-	1	1	1	1	2
CO5	3	2	1	1	-	1	-	1	1	1	1	2

High-3; Medium-2; Low-1

Course Code: 19ENHG2201	Course Title: COMMUNICATION SKILLS – II (Common to all B.E/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.

T3.B.S.Grewal, “Higher Engineering Mathematics”, 43rd Edition, Khanna Publishers, 2014.

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:

http://www.grammarinenglish.com-Jan 23,2018
https://www.northshore.edu/support_centre/pdf/listen-notes.pdf
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

Course Code: 19ECSC2201	Course Title: DIGITAL SYSTEM DESIGN (common to CS, IT, AD, AM & SC)		
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. Identify and 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, 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 Degin”, 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,

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

Web References:

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19CSSN2201	Course Title: PROGRAMMING WITH 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

- Fundamentals of Programming

Course Objectives

The course is intended to:

1. Write programs using control structures, arrays and functions

2. Construct programs using pointers

3. Choose appropriate string manipulation and graphics functions

4. Construct appropriate structure and union representations

5. Develop programs using preprocessor directives and files

Unit I C Basics and Functions 10 Hours

Program using Control structures and Arrays – Function 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.

Unit II Pointers 10 Hours

Features of Pointer – Pointer Declaration – void Pointer– Null Pointer – Operations on Pointers–Pointers and Arrays – Array of Pointers – Pointer to a Pointer– Pointer to an Array – Pointer to a function – Dynamic memory allocation.

Unit III Strings and Graphics 7 Hours

Strings: Declaration and Initialization of string – Display of strings with different formats – String standard Functions – String conversion functions – Graphics: Initialization of Graphics – Graphics functions – Programs Using Library Functions.

Unit IV Structures and Union 9 Hours

Declaration & Initialization of Structures – Structure within Structure – Array of Structures – Pointer to Structures – Structure and Functions – type def – Declaration & Initialization of Union–Operations on Union – Enumerated data type – Bit Fields.

Unit V Preprocessor Directives and Files **9 Hours**

Preprocessor Directives: Types – Macros – File inclusion – Conditional compilation directives Files: Streams – File access: Sequential access, Random access – File type – File operations (open, close, read, write) – Command line arguments

List of Experiments **45 Hours**

1. Construct programs using control structures and arrays
2. Develop programs using functions and pointers
3. Design programs for string manipulation
4. Construct programs using graphics functions
5. Develop programs using structures and union
6. Create programs using preprocessor directives and files

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Write programs using control structures, arrays and functions for a given scenario	Apply
CO2: Construct programs using pointers for a given problem	Apply
CO3: Choose appropriate string manipulation and graphics functions for a Given application	Apply
CO4: Construct appropriate structure and union representations for handling compound data	Apply
CO5: Develop programs using preprocessor directives and files for a given scenario	Apply

Text Book(s):

T1. Ashok N. Kamthane, Amit.A. Kamthane, “Programming in C”, 3rd Edition, Pearson Education India, 2015.

T2. Ajay Mittal, “Programming in C – A Practical Approach”, Pearson Education, 2010.

Reference Book(s):

R1.Yashavant. P. Kanetkar “Let Us C”,16th edition, BPB Publications, 2018.

R2.PradipDey, ManasGhosh, “Computer Fundamentals and Programming in C”, 2nd Edition, Oxford University Press, 2013.

R3.Byron S Gottfried, “Programming with C”, Schaum’s Outlines, 2nd Edition, Tata McGraw-Hill, 2006.

Web References:

1. https://electronicsforu.com/resources/15-free-c-programming-ebooks

2. https://www.fromdev.com/2013/10/c-programming-tutorials.html 3. https://books.goalkicker.com/CBook/

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	1
CO2	3	2	2	2	2	1	1	2	3	2	-	2	3	1
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

Course Code: 19MESC4001	Course Title: ENGINEERING DRAWING (Common to AU, CS, EC, EI, IT, ME, AD, AM & SC)		
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", Tata McGraw Hill India, New Delhi, 7th Edition, 2017.

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

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

Reference Book(s):

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

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

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

Web References:

1. Engineering Drawing - http://nptel.ac.in/courses/112103019/2.

2. https://en.wikipedia.org/wiki/Engineering_drawing

Publications of Bureau of Indian Standards

1. IS 10711 – 2001: Technical products Documentation – Size and lay out 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.

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	-	-

High-3; Medium-2; Low-1

Course Code: 19CSSC4001	Course Title: IT PRACTICES LAB (common to CS, IT, AD, AM & SC)		
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

1. Web Applications

2. Develop a web page with image, text, links, tables

3. Build a web page with Menus, Image links and Navigations bars

4. Create a web page with containers and Media

5.Construct a web page to display own resume

6.Construct a web page to display the products of a company

Mobile Applications

7. Design an application with GUI widgets

8. Design an application with Layouts and Media

9. Create an application using Event handlers

10. Develop a calculator application to perform all arithmetic operations

11.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", 4th 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	1
CO2	3	2	2	2	2	1	1	2	3	2	-	2	3	1
CO3	3	2	2	2	2	1	1	2	3	2	-	2	3	-
CO4	3	2	2	2	2	1	1	2	3	2	-	2	3	1

High-3; Medium-2; Low-1

Course Code: 19CHMG6201	Course Title: ENVIRONMENTAL SCIENCES (Common to all B.E/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	**Cognitive Level**
At the end of this course, students will be able to:	
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	-	-	-	-

High-3; Medium-2; Low-1

Course Code: 19PSHG6003	Course Title:HERITAGE OF TAMILS (Common to all B.E/B.TechProgrammes)		
Course Category: Humanities		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

மாணவர்கள் இப்பாடத்தை கற்றலின் மூலம்

CO.1 மொழி மற்றும் இலக்கியம், பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை , நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் , திணைக் கோட்பாடுகள் மூலம் தமிழர் மரபை அறிந்து கொள்ள இயலும்.

CO.2இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பை அறிந்து கொள்ள இயலும்.

தமிழர் மரபு

அலகு 1 – மொழி மற்றும் இலக்கியம் 3

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி –தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு 2 – மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு 3 – நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு 4 – தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக் கோட்பாடு – சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு 5 – இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு 3

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறபகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுய மரியாதை இயக்கம் – இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத் துப் படிகள்– தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
மாணவர்கள் இப்பாடத்தை கற்றபின்	
CO.1 மொழி மற்றும் இலக்கியம், பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை , நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் , திணைக் கோட்பாடுகள் மூலம் தமிழர் மரபை அறிந்து கொள்வார்கள்.	அறிதல் (Understand)
CO.2 இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பை அறிந்து கொள்வார்கள்.	அறிதல் (Understand)

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by:
   Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Articulation Matrix

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

High–3; Medium–2; Low–1

Course Code: 19PSHG6003	Course Title:HERITAGE OF TAMILS (Common to all B.E/B.TechProgrammes)		
Course Category: Humanities		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Understand the Heritage of Tamils in terms of Language and Literature, Rock Art Paintings to Modern Art – Sculpture, Folk and Martial Arts, Thinai Concept.
2. Understand the Contribution of Tamils to Indian National Movement and IndianCulture.

HERITAGE OF TAMILS

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS **3**

Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS **3**

Flora and Fauna of Tamils &Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIANCULTURE **3**

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO.1 Understand the Heritage of Tamils in terms of Language and Literature, Rock Art Paintings to Modern Art – Sculpture, Folk and Martial Arts, Thinai Concept.	Understand
CO.2 Understand the Contribution of Tamils to Indian National Movement and IndianCulture.	Understand

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by:
   Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Articulation Matrix

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

High–3; Medium–2; Low–1

Semester III			
Course Code: 19MABC1303	**Course Title: DISCRETE MATHEMATICS (common to CS, IT, AM &SC)**		
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 combinatory 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 Relations, Lattices 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 Combinatory 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 – Codesand Group codes.

Unit V Divisibility and Congruence 9 +3 Hours

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:	
CO6: Apply logic to test the validity of arguments	Apply
CO7: Apply the concepts of sets, relations and functions in discrete structures	Apply
CO8: Solve the counting problems using combinatorics	Apply
CO9:Apply the concepts of groups and its properties to algebraic structures	Apply
CO5: Compute GCD using Euclidean algorithm and solve system of linear	Apply
Text Book(s):	
T4. J.P.Tremblay, R. Manohar, "Discrete Mathematical Structures with applications to Computer Science", TMH International Edition, July 2017	
T2. T.Veerarajan, "Discrete Mathematical Structures with Graph Theory and Combinatorics", Tata McGraw-Hill Education Private Limited, New Delhi, July 2017.	
Reference Book(s):	
R1. Kennth H. Rosen, "Discrete Mathematics and Its Applications", 7th Edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, July 2017.	
R2. Ralph P Grimaldi, Ramana. B. V, " Discrete and Combinatorial Mathematics", 5th Edition,	

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCC2301	Course Title: DATA STRUCTURES AND ALGORITHM ANALYSIS (Common to SC & AM)		
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. Explain the algorithm to solve problems using design strategies and estimate their complexities.

2. Implement linear data structures.

3. Implement the stack and queue operations.

4. Implement non – linear data structures.

5. Implement solutions using various searching and sorting techniques to solve problems.

Unit I Algorithm Design and Analysis **9 Hours**

Introduction – Classification of Data Structures – Abstract data type – Algorithm properties – Fundamentals of Algorithmic Problem Solving –The Analysis framework – Asymptotic notations and Basic Efficiency classes.

Unit II Linked List **9 Hours**

Introduction to Abstract Data Type (ADT) – Linked list - Doubly-linked lists – circular linked list – Cursor implementation of linked lists - applications of lists.

Unit III Stack and Queue **9 Hours**

Stack – Implementation – Applications: Infix to Postfix conversion, Evaluation of Postfix expression – Queue – Array Implementation of Queues – Circular Queue – Applications

Unit IV Trees and Graphs **9 Hours**

Trees – Terminologies – Binary Trees – Search Tree ADT – AVL Trees - Tree Traversals - Graph: Definitions - Representation of Graph – Shortest Path Algorithms – Depth First Search – Breadth First Search.

Unit V Searching and Sorting Algorithm **9 Hours**

Searching: Sequential and Binary - Hash Function - Separate Chaining - Open Addressing - Sorting: Bubble Sort – Selection Sort - Merge Sort.

List of Exercises **30 Hours**

1. Implementation of Stack and Queue

2. Implementation of Linked list

3. Applications of Stack

a. Infix to post fix conversion

b. Postfix Evaluation

4. Implementation of Binary Search Trees

5. Implementation of search – Linear, Binary

6. Implementation of sorting technologies – Bubble & Selection

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain algorithm to solve problems using design strategies and estimate their complexities	Apply
CO2: Implement linear data structures	Apply
CO3: Implement the stack and queue operations	Apply
CO4: Implement non – linear data structures	Apply
CO5: Implement solutions using various searching and sorting techniques to solve problems.	Apply

Text Book(s):

T1. Mark A. Weiss., “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson, June 2003.

T2. Anany Levitin, “Introduction to the Design & Analysis of Algorithms”, 4th Edition, Pearson Education, February 2017

Reference Book(s):

R1. Robert kruse, C.L, Tondo, and Bruce Leung, “Data Structures & Program Design in C”, Pearson, 2014

R2. Michael T. Goodrich, Roberto Tamassia, David M. Mount, “Data Structures and Algorithms,2007

R3. Tom M.Apostol,”Introduction to Analytic Number Theory”, Springer Science+ Business

Web Reference(s):

1. Animation of Various Data Structures URL:http://visualgo.net/

2. NPTEL Course Content URL: http://nptel.ac.in/courses/106102064/ Data Structures and Algorithm

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCC1301	Course Title: COMPUTER ORGANIZATION AND ARCHITECTURE (Common to SC & AM)		
Course Category: Professional Core		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 the basic principles of computer architecture.

2. Explain the input / output accessing and various processing element architectures.
3. Illustrate the concept memory organization
4. Understand various pipeline techniques.

5. Discuss the functional blocks of multiprocessors.

Unit I Basic Structure of a Computer System **9 Hours**

Functional Units - Basic Operational Concepts - Number Representation and Arithmetic - Operations - Character Representation - Performance - Memory Locations and Addresses- Addressing Modes - Instruction Sets - CISC Vs RISC.

Unit II Input / Output and Processing Unit **9 Hours**

Accessing I/O Devices – Interrupts – Bus Structure- Bus Operation - Instruction Execution - Hardware Components - Instruction Fetch and Execution Steps- Control Signals - Hardwired Control- CISC-Style Processors.

Unit III Memory System **9 Hours**

Semiconductor RAM Memories - Read-only Memories - Direct Memory Access - Cache Memories – Mapping function - Performance Considerations - Virtual Memory - Memory Management Requirements - Secondary Storage.

Unit IV Pipelining **9 Hours**

Pipeline Organization - Pipelining Issues - Data Dependencies - Memory Delays - Branch Delays - Resource Limitations - Performance Evaluation- Superscalar Operation- Pipelining in CISC Processors.

Unit V Multiprocessors **9 Hours**

Characteristics of multiprocessors - interconnection structures - inter processor arbitration - inter processor communication and synchronization- cache coherence- shared memory multiprocessors.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the basic principles of computer architecture.	Understand
CO2: Explain the input / output accessing and various processing element.	Understand
CO3: Illustrate the concept memory organization.	Understand
CO4: Understand various pipeline techniques.	Understand
CO5: Discuss the functional blocks of multiprocessors.	Understand

Text Book(s):

T1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, and Naraig Manjikian “Computer Organization and Embedded Systems”, Mcgraw Hill Education, 6th edition, 2011.
T2. M.Morris Mano, “Computer System Architecture”, Pearson Publication, 2007

Reference Book(s):

R1. William Stallings, “Computer Organization and Architecture”, 7th Edition PHI ,2010.

R2.Daniel J,”Synthesis Lecture on Fault Tolerant Computer Architecture “, Pearson Education, 2019
R3.John P.Hayes, “Computer Architecure and Organization”, 3 rd Edition, McGraw-Hill

R4.Jim Ledin, “Modern Computer”, Pearson Education, 2017

Web Reference(s):

1. http://insy.ewi.tudelft.nl/content/image-and-video-compression-learning-tool-vcdemo
2. https://www.w3.org/standards/agents/authoring

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCN1302	Course Title: PRINCIPLES OF COMMUNICATION AND CYBER ATTACKS		
Course Category: Professional Core		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 the fundamentals of computer communication

2. Learn about the networking concept, layered protocols.
3. Discuss various communications concepts

4. Explain Physical and Data link Layers

5. Discuss about the principles of attacks

UNIT - I: Overview of Computer Communications and Networking **9 Hours**

Introduction to Computer Networks - Types of Computer Networks. Network Addressing, Routing, Reliability, Interoperability and Security, Network Standards, The Telephone System and Data Communications.

UNIT - II: Essential Terms and Concepts **9 Hours**

Essential Terms and Concepts of Computer Applications and Application Protocols - Computer Communications and Networking Models, Communication Service Methods and Data Transmission Modes, Analog and Digital Communications, Speed and Capacity of a Communication Channel, Multiplexing and Switching, Network Architecture and the OSI Reference Model.

UNIT - III: Analog and Digital Communication Concepts **9 Hours**

Analog and Digital Communication Concepts - Representing Data as Analog Signals, Representing Data as Digital Signals, Data Rate and Bandwidth Reduction, Digital Carrier Systems.

UNIT - IV: Introduction to Physical and Data link Layer **9 Hours**

Physical and Data Link Layer Concepts -The Physical and Electrical Characteristics of Wire, Copper Media, Fiber Optic Media, Wireless Communications, Introduction to Data Link Layer, The Logical Link Control and Medium Access Control Sub-layers.

UNIT - V: Principles of Cyber Attacks **9 Hours**

Introduction to cyber-attacks, application security (design, development and testing), operations security, monitoring, identifying threats and remediating them, – Browser Attacks – Web Attacks targeting users – Obtaining user or website Data – Email attacks

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the fundamentals of computer communication.	Understand
CO2: Learn about the networking concept, layered protocols.	Understand
CO3: Discuss various communications concepts.	Understand
CO4: Explain Physical and Data link Layers.	Understand
CO5: Discuss about the principles of attacks.	Understand

Text Book(s):

T1. Michel A. Gallo and William H. Hancock, “Computer Communications and Networking Technologies” , Thomson Brooks / Cole , 2002

T2. Behrouz A. Forouzan,”Data Communications and Networking”, Fourth Edition MC GRAW HILL

Reference Book(s):

R1. M. Barry Dumas, Morris Schwartz, “Principles of Computer Networks and Communications”, Pearson, 2012.

R2. James F. Kurose, K. W. Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, 3rd Edition, Pearson Education, 2017.

Web Reference(s):

1. https://study.com/learn/lesson/cybersecurity-overview-principles.html 2. https://www.javatpoint.com/cyber-security-principles

3.https://www.tutorialspoint.com/principles_of_communication/principles_of_communication_introduction.htm

1. https://study.com/learn/lesson/cybersecurity-overview-principles.html 2. https://www.javatpoint.com/cyber-security-principles

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCC2302	Course Title: DATABASE DESIGN (Common to SC & AM)		
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

- Nil

Course Objectives

The course is intended to:

1. Describe the fundamentals of database and data models

2. Draw the ER model and discuss normalization for given database
3. Construct relational tables and formulate SQL queries

4. Explain the concurrency control and recovery mechanisms.

5. Familiarize the various file organization techniques.

Unit I Introduction of DBMS **9 Hours**

Introduction – Database System – Terminologies – Need for DBMS – Data Models and its types – Functions of DBMS – Components of DBMS – DBMS Architecture – Key issues and Challenges in Database Systems

Unit II ER and Relational Models **10 Hours**

ER Models – ER to Relational Mapping Object Relational Mapping – Relational Model - Constraints – Keys – Dependencies – Relational Algebra - Normalization: 1NF, 2NF, 3NF, 4NF, BCNF – Join Dependencies

Unit III Database Design **10 Hours**

Basic DDL: Introduction to SQL: Data Definition – Data Manipulation – Set Operations - Aggregate functions – Joins - Nested Queries – triggers – cursors - Database Security, Embedded & Dynamic SQL

Unit IV Transaction Management **9 Hours**

Transaction Concepts – ACID Properties – Concurrency Control – Need for Concurrency – Lock based Protocols – Two Phase Locking – Deadlock – Transaction Recovery – Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

Unit V Implementation techniques **9 Hours**

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Query optimization using Heuristics and Cost Estimation Distributed Databases

List of Exercises **30 Hours**

1. Create database and write SQL queries to retrieve information

2. Design an employee record in an organization and perform the following operations: Insertion, Deletion, Modify, Alter, Update and View.

3. Implement Joins and Nested Queries to an existing Employee database.

a. IN and NOT IN, Exists and NOT EXISTS, UNIQUE, NOT UNIQUE, ALL, DISTINCT b. Aggregation operators

c. Grouping and Ordering Commands

4. Implement trigger using PL / SQL block

5. Implement Cursor using PL / SQL block.

6. Implement transaction management- commit, rollback, save point

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the fundamentals of database and data models.	Understand
CO2: Draw the ER model and discuss normalization for given database	Apply
CO3: Construct relational tables and formulate SQL queries	Analyze
CO4: Explain the concurrency control and recovery mechanisms	Understand
CO5: Familiarize the various file organization techniques.	Apply

Text Book(s):

T1. Thomas Connolly, Carolyn Begg, “Database Systems: A Practical Approach to Design, Implementation and Management”, 6th Edition, Pearson Education, 2015.

T2. A Silberschatz, H Korth, S Sudarshan, “Database System Concepts”, 7th Edition, McGraw - Hill, 2019.

Reference Book(s):

R1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts , McGraw Hill, 2015

R2. Ramez Elmasri and Shamkant B. Navathe, Fundamental Database Systems,Pearson Education, 2008

R3. Ramez Elmasri and Shamkant B. Navathe, Fundamental Database Systems,Pearson Education, 2008

R4. Peter Rob and Corlos Coronel, Database System, Design, Implementation and Management , Thompson Learning Course Technology, 2003

Web Reference(s):

1. NPTEL lecture videos and notes: https://onlinecourses.nptel.ac.in/noc23_cs41/course
2. SQL practice exercises with solutions: https://www.w3resource.com/sql-exercises/
3. https://www.geeksforgeeks.org/dbms/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCC3301	Course Title: PROGRAMMING USING JAVA LABORATORY (Common to SC & AM)		
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

- C Programming

Course Objectives

The course is intended to:

1. Implement the object oriented concepts, interfaces and packages
2. Demonstrate exception handling
3. Implement Applet programs
4. Use Event Handlers and Database Connectivity

List of Exercises **45 Hours**

1. Write a Java program using Classes and objects.
2. Write a Java program using Inheritance.
3. Write a Java program using Polymorphism, overloading, over riding.
4. Write a Java program using Interfaces and Packages.
5. Write a Java program to implement Applets.
6. Write a Java program using Exception handling
7. Write a Java program using Event Handlers
8. Write a Java program for database Connectivity using MYSQL.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1 : Implement the object oriented concepts, interfaces and packages	Apply
CO2 : Demonstrate exception handling.	Apply

CO3 : Implement Applet programs.	Apply
CO4 : Use Event Handlers and Database Connectivity.	Apply

Text Book(s):

T1.Walter Savitch, “An introduction to computer science and programming.” 3rdEdition,O’Reilly, 2004.

T2. Samuel A.Rebelsky, “Experiments in java”, 4thEdition, O’Reilly, 2000.

Reference Book(s):

R1.Horstmann, C.S Cornell, “Core java-fundamentals”, 8thEdition, pearson, 2013

R2.Hall, M.Brown, “Core Servlet and Java Server pages”, 2nd Edition,pearson, 2003

Web Reference(s):

1. Official documentation of java 3.10: https://docs.java.org/3/tutorial/
2. Beginner to Advanced java developer guide: https://www.learnjava.org/
3. Java quick reference guide

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

Course Code: 19SCCC3302	Course Title: PROGRAMMING USING PYTHON LABORATORY (Common to SC & AM)		
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

- C Programming

Course Objectives

The course is intended to:

1. Implement the basic programming structures in python.

2. Demonstrate python data structures – lists, tuples, dictionaries.
3. Implement file management in python.

4. Develop application using various libraries in python.

5. Develop games using pygame

List of Exercises **45 Hours**

1.Write a Python Program

a. To exchange the values of two variables.

b. To implement Fibonacci series up to n using lambda.

c. To implement array rotation.

2. Write a Python Program

a. To reverse a string.

b. To check if a string is palindrome or not. c. To count number of characters in a string. d. To replace characters in a string.

3. Write a Python Program

a. To implement lists. b. To implement tuple.

c. To implement operations in dictionaries.

Write a Python Program

To find the factorial of a number using functions.

To find the largest number in a list using functions.

Write a Python Program

a. To copy a text from one file to another file. b. To count number of words in a file.

c. To find longest word in a file

Write a Python Program

a. To compare the elements of the two pandas series using pandas library. b. To test whether elements in given array using Numpy library.

c. To plot a graph using matplot lib library.

d. To return the specified unit in seconds using scipy library

a. To compare the elements of the two pandas series using pandas library. b. To test whether elements in given array using Numpy library.
Write a Python program to simulate bouncing ball using pygame.

Write a Python program to simulate elliptical orbits in pygame.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1 : Implement the basic programming structures in python.	Apply
CO2 : Demonstrate python data structures – lists, tuple, dictionaries.	Apply
CO3 : Implement file management in python.	Apply
CO4 : Develop application using various libraries in python.	Apply
CO5: Develop games using pygame .	Apply

Text Book(s):

T1.Peter Wentworth, Jeffrey Elkner, Allen B. Downey, and Chris Meyers, “How to Think Like a Computer Scientist: Learning with Python”,3rd Edition, O’Reilly, 2016.

T2.Mark Lutz, “Powerful Object Oriented Programming Python”, 4th Edition, O’Reilly, 2012

Reference Book(s):

R1. Mark Lutz, “Learning Python, Powerful OOPs”, 5th Edition, O’Reilly, 2013.

R2. Zelle, John M, “Python Programming: An Introduction to Computer Science”, Franklin Beedle& Associates, 2003

Web Reference(s):

1. Official documentation of python 3.10: https://docs.python.org/3/tutorial/
2. Beginner to Advanced Python developer guide: https://www.learnpython.org/
3. Python quick reference guide: https://www.pyschools.com/
4. https://www.geeksforgeeks.org/python-programming-examples/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19PSHG6002	Course Title: UNIVERSAL HUMAN VALUES 2: UNDERSTANDINGHARMONY		
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 I)

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 **8 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 **10 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 **9 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 8 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 Hormony on Professional Ethics 10 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	**Cognitive 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 well-being of self and practice techniques to promote well being	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	Receiving

Text Book(s):

T1. R R Gaur, R Sangal, G P Bagaria, “Human Values and Professional Ethics”, Excel books, new Delhi, 2010.
T2. A.N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004.

Reference Book(s):

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

R2. Annie Leonard, “The story of stuff”, Free Press, New York, 2010

Web Reference(s):

https://aktu.ac.in/hvpe/ResourceVideo.aspx

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
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

Course Code: 19PSHG6004	Course Title:TAMILS AND TECHNOLOGY (Common to all B.E/B.TechProgrammes)		
Course Category: Humanities		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

மாணவர்கள் இப்பாடத்தை கற்றலின் மூலம்

CO.1 நெசவு மற்றும் பானைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம், உற்பத்தித் தொழில்நுட்பம், வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் ஆகியன குறித்து அறிந்து கொள்ள இயலும்.

CO.2 அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் குறித்து அறிந்து கொள்ள இயலும்.

தமிழரும் தொழில்நுட்பமும்

அலகு 1 – நெசவு மற்றும் பானைத் தொழில்நுட்பம் 3

சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்

அலகு 2 – வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ஷ சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம் மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள், பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ – சாரோசெனிக் கட்டிடக் கலை.

அலகு 3 – உற்பத்தித் தொழில்நுட்பம் 3

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு 4 வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் 3

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன் வளம் – முத்து மற்றும் முத்துக் குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு 5 – அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் 3

அறிவியல் தமிழின் வளர்ச்சி – கணினித் தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென் பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
மாணவர்கள் இப்பாடத்தை கற்றபின்	
CO.1 நெசவு மற்றும் பானைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம், உற்பத்தித் தொழில்நுட்பம், வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் ஆகியன குறித்து அறிந்து கொள்வார்கள்.	அறிதல் (Understand)
CO.2 அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் குறித்து அறிந்து கொள்வார்கள்.	அறிதல் (Understand)

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை (வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Articulation Matrix

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

High–3; Medium–2; Low–1

Course Code: 19PSHG6004	Course Title:TAMILS AND TECHNOLOGY (Common to all B.E/B.TechProgrammes)		
Course Category: Humanities		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Understand Weaving and Ceramic Technology, Design and Construction Technology, Manufacturing Technology, Agriculture and Irrigation Technology.

2. Understand the Scientific Tamil & Tamil Computing.

TAMILS AND TECHNOLOGY

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions inSilappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- ThirumalaiNayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold-Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY **3**

Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING **3**

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO.1 Understand Weaving and Ceramic Technology, Designand Construction Technology, Manufacturing Technology, Agriculture and Irrigation Technology.	Understand
CO.2 Understand the Scientific Tamil & Tamil Computing.	Understand

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
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10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
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12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Course Articulation Matrix

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

High–3; Medium–2; Low–1

Semester IV

Course Code: 19MABG1401	Course Title: PROBABILITY AND STATISTICS (common to all B.E/B.Tech programmes)		
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. Apply the samples based on variance

Unit I Probability and Random Variables **9+3 Hours**

Axioms of Probability – Conditional Probability – Total Probability – Bayes' 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 –poison –uniform –Exponential 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: Apply the samples based on variance	Apply

Text Book(s):

T1. Dr.J.Ravichandran, “Probability and Statistics for Engineers”, Wiley India Pvt.Ltd., 2010.

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

T3. Veerarajan T, “Probability, Statistics and Random process”, 4th Edition, Tata McGraw-Hill, New Delhi, 2013.

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

Web Reference(s):

1. Probability, Random Variables, Standard Distributions, Two dimensional random variables, Testing of Hypotheses: https://onlinecourses.nptel.ac.in/111105041/

2. Probability, Random Variables, Standard Distributions, Two dimensional random variables,Testing of Hypotheseshttps://nptel.ac.in/courses/111105090/

3. Design of Experiments : https://nptel.ac.in/courses/111104075/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19CSCN2401`	Course Title: BASICS OF OPERATING SYSTEMS (common to AIML & CYS)		
Course Category: Professional Core		Course Level : Introductory	
L: T: P(Hours/Week) 3: 1: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Describe the components of operating systems and its services

2. Solve process scheduling and synchronization problems
3. Compare different memory management techniques.

4. Develop solutions for free space management

5. Summarize various administrative tasks in Linux environment

Unit I Introduction **9 Hours**

Computer System Organization– Operating System Operations – Kernel Data Structures–Operating Systems Structures: System Components, Operating System Services, System calls, System Programs – Process Concepts: Process Scheduling, Operation on Process, CoOperating process, Inter Process Communication.

Unit II Process Management **9 Hours**

CPU scheduling: Scheduling Algorithms – Process Synchronization: The Critical Section Problem, Peterson's Solution, Hardware Support for Synchronization, Mutex Locks, Semaphores, Monitors – Classical problems of Synchronization – Deadlock: Deadlock Characterization – Methods for handling Deadlocks: Deadlock Prevention, Avoidance, Detection and Recovery from Deadlock

Unit III Memory Management **9 Hours**

Main Memory: Contiguous Memory Allocation, Paging, Structure of Page Table, Swapping –Virtual Memory: Demand paging, Copy-on-write, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Unit IV File Systems **9 Hours**

Mass Storage Structure: Overview – Hard Disk Scheduling – RAID Structure – File System Interface: File Concepts, Access methods, Directory Structure, File Protection – File System Implementation: File System Structure and Operations, Directory Implementation, Allocation methods, Free Space Management.

Unit V Case Study-Linux **9 Hours**

History of Unix and Linux, Overview – Processes in Linux – Memory Management in Linux - Linux File System – Security in Linux, Android – History – Architecture - Applications

List of Exercises **30 Hours**

1.Implementation of Process and I/O System calls

2. Implementation of CPU Scheduling Algorithms

3. Implementation of Classical Synchronization problems using semaphores

4. Implementation of Memory Allocation Strategies

5. Implementation of Page Replacement Algorithms

6. Implementation of Disk Scheduling Algorithms

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the components of operating systems and its services based on system calls	Understand
CO2: Solve process scheduling and synchronization problems using algorithms	Apply
CO3:Compare different memory management techniques using allocation schemes	Apply
CO4: Develop solutions for free space management using file systems and disk scheduling concepts	Apply
CO5: Summarize various administrative tasks in Linux environment using its components and services	Understand

Text Book(s):

T1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 10thEdition, John Wiley & Sons, 2018.
T2.Andrew S. Tanenbaum, “Modern Operating Systems”, 4th Edition, Pearson Education, 2015.

Reference Book(s):

R1.William Stallings, “Operating Systems Internals and Design Principles”, 9th Edition, Pearson Education, 2018.

Web Reference(s):

MIT open course on operating system engineering: http://ocw.mit.edu/courses/electrical-
Bell’s Course Notes on Operating Systems Processes:
https://www2.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/3 Processes.html
NPTEL course on Operating System Fundamentals:
https://nptel.ac.in/courses/106/105/106105214/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCN1401	Course Title: COMPUTER NETWORKS AND ATTACKS		
Course Category: Professional core		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. Discuss the Network components and Data link layers concepts.

2. Implement the network layer protocols.
3. Illustrate the functionalities of transport layer protocols.

4. Demonstrate the working principles of application layer protocols.

5. Identify the Concepts of Networks Attacks.

Unit I Network Components **9 Hours**

Network Requirements– Socket implementation –Bandwidth and Latency – Delay X Bandwidth product – Application Performance needs –Connection Perspectives – Encoding – Framing: (PPP, HDLC, SONET) – Error Detection (Parity, Internet Checksum, CRC).

Unit II Network Layer **9 Hours**

Internet Protocol (IP) – Service Model – Global Addresses – Datagram Forwarding in IP – Subnetting and Classless Addressing – ARP – DHCP – ICMP – Routing protocols: RIP and OSPF – IPv6 – Distance vector – Link state Routing Algorithm - Mobile IP

Unit III Transport Layer **9 Hours**

UDP: Segment format, Applications – TCP: Segment Format, Connection Establishment and Termination– TCP Congestion Control – Congestion Avoidance Mechanisms.

Unit IV Application Layer 9 Hours

Electronic Mail: SMTP, MIME, IMAP – World Wide Web: HTTP – Web Services – Infrastructure Services: Domain Name System, Simple Network Management Protocol –Firewalls.

UNIT V Network Attacks 9 Hours

Network Attacks: Security attacks – Active and Passive, Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks, Trojan horse and spyware attacks, Worms Attacks.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Discuss the Concepts of Network components and Data link layers.	Understand
CO2: Implement the various network layer protocols.	Apply
CO3: Use the functionalities of transport layer protocols.	Apply
CO4: Demonstrate the working principles of application layer protocols.	Apply
CO5: Describe the Concepts of Networks Attacks.	Understand

Text Book(s):

T1. A. S. Tanenbaum “Computer Networks”, 6th edition, Pearson Education/ PHI, New Delhi, India, 2021.

T2. William Stallings ,” Network Security Essentials : Applications and Standards” Sixth Edition, Pearson, 2018.

Reference Book(s):

R1. Behrouz A. Forouzan,” Data communication and Networking”, 4th Edition, Mc Graw-Hill, India, 2006

R2. Kurose, Ross, “ Computer Networking: A top down approach”, Pearson Education, India, 2010.

R3. Markus Jakobsson and Zulfikar Ramzan, “Crimeware, Understanding New Attacks and Defense”, Symantec Press, 2008.

R4. Beaver.K., “Hacking for Dummies”, 3rd Edition. John Wiley & sons., 2013.

Web Reference(s):

1. MIT Open course ware - Data Communication Networks: http://ocw.mit.edu/courses/ electrical– engineering– and– computer– science/6– 829– computer– networks– fall– 2002

2. NPTEL - Computer Networks: http://nptel.ac.in/courses/106105081

3. https://www.w3schools.com/cybersecurity/cybersecurity_network_attacks.php

4. https://www.educba.com/types-of-network-attacks

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCN1402	Course Title: CRYPTOGRAPHY AND SECURITY		
Course Category: Professional Core		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 to analyze the security and Encryption Techniques

2. Explain Data Encryption and Advanced Encryption Standard
3. Develop cryptographic algorithms for information security

4. Explain hash functions and Message Authentication code

5. Understand Security threats

Unit I Computer Security and Classical Encryption Techniques 9 Hours

Introduction - Computer Security Concepts – Security Attacks – Security Mechanism – Symmetric Cipher Model – Substitution Techniques – Transposition Techniques.

Unit II Block Ciphers, Data Encryption Standard, Advanced Encryption Standard 9 Hours

Block Cipher Structure – The Data Encryption Standard – DES Example – The strength of DES – Block Cipher Design Principles – AES Structure – AES transformation - AES example – Mode of Operations

Unit III Public Key Cryptography 9 Hours

Principles of Public – Key Cryptosystems – The RSA Algorithm – Diffie – Hellman Key Exchange – The Algorithm – Key Exchange Protocols – Man-in-the-Middle Attack - Elgamal Cryptographic System - Elliptic Curve Cryptography.

Unit IV Hash Functions and Message Authentication Code 9 Hours

Applications of Cryptographic Hash Functions – Hash functions based on Cipher Block

Chaining - Secure Hash Algorithm – Message Authentications Requirements - Functions – MACs Based on Block Ciphers DAA and CMAC - Digital Signatures.

Unit V Security Threats **9 Hours**

Introduction to Security Threats – Virus – Worms – Trojan Horse – Bombs – TrapDoor – Network and Services Attack – Denial-of-Service Attack – Types of DOS Attack – Examples – Electronic Mail Security – PGP – S/MIME - System Security – Intruders – Firewalls.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Learn to analyze the security and Encryption Techniques	Apply
CO2: Explain Data Encryption and Advanced Encryption Standard ures	Apply
CO3: Develop cryptographic algorithms for information security	Apply
CO4: Explain hash functions and Message Authentication code	Apply
CO5: Understand Security threats	Understand

Text Book(s):

T1. William Stallings “Cryptography And Network Security Principles And Practice”, 7th Edition, Pearson Education.

T2. Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed, “Fundamentals of Cyber Security (Principles, Theory and Practices) ” BBP Publications, First Edition

Reference Book(s):

R1. Wenbo Mao, “Modern Cryptography: Theory and Practice”, Prentice Hall PTR.

R2. William Stallings, “Network Security Essentials: Applications and Standards”, Pearson Education, 2001.

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCN3401	Course Title: COMPUTER NETWORKS AND CYBER LABORATORY		
Course Category: Professional Core		Course Level : Practice	
L: T: P(Hours/Week) 0: 0: 4	Credits: 2	Total Contact Hours:60	Max. Marks:100

Pre-requisites

- Python Programming

Course Objectives

The course is intended to:

1. Define and use network commands

2. Implement Routing Protocols
3. Configure and test various network protocols

4. Built application using simulation tools

5. Identify various Network attacks

List of Exercises

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine

2. Write a HTTP web client program to download a web page using TCP sockets

3. Applications using TCP sockets like:

• Echo client and echo server

• Chat

• File Transfer

4. Simulation of DNS using UDP sockets.

5. Write a code simulating ARP /RARP protocols.

6. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS

7. Study of TCP/UDP performance using Simulation tool.

8. Simulation of Distance Vector/ Link State Routing algorithm.

9. Performance evaluation of Routing protocols using Simulation tool.

10. Simulation of error correction code (like CRC).

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Define and use network commands	Apply
CO 2: Implement Routing Protocols.	Apply
CO 3: Configure and test various network protocols.	Apply
CO 4: Built application using simulation tools.	Apply
CO5: Identify various Network attacks.	Apply

Text Book(s):

T1. S. Tanenbaum , Computer Networks, 4th edition, Pearson Education/ PHI, New Delhi, India.

T2. Zouheir Trabelsi, Kadhim Hayawi, Arwa Al Braiki, Sujith Samuel Mathew , Network Attacks and Defenses: A Hands-on Approach ,1st Edition, CRC Press, 2012.

Reference Book(s):

R1. Behrouz A. Forouzan (2006), Data communication and Networking, 4th Edition, Mc Graw-Hill, India. 2. Kurose, Ross (2010), Computer Networking: A top down approach, Pearson Education, India

R2. Markus Jakobsson and Zulfikar Ramzan, Crimeware, Understanding New Attacks and Defenses, Symantec Press, 2008, ISBN: 978–0–321–50195–0.

Web Reference(s):

1. https://www.geeksforgeeks.org/computer-network-tutorials/
2. https://www.geeksforgeeks.org/deniel-service-prevention/
3. https://www.w3schools.com/cybersecurity/cybersecurity_networking.php

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCN3402	Course Title: CRYPTOGRAPHY AND SECURITY LABORATORY		
Course Category: Professional Core		Course Level : Practice	
L: T: P(Hours/Week) 0: 0: 4	Credits:2	Total Contact Hours:60	Max. Marks:100

Pre-requisites

- C / Python Programming

Course Objectives

The course is intended to:

1. Implement the Cipher techniques to perform encryption and decryption

2. Implement transposition techniques
3. Implement algorithms DES, AES, RSA, Diffie-Hellman, MD5, SHA-1

4. Demonstrate digital signature standard

List of Exercises

1. Write a program to implement the following cipher techniques to perform encryption and decryption i. Caesar Cipher 85 ii. Playfair Cipher iii. Hill Cipher

2. Write a program to implement the following transposition techniques (i) Rail fence technique – Row major transformation (ii) Rail fence technique - Column major transformation

3. Write a program to implement DES algorithm

4. Write a program to implement AES algorithm

5. Write a program to implement RSA Encryption algorithm

6. Write a program to implement the Diffie-Hellman Key Exchange mechanism. Consider one of the parties as Alice and the other party as bob.

7. Write a program to calculate the message digest of a text using the SHA-1 algorithm

8. Write a program to calculate the message digest of a text using the MD-5 algorithm.

9. Write a program to implement digital signature standard.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Implement cipher techniques	Apply
CO 2: Implement transposition techniques	Apply
CO 3: Implement DES, AES, RSA, Diffie – Hellman.MD5, SHA - 1	Apply
CO 4: Demonstrate digital signature standard	Apply

Text Book(s):

T1. William Stallings, “Cryptography and Network Security - Principles and Practices”, 7th Edition, Pearson Education, 2017.
T2. Atul Kahate, “Cryptography and Network Security”, 3rd Edition, Tata Mcgraw Hill, 2013.

Reference Book(s):

R1. Behrouz A Forouzan and Debdeep Mukhopadhyay, “Cryptography and Network Security”, 3rd Edition, Tata McGraw Hill, New Delhi, 2016.

R2. Atul Kahate, “Cryptography and Network Security”, 3rd Edition, Tata Mcgraw Hill, New R3. Douglas R Stinson, “Cryptography - Theory and Practice”, Chapman and Hall / CRC Press,
R3. Douglas R Stinson, “Cryptography - Theory and Practice”, Chapman and Hall / CRC Press

Web Reference(s):

1. NPTEL Course contents on Cryptography and Network Security URL:http://nptel.ac.in/courses/106105162/
2. Learn Internet Security at Tutorial point https://www.tutorialspoint.com/cryptography/index.htm
3. Khan Academy Course on cryptography https://www.khanacademy.org/computing/computer-science/cryptography

Course Articulation Matrix

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

Course Code: 19SCPN6401	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. Identify solutions to simple engineering problems.

2. Use the knowledge of Science, engineering & engineering tools to solve simple problems relevant to the discipline.

The objective of Project is to enable the student to take up investigative study in the broad field of Computer Science and Engineering, to solve relevant social/environmental/ethical issues 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. The assignment will normally include:

1. Survey and study of published literature on the assigned topic.

2. Working out a preliminary Approach to the Problem relating to the assigned topic

3. Conducting Analysis, Design, Implementation/Modeling /Simulation

4. Preparing a Written Report of the Study/Work

5. Final Presentation before a departmental committee.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Design, develop and implement solutions using relevant modern tools to simple engineering problems that are relevant to the discipline.	Apply
CO2: Work in teams performing different roles for effective accomplishment of project goals following ethical practices.	Apply

CO3: Demonstrate the use of prior knowledge of science and engineering and engineering tools to formulate, analyze and investigate problems systematically	Apply
CO4: Communicate the process, methods and materials, findings, results and solutions through reports and presentations in appropriate forums.	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Semester V			
Course Code: 19SCCN1501	**Course Title: APPLIED CRYPTOGRAPHY**		
Course Category: Professional Core		**Course Level: Mastery**	
L: T: P(Hours/Week) **3: 0: 0**	**Credits:3**	**Total Contact Hours:45**	**Max. Marks:100**

Pre-requisites

- Cryptography and Security

Course Objectives

The course is intended to:

1: Teach the basic concept of number theory.

2: Teach the basic operations of login protocols.

3: Discuss various authenticated key exchange protocols.

4: Compare various identity – based key agreement protocols

5: Build different Group Key aggrement protocols.

Unit I NUMBER THEORY 9 Hours

Euclidean Algorithm- Modular Arithmetic – Fermat's and Eulers's Theorem – Testing for Primality – Chinese remainder theorem – Random Number generator.

Unit II DIGITAL SIGNATURE SCHEMES 9 Hours

Digital Signature Schemes : Elgamal – Merkle one time signature - Elliptic curve Cryptosystem – Rabin one time signature. Advanced Protocols: Zero Knowledge Proofs - Zero Knowledge Proof of Identity.

Unit III AUTHENTICATED KEY EXCHANGE PROTOCOL 9 Hours

Identification and AKE – An encryption-based protocol (PGP) - Password authenticated Key exchange protocol with an online TTP (Kerberos). Protocols for identification and login: Feige-Fiat-Shamir - Schnorr's identification.

Unit IV IDENTITY – BASED KEY AGREEMENT 9 Hours

Introduction: Identity Based Protocols without Pairings – Pairing Based Key Agreement with Basic Message Format – Explicit Authentication

Unit V GROUP KEY ESTABLISHMENT 9 Hours

Group Key Agreement Protocols: Diffie Hellman Key Agreement – Station to Station protocol – Elliptic curve Diffie Helman – Integrated Encryption Scheme - TLS – Ipsec.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the basic concepts of number theory.	Understand
CO2: Explain the basic operations of login protocols.	Understand
CO3: Summarize various authenticated key exchange protocols.	Apply
CO4: Experiment various identity – based key agreement protocols	Apply
CO5: Build different Group Key agreement protocols.	Apply

Text Book(s):

T1. William Stallings, Cryptography and Network Security , 7th edition, Pearson, Global Edition.

T2.Boneh, Dan, and Victor Shoup. A graduate course in applied cryptography. Draft 0.5; 2020

T3.Boyd, Colin, Anish Mathuria, and Douglas Stebila. Introduction to Authentication and Key Establishment. Protocols for Authentication and Key Establishment. Springer, Berlin,

Reference Book(s):

R1.J. Menezes, P. C. V. Oorschot and S. A. Vanstone, Handbook of Applied Cryptography, CRC Press, 1996.

R2.J. Pieprzyk, T. Hardjono and J. Seberry, Fundamentals of computer security, Springer; 2003.

Web References:

https://www.geeksforgeeks.org/agreement-protocol-in-distributed-systems/

https://www.geeksforgeeks.org/types-of-authentication-protocols/

https://doubleoctopus.com/security-wiki/protocol/key-agreement-protocol-2/

Course Articulation Matrix

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

High-3; Medium-2 Low-1

Course Code: 19SCCN1502		Course Title: SYSTEM SECURITY	
Course Category: Professional core		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Computer networks and attacks

Course Objectives

The course is intended to:

1: Teach the fundamentals of Database and Operating Systems

2: Discuss access control security models and policies in database and operating systems

3: Identify the Challenges, Attacks and Defences in Database Systems

4: Identify the functionalities of different types of Malwares

5: Experiment the foundation of Vulnerabilities and trusted computing

Unit I INTRODUCTION TO DATABASE AND OPERATING SYSTEMS 9 Hours

Program vs processes, Transaction recovery and concurrency control in database systems- Schedule, Concurrency control protocols, Deadlock handling. Access control mechanisms in general computing systems - Lampson's access control matrix

Unit II ACCESS CONTROL SECURITY MODELS AND POLICIES 9 Hours

Mandatory access control, Authentication mechanisms in databases, DAC, MAC, RBAC. Auditing in databases, Statistical inferencing in databases, Private information retrieval viewed as a database access problem. Privacy in data publishing, Virtual Private Databases.

Unit III CHALLENGES, ATTACKS AND DEFENCES IN DATABASE SYSTEMS 9 Hours

Security and protection in operating systems - access control, auditing, trusted computing base with reference to Multics and the commercial Operating Systems Malware analysis and protection.

Unit IV CATEGORIES OF MALWARES 9 Hours

viruses, worms and Trojans, Rootkits, Ransomware, Polymorphic malware, Malware capture and analysis using honeypots..

Unit V VULNERABILITIES AND TRUSTED COMPUTING 9 Hours

Common vulnerabilities and Exposures, Secure system configuration, Minimal footprint, Security of booting, Trusted computing, Virtualization techniques for security, Mobile Operating Systems security especially in Android.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Explain the fundamentals of Database and Operating Systems	Understand
CO2: Summarize access control security models and policies in database and operating systems	Understand
CO3: Solve the Challenges, Attacks and Defences in Database Systems	Apply
CO4: Experiment the functionalities of different types of Malwares	Apply
CO5: Apply the foundation of Vulnerabilities and trusted computing	Apply

Text Book(s):

T1. Charles P. Pfleeger and Shari Lawrence Pfleeger, Security in computing, Prentice Hall Professional Technical Reference, Fourth Edition; 2006.

Reference Book(s):

R1. M. Gertz and S. Jajodia, Handbook of Database Security-Applications and Trends, Springer; 2008.

R2. Jaeger, Operating System Security, Vol. 1 of Synthesis Lectures on Information Security,Privacy and Trust, Morgan & Claypool Publishers; 2008.

R3. W. Mauerer, Professional Linux Kernel Architecture, John Wiley and Sons, New York;

R4. R Anderson, Security engineering, John Wiley & Sons; 2008.

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	1		2						3	2
CO2				3	1		2						3	2
CO3				3	1		2						3	2
CO4				3	1		2						3	2
CO5				3	1		2						3	2

High-3; Medium-2; Low-1

Course Code: 19SCCN1503	Course Title: Distributed Computing		
Course Category: Professional Core		Course Level : Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Teach the computation and communication models of distributed systems

2: Discuss the issues of synchronization and collection of information in distributed systems

3: Implement distributed mutual exclusion and distributed deadlock detection techniques

4: Compare the Consensus and Agreement Algorithms

5: Build Various cloud computing models

Unit I INTRODUCTION TO DISTRIBUTED COMMUNICATION 9 Hours

Introduction: Definition-Relation to Computer System Components – Motivation – Message - Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A Distributed Program – A Model of Distributed Executions – Models of Communication Networks – Global State of a Distributed System

Unit II LOGICAL TIME AND GLOBAL STATE 9 Hours

Logical Time: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks- Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Recording Algorithms: Introduction – System Model and Definitions– Snapshot Algorithms for FIFO Channels.

Unit III DISTRIBUTED MUTEX AND DEADLOCK 9 Hours

Distributed Mutual exclusion Algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart- Agrawala's Algorithm –– Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm for the AND model and

OR Model

Unit IV CONSENSUS AND RECOVERY 9 Hours

Consensus and Agreement Algorithms: Problem Definition – Overview of Results – Agreement in a Failure-Free System(Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Checkpointing and Rollback Recovery: Introduction – Background and Definitions – Issues in Failure Recovery – Checkpoint-based Recovery – Coordinated Checkpointing Algorithm -- Algorithm for Asynchronous Checkpointing and Recovery

Unit V CLOUD COMPUTING 9 Hours

Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services – Application Services

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the computation and communication models of distributed systems	Understand
CO2: Summarize the issues of synchronization and collection of information in distributed systems	Understand
CO3: Experiment distributed mutual exclusion and distributed deadlock detection techniques	Apply
CO4: Solve the Consensus and Agreement Algorithms	Apply
CO5: Build Various cloud computing models	Apply

Text Book(s):

T1.Kshemkalyani Ajay D, Mukesh Singhal, “Distributed Computing: Principles, Algorithms and Systems”, Cambridge Press, 2011

Reference Book(s):

R1: George Coulouris, Jean Dollimore, Time Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012

R2:Pradeep L Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007.

Web References:

https://wiki.sei.cmu.edu/confluence/display/c/SEI+CERT+C+Coding+Standard.

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCN3501		Course Title: Applied Cryptography Laboratory	
Course Category: Professional core		Course Level: Mastery	
L:T:P(Hours/Week) 0: 0: 3	Credits: 1.5	Total Contact Periods: 45	Max Marks:100
Pre-requisites			

- Cryptography and security

Course Objectives

The course is intended to:

1.Develop Various Identification Protocol

2.Experiment the use of public key encryption, digital signatures, and key establishment

3.Solve Message Authentication Codes

List of Experiments **45 Hours**

1. Implement Feige-Fiat-Shamir identification protocol.

2. Implement Schnorr identification protocol.

3. Implement Rabin one-time signature scheme.

4. Implement Merkle one-time signature scheme.

5. Study of CrypTool and its working Principle.

6. Calculate the hash value of a file using different hash functions (e.g., MD5, SHA-256) and compare the results.

7. Perform a key exchange using Diffie-Hellman key exchange algorithm using CrypTool

8. Hide a message within an image file using steganography techniques available in Cryptool.

9. Create a digital signature for a file using RSA (or DSA) and verify the signature using CrypTool.

10. Encrypt a plaintext message using AES (Advanced Encryption Standard) with a key of your choice using CrypTool.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1:Experiment Various Identification Protocol	Apply

CO2.Utilize the use of public key encryption, digital signatures, and key establishment with the help of CrypTool.	Apply
CO3.Construct Message Authentication Codes using CryTool.	Apply

Reference(s):

R1. ShaffiGoldwasser and MihirBellare, Lecture Notes on Cryptography: Principles and Apllications, Springer Verlag.

R2. Wenbo Mao, Modern Cryptography, Theory and Practice, Pearson Education (Low Priced Edition)

Course Articulation Matrix

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2			1	1						1		
CO2		1												
CO3	3	2			2	1		1	1		1	2		

High-3; Medium-2;Low-1

Course Code: 19SCCN3502		Course Title: System Security Laboratory	
Course Category: Professional Core		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0: 3	Credits: 1.5	Total Contact Periods: 45	Max Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Construct the fundamentals of binaries.

2: Develop various discretionary access control mechanism in operating Systems

3: Build the Linux Virtualization and private database.

List of Experiments **45 Hours**

1. Exploring the concepts of binaries, libraries (static and dynamic) and Makefile
2. Implementing the discretionary access control mechanism in operating Systems (linux)
3. Implementing the discretionary access control mechanism in databases (mysql)
4. Construct a web page to display own resume
5. Linux Virtualization (Chroot)
6. Virtual private databases (Oracle label Security).
7. Implement Authentication trees and one-time signatures.
8. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome).
9. Study of different types of vulnerabilities for hacking a websites/ web applications.
10. Simple penetration testing tasks using python.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Solve the fundamentals of binaries.	Apply
CO2: Experiment various discretionary access control mechanism in operating Systems	Apply

CO3: Construct the Linux Virtualization and private database.	Apply

Reference(s):

R1. M. Gertz and S. Jajodia, Handbook of Database Security-Applications and Trends,Springer; 2008

R2. Jaeger, Operating System Security, Vol. 1 of Synthesis Lectures on Information Security,Privacy and Trust, Morgan & Claypool Publishers; 2008.

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Course Code:19PSHG6501	Course Title: Employability Skills 1: Teamness and Interpersonal Skills		
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. 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'ts– 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 Attitude & 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'ts – Handling Rejections– Identifying Negativities – How to handle 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	**Cognitive Level**
At the end of this course, students will be able to:	
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

Semester VI			
Course Code: 19SCCN1601	**Course Title: CYBER FORENSICS**		
Course Category: Professional Core		**Course Level : Mastery**	
L: T: P(Hours/Week) **3: 0: 0**	**Credits:3**	**Total Contact Periods:45**	**Max. Marks:100**

Pre-requisites

- Computer networks and attacks

Course Objectives

The course is intended to:

1: Teach the basic concept of cybercrime and forensics

2: Discuss various forensics tools

3: Illustrate network and e-mail forensics techniques

4: Compare different Ethical Hacking tools and techniques

5: Summarize the concept of Social Engineering and SQL Injection

Unit I Introduction To Cyber Crime And Forensics 9 Hours

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Role of ECD and ICT in Cybercrime - Classification of Cyber Crime. The Present and future of Cybercrime - Cyber Forensics -Steps in Forensic Investigation - Forensic Examination Process - Types of CF techniques - Forensic duplication and investigation - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition

Unit II Evidence Collection And Forensics Tools 9 Hours

Processing Crime and Incident Scenes – Digital Evidence - Sources of Evidence -Working with File Systems. - Registry - Artifacts - Current Computer Forensics Tools: Software/ Hardware Tools- Forensic Suite Acquisition and Seizure of Evidence from Computers and Mobile Devices - Chain of Custody- Forensic Tools

Unit III Analysis And Validation 9 Hours

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics -

Analysis of Digital Evidence - Admissibility of Evidence - Cyber Laws across global - Case Studies

Unit IV Ethical Hacking and foot printing tools 9 Hours

Introduction to Ethical Hacking - Foot printing and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats – Sniffing – Email Tracking- foot printing tools: Nmap, Maltego, theHarvester.

Unit V Ethical Hacking In Web 9 Hours

Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking Web Applications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the basic concept of cybercrime and forensics	Understand
CO2: Experiment various forensics tools	Apply
CO3: Summarize network and e-mail forensics techniques	Apply
CO4: Choose different Ethical Hacking tools and techniques	Apply
CO5: Model the concept of Social Engineering and SQL Injection	Apply

Text Book(s):

T1. Bill Nelson, Amelia Phillips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, Cengage Learning, India Sixth Edition, 2019

T2. Niranjan Reddy, “Practical Cyber Forensics: An Incident-Based Approach to Forensic Investigations”, Publisher: APress, 1st Edition,July 2019.

T3. E. Casey, Handbook of Digital Forensics and Investigation, Academic Press; 2023.

T4. David Cowen, Computer Forensics: A Beginners Guide, McGraw Hill Education; 2020.

T5. Bill Nelson, Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, Fourth Edition; 2022

Reference Book(s):

R1.CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, Version 11, 2021.

R2. Dejey, S. Murugan, “Cyber Forensics”, Oxford University Press, India, 2018

R3.Brian Carrier, File System Forensic Analysis, Pearson, 2019

R4. Marjie T. Britz, Computer Forensics and Cyber Crime, Pearson, 2020

R5. Understanding Cryptography: A Textbook for Students and Practitioners :Christof paar, Jan Pelzl.

R6.Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers

R7.Handbook of Digital and Multimedia Forensic Evidence [Paperback] John J. Barbara

R8.Computer Forensics: Investigating Network Intrusions and Cyber Crime (Ec-Council Press Series:

R9.CyberForensics: Understanding Information Security Investigations (Springer's Forensic

Web References:

1. https://ipindia.gov.in/writereaddata/Portal/ev/sections-index.html

2. https://forensicresources.org/view-resources/websites

3. https://www.nist.gov/itl/ssd/digital-forensics

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS02
CO1							1	1				2		3
CO2	2	1	1	2								2	2	1
CO3	2	2	1	1	2						2	1	3	
CO4							1	2				1		2
CO5		3		2	2		1	1				2	2	1

High-3; Medium-2; Low-1

Course Code: 19SCCN1602	Course Title: NETWORK SECURITY		
Course Category: Professional Core		Course Level : Mastery	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Computer Networks and Attacks

Course Objectives

The course is intended to:

1: Teach the concepts of networking security and access control

2: Discuss various authentication protocols and digital signatures.

3: Illustrate proficiency in various security protocols and standards.

4: Identify various network security attacks and provide countermeasures against security threats.

5: Experiment the IP and Web security essentials.

Unit I FUNDAMENDALS OF NETWORKING SECURITY 9 Hours

Overview of networking security- Security Services -Confidentiality, Authentication, Integrity, Non- repudiation, access Control - Availability and Mechanisms- Security Attacks - Interruption, Interception ,Modification and Fabrication.

Unit II AUTHENTICATION AND SECURITY 9 Hours

Authentication overview - Authentication protocols - Authentication and key establishment - key exchange - mediated key exchange - User Authentication –password based authentication - password security - Certificate Authority and key management - digital signatures - digital Certificates

Unit III PROTOCOL STANDARDS AND INTRUSION DETECTION SYSTEM 9 Hours

Protocols and Standards- Intrusion Detection System-Snort, Signature and Anomaly based detection, Honeypots and Honeynets, Network Log management-syslog or SPLUNK; RBAC: Role mining; DNS-Dig tool: DNSSEC-DS and NSEC records

Unit IV SECURITY ATTACKS **9 Hours**

Buffer overflow attacks & format string vulnerabilities - Denial-of-Service Attacks -Hijacking attacks: exploits and defenses - Internet worms – viruses – spyware –phishing – botnets - TCP session hijacking - ARP attacks - route table modification - UDP hijacking - man-in-the-middle attacks.

Unit V IP SECURITY AND WEB SECURITY **9 Hours**

Network defense tools: Firewalls,VPNs, Intrusion Detection, and filters - Email privacy: Pretty Good Privacy (PGP) and S/MIME - Network security protocols in practice- Introduction to Wireshark – SSL - IPsec, and IKE -DNS security- Secure Socket Layer (SSL) and Transport Layer Security (TLS) - Secure Electronic Transaction (SET)

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the concepts of networking security and access control	Understand
CO2: Summarize various authentication protocols and digital signatures.	Understand
CO3: Develop proficiency in various security protocols and standards.	Apply
CO4: Experiment various network security attacks and provide countermeasures against security threats.	Apply
CO5: Identify the IP and Web security essentials.	Understand

Text Book(s):

T1.William Stallings, Cryptography and Network Security: Principles and Practice, 8th Edition, Pearson edition, 2020.

Reference Book(s):

R1.Behrouz A. Forouzan, Cryptography & Network Security, McGraw-Hill, 3rd Edition 2015.

R2.Bryan Sullivan and Vincent Liu, Web Application Security, A Beginner's Guide, McGraw-Hill Education, 2012.

Web References:

1. https://www.nist.gov/itl/applied-cybersecurity/nice/resources/online-learning-content

2. https://www.ibm.com/topics/network-security

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCN3601		Course Title: Advanced Protocol Engineering and Security Laboratory	
Course Category: Engineering Science		Course Level: Mastery	
L:T:P(Hours/Week) 0: 0: 3	Credits: 1.5	Total Contact Hours: 45	Max Marks:100

Pre-requisites:

- Computer Networks

Course Objectives

The course is intended to:

1: Build different protocol headers.

2: Implement the concept of hashing.

3: Experiment the Concept of Denial-of-Service attacks

4: Build proficiency in encryption and authentication methods for secure communication

List of Experiments **30 Hours**

1.Installing and configuring NS3 (Network Simulator) and analyze its functionalities.

2. Analysis of Network Latency in a Simple Point-to-Point Connection using NS3

3. Compare the performance of AODV and DSR routing protocols using NS3

4. Using Wireshark explore the different protocol headers and analyze network traffic

5. Create a network with static routing Configuration.

6. Create a network with Dynamic Routing Protocol. (any one)

7. Use Snort rules to detect and prevent email-related security threats such as spam and phishing.

8. Create a testbed with both normal and malicious traffic using tools like Snort or Suricata.

9.Analyze the security vulnerabilities of different network protocols.

10.Analyze the performance of different protocols in real time applications (eg. Video Streaming and Online gaming)

11.Explore different IPv6 transition mechanisms and assess their impact on network performance during the transition from IPv4 to IPv6.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Implement the various functionalities using Network Simulator 3	Apply
CO2: Analyze the network traffic and Email traffic using Wireshark tool	Apply
CO3: Create a network with static and Dynamic protocol configuration.	Apply
CO4: Develop proficiency in encryption and authentication methods for secure communication.	Apply

Reference(s):

https://www.geeksforgeeks.org/introduction-to-wireshark/

https://www.javatpoint.com/wireshark

Course Articulation Matrix

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
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

Course Code: 19SCCN3602		Course Title: Network Security Laboratory	
Course Category: Professional Core		Course Level: Mastery	
L:T:P(Hours/Week) 0: 0: 3	Credits: 1.5	Total Contact Periods: 45	Max Marks:100

Pre-requisites:

- Computer Networks

Course Objectives

The course is intended to:

1:Teach the foundations of network security commands

2:Implement role-based access control

3: Develop packet sniffing techniques

4: Implement error correction techniques

List of Experiments **45 Hours**

Firewall Configuration and Testing

1. Implement the basic pfSense Firewall Configuration using pfSense to filter traffic based on source/destination IP, ports, and protocols. Tools: pfSense (installed on a physical machine or virtual machine).

2.Set up NAT in pfSense to allow internal devices with private IPs to communicate with the internet using a public IP.

3.Configure Intrusion Detection/Prevention Systems (IDS/IPS) using pfSense with Snort or Suricata.

4.Use pfSense as a DHCP server to assign IP addresses automatically to clients in the network.

5.Set up VLANs (Virtual LANs) in pfSense to segregate network traffic into different virtual networks.

Penetration Testing

6. Perform a basic password cracking operation on a set of password hashes.

7.Perform a dictionary attack using a custom wordlist to crack password hashes.

8.Simulate DoS and Distributed Denial of Service (DDoS) attacks to study their impact on a network using Tools: LOIC, HOIC, hping3.

9.Identify vulnerabilities in a network using scanning tools using Tools: Nmap, OpenVAS, Nessus.

10.Explore vulnerabilities in wireless networks and configure secure wireless communication.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Implement Firewall concepts using tool like pfSense and build various functions using pfSense tools	Apply
CO2: Demonstrate Firewall configuration using pfSense tool.	Create
CO3: Identify network vulnerabilities using various scanning tools.	Apply
CO4: Implement error correction techniques.	Apply
Reference(s):	
https://www.geeksforgeeks.org/introduction-to-wireshark/	
https://www.javatpoint.com/wireshark	

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Course Code: 19SCPN6601	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. Identify solutions to complex engineering problems.
2. Use the knowledge of Science, engineering & engineering tools to solve complex problems relevant to the discipline.

The objective of Project is to enable the student to take up investigative study in the broad field of Computer Science and Engineering, to solve relevant social/environmental/ethical issues 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. The assignment will normally include:

1. Survey and study of published literature on the assigned topic.

2. Working out a preliminary Approach to the Problem relating to the assigned topic

3. Conducting Analysis, Design, Implementation/Modeling /Simulation.

4. Preparing a Written Report of the Study/Work

5. Final Presentation before a departmental committee.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Design, develop and implement solutions to complex engineering problems using appropriate tools and techniques.	Apply
CO2: Work in teams performing different roles for effective accomplishment of project goals following ethical practices.	Apply
CO3: Demonstrate the use of prior knowledge of science and engineering critical reflection and continuous learning to formulate, analyze and investigate problems systematically.	Apply
CO4: Communicate the process, methods and materials, findings, results and solutions through reports, presentations and other media in appropriate forums.	Apply

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
CO2	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO3	3	3	-	3	-	3	3	-	-	-	-	3	3	3
CO4	-	-	-	-	-	-	-	-	-	3	-	-	-	-

High– 3; Medium– 2; Low– 1

Course Code:19PSHG6601	Course Title: Employability Skills 2: Campus to Corporate		
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. 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	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Understand the emotions and necessity to handle them	Apply
CO2: Build effective resumes to project the positives to be employable	Apply
CO3: Facilitate collaborative work environment and to engage in healthy 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

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

Semester VII			
Course Code: 19SCCN1701	**Course Title: WEB TECHNOLOGY**		
Course Category: Professional Core		**Course Level : Introductory**	
L: T: P(Hours/Week) **3: 0: 0**	**Credits:3**	**Total Contact Hours:45**	**Max. Marks:100**

Pre-requisites

- ITPL

Course Objectives

The course is intended to:

1: Construct a basic website using HTML and Cascading Style Sheets

2: Develop dynamic web page using Java Script objects

3: Develop server-side programs using Servlets and JSP

4: Construct simple web pages in PHP and to represent data in XML format.

5: Develop interactive web applications.

Unit I WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0 9 Hours

Web Essentials: Clients, Servers and Communication – The Internet – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations. Bootstrap Framework

Unit II CLIENT-SIDE PROGRAMMING 9 Hours

Java Script: An introduction to JavaScript–JavaScript DOM Model-Exception Handling-Validation- Built-in objects - Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files.

Unit III SERVER-SIDE PROGRAMMING 9 Hours

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- DATABASE CONNECTIVITY: JDBC.

Unit IV PHP and XML **9 Hours**

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation. XML: Basic XML- Document Type Definition- XML Schema, XML Parsers and Validation, XSL.

Unit V INTRODUCTION TO ANGULAR and WEB APPLICATIONS FRAMEWORKS Directives **9 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.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Construct a basic website using HTML and Cascading Style Sheets	Apply
CO2: Develop dynamic web page using Java Script objects	Apply
CO3: Develop server-side programs using Servlets and JSP	Apply
CO4: Construct simple web pages in PHP and to represent data in XML format.	Apply
CO5: Develop interactive web applications.	Apply

Text Book(s):

T1. Deitel and Deitel and Nieto, Internet and World Wide Web - How to Program, Prentice Hall, 5th Edition, 2011

T2. Jeffrey C and Jackson, Web Technologies A Computer Science Perspective, Pearson Education, 2011

T3. Angular 6 for Enterprise-Ready Web Applications, Doguhan Uluca, 1st edition, Packt Publishing

Reference Book(s):

R1. Stephen Wynkoop and John Burke “Running a Perfect Website”, QUE, 2nd Edition,1999

R2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009

R3. Gopalan N.P. and Akilandeswari J., “Web Technology”, Prentice Hall of India, 2011

R4. UttamK.Roy, “Web Technologies”, Oxford University Press, 2011.

R5. Angular: Up and Running: Learning Angular, Step by Step, Shyam Seshadri, 1st edition, O′Reilly

Web References:

1. https://www.geeksforgeeks.org/server-side-client-side-programming/

2. https://www.javatpoint.com/server-side-scripting-vs-client-side-scripting

3. https://www.w3schools.com/php/php_intro.asp

4. https://www.geeksforgeeks.org/introduction-to-angularjs/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO 2
CO1	3	3	3	3	-				1	2	3	3	2	1
CO2	2	1	3	2	2				1	2	2	3	3	1
CO3	3	1	3	3	1				1	2	1	1	1	3
CO4	3	2	3	2	1				1	2	2	3	2	2
CO5	2	3	3	2	2				1	3	3	2	3	1

High-3; Medium-2; Low-1

Course Code: 19SCCN1702	Course Title : CLOUD COMPUTING AND SECURITY		
Course Category: Professional Core		Course Level : Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Discuss the concepts and architecture of cloud computing.

2: Implement security measures for cloud-based systems and applications.

3: Examine data security and privacy considerations in the cloud.

4: Describe advanced technologies in cloud security.

5: Analyse legal, ethical, and regulatory aspects of cloud security.

Unit I Introduction 9 Hours

Overview of Cloud Computing-Evolution of Cloud Technologies-Cloud Service Models (IaaS, PaaS, Saa-Cloud Deployment Models (Public, Private, Hybrid)-Virtualization in Cloud Computing-Cloud Computing Architecture-Service-Oriented Architecture (SOA)

Unit II Cloud Security Fundamentals 9 Hours

Principles of Cloud Security-Identity and Access Management in the Cloud-Data Encryption and Key Management-Network Security in Cloud Environments-Security Compliance and Governance-Incident Response and Cloud Security-Security Best Practices for Cloud Deployment

Unit III Securing Cloud Applications 9 Hours

Web Application Security -API Security and Management-Container Security (e.g., Docker, Kubernetes)-Serverless Security-Securing Cloud Databases-Microservices SecuritySecuring Serverless Architectures-Security Automation and Orchestration

Unit IV Cloud Data Security and Privacy 9 Hours

Data Loss Prevention- Backup and Recovery Strategies- Privacy Concerns in Cloud Computing- Big Data Security- Data Governance in the Cloud- Security Monitoring and Auditing

Unit V Advancements in cloud computing 9 Hours

Cloud Security Measures -Zero Trust Security - DevSecOps and Continuous Security - Securing IoT in cloud- Security Auditing and Monitoring

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Discuss the concepts and architecture of cloud computing.	Understand
CO2: Implement security measures for cloud-based systems and applications.	Apply
CO3: Examine data security and privacy considerations in the cloud.	Apply
CO4: Describe advanced technologies in cloud security.	Understand
CO5: Analyze legal, ethical, and regulatory aspects of cloud security.	Apply

Text Book(s):

T1. " Cloud Computing: Concepts, Technology & Architecture", Thomas Erl, Ricardo Puttini, Prentice Hall, 2013

T2. " Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance " by Tim Mather, Subra Kumaraswamy, O'Reilly Media, 2009

T1. John R. Vacca, "Cloud Computing Security: Foundations and Challenges" CRC Press,2020.

Reference Book(s):

R1."CCSP (ISC)2 Certified Cloud Security Professional Official Study Guide "by O'Hara, Ben Malisow, Sybex,2017

R2.Cloud Security: A Comprehensive Guide to Secure Cloud Computing"", Ronald L. Krutz and Russell Dean Vines, Wiley ,2010

Web References:

1. https://cloudsecurityalliance.org/
2. https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication500-292.pdf

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCN3701	Course Title: Web Application Security lab		
Course Category: Professional Core		Course Level : Introductory	
L: T: P(Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Implement secure coding practices and assess vulnerabilities

2: Implement secure session management techniques and evaluate code for security improvements.

3: Implement measures to prevent SQL injection attacks

4: Develop incident response skills

LIST OF EXPERIMENTS

1. Identify and analyze vulnerabilities in a web application.

2. Implement secure coding practices in web development.

3. Configure and test a Web Application Firewall.

4. Implement measures to prevent XSS attacks.

5. Implement measures to prevent SQL injection attacks.

6. Configure security headers for enhanced web security.

7. Develop incident response skills for web application security incidents.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Implement secure coding practices and assess vulnerabilities	Apply
CO2: Implement secure session management techniques and evaluate code for security improvements.	Apply

CO3: Implement measures to prevent SQL injection attacks	Apply
CO4: Develop incident response skills	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCN3702	Course Title: Cloud computing and security lab		
Course Category: Professional Core		Course Level : Introductory	
L: T: P(Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Install and configure popular virtualization platforms

2: Configuring different operating systems within virtual machines.

3: Developing web applications using Google App Engine.

4: Implement cloud security measures

LIST OF EXPERIMENTS

1. Install Virtual box / VMware Workstation with different flavours of Linux or windows OS on top of windows7 or 8.

2.Install a C compiler in the virtual machine created using virtual box and execute Simple Programs

3. Install Google App Engine. Create hello world app and other simple web applications using python / java.

4.Find a procedure to transfer the files from one virtual machine to another virtual machine

5.Find a procedure to launch virtual machine using trystack (Online Openstack DemoVersion)

6. Implement IAM policies to control access to cloud resources.

7. Set up and configure WAF to protect web applications.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Install and configure popular virtualization platforms	Apply
CO2: Configuring different operating systems within virtual machines.	Apply

CO3: Developing web applications using Google App Engine.	Create
CO4: Implement cloud security measures	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Semester VIII			
Course Code: 19SHVG6001		**Course Title: Entrepreneurship Development**	
Course Category:		**Course Level:** Basic	
L:T:P 1:0:0 (Hours/Week)	**Credits: 1**	**Total Contact Hours: 15**	**Max Marks:100**

Course Objectives:

The course is intended to equip students with the entrepreneurial mindset, understand market, apply the process of problem solving, and Entrepreneurship ecosystem.

Entrepreneurship **15 Hours**

Entrepreneur- Types of Entrepreneurship-Problem identification-Opportunity Discovery-Explore Market, customer persona-customer segmentation, TAM,SOM,SAM- creating compelling value proposition- competitor analysis. Prototyping- Types -Business model canvass-Idea pitching. Entrepreneurial eco system- Startups-Angel Investors, Venture Capitalist, Makers Space, Incubators, Accelerators-Financial models- Equity, Debt, Crowd funding.

Course Outcomes	**Cognitive Level**
At the end of the course, students will able to	
CO1: Pitch an Idea for a problem with understanding entrepreneurial ecosystem.	Apply

Text Book(s):

1. Robert D.Hisrich, Micheal P. Peters, Dean A. Shepherd, Sabayasachi (2020), Entrepreneurship,McGrawHill, 11th Edition.
2. Donald F Kuratko,Entrepreneurship: Theory, Process, Practice with MindTap, 11th Edition.

Web References:

1. https://wadhwanifoundation.org/our-programs/ignite/
2. https://academy.forge-iv.co/#academia

Assessment Plan:

Internal Component:

Idea Pitching Presentation- 75 Marks

End Semester Assessment: 1.

25 Multiple Choice Questions- 25 Marks

Course code : 19SCPN6801		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. Identify solutions to complex interdisciplinary engineering problems.
2. Use the knowledge of Science, engineering & engineering tools to solve complex interdisciplinary problems relevant to the discipline.

The objective of Project is to enable the student to take up investigative study in the broad field of Computer Science and Engineering, to solve relevant social/environmental/ethical issues 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. The assignment will normally include:

1. Survey and study of published literature on the assigned topic.
2. Working out a preliminary Approach to the Problem relating to the assigned topic
3. Conducting Analysis, Design, Implementation/Modeling /Simulation.
4. Preparing a Written Report of the Study/Work.
5. Publication of work/findings in standard Journal/Conference.
5. Final Presentation before an expert committee.

Course Outcomes	Cognitive Level
At the end of this course, students will able to:	
CO1: Design, develop and implement solutions to complex interdisciplinary engineering problems that are socially relevant, economically viable and environment friendly using appropriate tools and techniques.	Apply
CO2: Work in teams performing different roles for effective accomplishment of project goals following ethical practices.	Apply
CO3: Demonstrate the use of prior knowledge of science and engineering critical reflection and continuous learning to formulate, analyze and investigate problems systematically.	Apply
CO4: Communicate the process, methods and materials, findings, results and solutions through reports, presentations and other media in appropriate forums.	Apply

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
CO2	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO3	3	3	-	3	-	3	3	-	-	-	-	3	3	3
CO4	-	-	-	-	-	-	-	-	-	3	-	-	-	-

High– 3; Medium– 2; Low– 1

Vertical I Full stack Development Electives			
Course Code: 19SCEN1001	**Course Title: APP DEVELOPMENT**		
Course Category: Professional Elective		**Course Level : Introductory**	
L: T: P(Hours/Week) **3: 0: 0**	**Credits:3**	**Total Contact Periods:45**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Teach Native applications with GUI Components
2. Explain hybrid applications with basic event handling.
3. Implement cross-platform applications with location and data storage capabilities
4. Build cross platform applications with basic GUI and event handling.
5. Develop web applications with cloud database access

Unit I FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT 9 Hours

Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App, What is Progressive Web App, Responsive Web design

Unit II NATIVE APP DEVELOPMENT USING JAVA 9 Hours

Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Dev elopment Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props.

Unit III HYBRID APP DEVELOPMENT 9 Hours

Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova,

Unit IV CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE 9 Hours

What is Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Cross- platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props

Unit V NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS 9 Hours

Comparison of different App frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1. Construct Native applications with GUI Components	Apply
CO2. Develop hybrid applications with basic event handling.	Apply
CO3. Experiment cross-platform applications with location and data storage capabilities	Apply
CO4. Build cross platform applications with basic GUI and event handling.	Apply
CO5. Develop web applications with cloud database access	Apply

Text Book(s):

T1. Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition

T2. Apache Cordova in Action, Raymond K. Camden, Manning, 2015.

T3. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing

Reference Book(s):

R1. Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition

R2. Native Mobile Development by Shaun Lewis, Mike Dunn

R3. Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras

R4. Apache Cordova 4 Programming, John M Wargo, 2015UttamK.Roy, "Web Technologies", Oxford University Press, 2011.

R5. 5. React Native Cookbook, Daniel Ward, Packt Publishing, 2nd Edition

Web References:

1. https://www.startechup.com/blog/app-development-with-java/

2. https://www.geeksforgeeks.org/learn-java-for-android-app-development-a-complete-guide/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1002	Course Title: Principles Of Management		
Course Category: Professional Elective		Course Level : Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Teach the Evolution of Management
2. Explain the functions and principles of management
3. Summarize the application of the principles in an organization.
4. Outline the various HR related activities
5. Explain the position of self and company goals towards business.

Unit I Introduction To Management And Organizations 9 Hours

Definition of Management – Science or Art – Manager Vs Entrepreneur- types of managers- managerial roles and skills – Evolution of Management –Scientific, human relations, system and contingency approaches– Types of Business organization- Sole proprietorship, partnership, company-public and private sector enterprises-- Organization culture and Environment – Current trends and issues in Management.

Unit II Planning 9 Hours

Nature and purpose of planning – Planning process – Types of planning – Objectives – Setting objectives – Policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

Unit III Organizing 9 Hours

Nature and purpose – Formal and informal organization – Organization chart – Organization structure – Types – Line and staff authority – Departmentalization – delegation of authority – Centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management

Unit IV Directing **9 Hours**

Foundations of individual and group behaviour– Motivation – Motivation theories – Motivational techniques – Job satisfaction – Job enrichment – Leadership – types and theories of leadership – Communication – Process of communication – Barrier in communication – Effective communication – Communication and IT.

Unit V Controlling **9 Hours**

System and process of controlling – Budgetary and non - Budgetary control techniques – Use of computers and IT in Management control – Productivity problems and management – Control and performance – Direct and preventive control – Reporting.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1. Explain the Evolution of Management	Understand
CO2. Illustrate the functions and principles of management	Understand
CO3. Interpret the application of the principles in an organization.	Understand
CO4. Classify the various HR related activities	Understand
CO5. Summarize the position of self and company goals towards business.	Analyze

Text Book(s):

T1. Harold Koontz and Heinz Weihrich “Essentials of management” Tata McGraw Hill,1998

T2. Stephen P. Robbins and Mary Coulter, “ Management”, Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.

Reference Book(s):

R1. Robert Kreitner and Mamata Mohapatra, “ Management”, Biztantra, 2008.

R2. Stephen A. Robbins and David A. Decenzo and Mary Coulter, “Fundamentals of Management” Pearson Education, 7th Edition, 2011.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_mg104/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1003	Course Title: UI AND UX DESIGN		
Course Category: Professional Elective		Course Level: Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. To provide a sound knowledge in UI & UX

2. To understand the need for UI and UX

3. To understand the various Research Methods used in Design

4. To explore the various Tools used in UI & UX

5. Creating a wireframe and prototype

Unit I FOUNDATIONS OF DESIGN 9 Hours

UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy

Unit II FOUNDATIONS OF UI DESIGN 9 Hours

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides

Unit III FOUNDATIONS OF UX DESIGN 9 Hours

Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals

Unit IV WIREFRAMING, PROTOTYPING AND TESTING 9 Hours

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration

Unit V **RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE** **9 Hours**

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Build UI for user Applications	Understand
CO2: Evaluate UX design of any product or application	Apply
CO3: Demonstrate UX Skills in product development	Apply
CO4: Implement Sketching principles	Apply
CO5: Create Wireframe and Prototype	Apply

Text Book(s):

T1. Joel Marsh, “UX for Beginners”, O’Reilly, 2022

T2. Jon Yablonski, “Laws of UX using Psychology to Design Better Product & Services”

O’Reilly 2021

Reference Book(s):

R1. 1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” 3rd Edition, O’Reilly 2020

R2. 2. Steve Schoger, Adam Wathan “Refactoring UI”, 2018

R3. 3. Steve Krug, “Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile”, Third Edition, 2015

Web References:

1. https://www.nngroup.com/articles/

2. https://www.interaction-design.org/literature.

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1004	Course Title: WEB APPLICATION SECURITY		
Course Category: Professional Elective		Course Level : Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Teach the fundamentals of web application security

2: Illustrate the Development and deployment of web applications

3: Build secure APIs

4: Develop the basics of vulnerability assessment and penetration testing

5: Identify Hacking techniques and Tools

Unit I FUNDAMENTALS OF WEB APPLICATION SECURITY 9 Hours

The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation

Unit II SECURE DEVELOPMENT AND DEPLOYMENT 9 Hours

Web Applications Security - Security Testing, Security Incident Response Planning, The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM)

Unit III SECURE API DEVELOPMENT 9 Hours

API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.

Unit IV VULNERABILITY ASSESSMENT AND PENETRATION TESTING 9 Hours

Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database-

based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing

Unit V HACKING TECHNIQUES AND TOOLS 9 Hours

Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite, etc.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Outline the fundamentals of web application security	Understand
CO2: Experiment the Development and deployment of web applications	Apply
CO3: Build secure APIs	Apply
CO4: Develop the basics of vulnerability assessment and penetration testing	Apply
CO5: Identify Hacking techniques and Tools	Apply

Text Book(s):

T1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, First Edition, 2020, O'Reilly Media, Inc

T2. Bryan Sullivan, Vincent Liu, Web Application Security: A Beginners Guide, 2012, The McGraw- Hill Companies

T3. Neil Madden, API Security in Action, 2020, Manning Publications Co., NY, USA.

Reference Book(s):

R1. Michael Cross, Developer's Guide to Web Application Security, 2007, Syngress Publishing, Inc.

R2. Ravi Das and Greg Johnson, Testing and Securing Web Applications, 2021, Taylor & Francis Group, LLC.

R3. Prabath Siriwardena, Advanced API Security, 2020, Apress Media LLC, USA.

R4. Malcom McDonald, Web Security for Developers, 2020, No Starch Press, Inc.

R5. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Grey Hat Hacking: The Ethical Hacker's Handbook, Third Edition, 2011, The McGraw-Hill Companies.

Web References:

1. https://www.udemy.com/course/ethical-hacking-pentesting-tools/
2. https://www.geeksforgeeks.org/5-common-hacking-techniques-used-by-hackers/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1005	Course Title: PRINCIPLES OF PROGRAMMING LANGUAGES		
Course Category: Professional 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 :

1. Teach the syntax and semantics of programming languages
2. Explain the concept of data, data types, and basic statements
3. Discuss call-return architecture and ways of implementing them
4. Experiment object-orientation, concurrency, and event handling in programming languages
5. Develop programs in non-procedural programming paradigms

Unit I SYNTAX AND SEMANTICS 9 Hours

Evolution of programming languages – describing syntax – context-free grammars – attribute grammars – describing semantics – lexical analysis – parsing – recursive-descent – bottom up parsing

Unit II DATA, DATA TYPES, AND BASIC STATEMENTS 9 Hours

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

Unit III SUBPROGRAMS AND IMPLEMENTATIONS 9 Hours

Subprograms – design issues – local referencing – parameter passing – overloaded methods – generic methods – design issues for functions – semantics of call and return – implementing simple subprograms – stack and dynamic local variables – nested subprograms – blocks – dynamic scoping

Unit IV OBJECT-ORIENTATION, CONCURRENCY, AND EVENT HANDLING 9 Hours

Object-orientation – design issues for OOP languages – implementation of object-oriented

constructs – concurrency – semaphores – monitors – message passing – threads – statement level concurrency – exception handling – event handling

Unit V FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES 9 Hours

Introduction to lambda calculus – fundamentals of functional programming languages – Programming with Scheme – Programming with ML – Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1. Explain the syntax and semantics of programming languages	Understand
CO2. Summarize the concept of data, data types, and basic statements	Understand
CO3. Experiment call-return architecture and ways of implementing them	Understand
CO4. Construct object-orientation, concurrency, and event handling.	Apply
CO5. Build programs in non-procedural programming paradigms	Understand

Text Book(s):

T1. Robert W. Sebesta, “Concepts of Programming Languages”, Twelfth Edition (Global Edition), Pearson, 2022

T2. Michael L. Scott, “Programming Language Pragmatics”, Fourth Edition, Elsevier, 2018

T3. R. Kent Dybvig, “The Scheme programming language”, Fourth Edition, Prentice Hall, 2011

T4. W. F. Clocksin and C. S. Mellish, “Programming in Prolog: Using the ISO Standard”, Fifth Edition, Springer, 2003

Reference Book(s):

Web References:

1. https://www.geeksforgeeks.org/principles-of-programming-languages-gq/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1006	Course Title: DEVOPS		
Course Category: Professional 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 :

1. Teach the basics of DevOps terminologies.
2. Explain the different Version control tools like Git, Mercurial
3. Implement the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment)
4. Develop Configuration management using Ansible
5. Build cloud-based Devops tools to solve real world problems

Unit I INTRODUCTION TO DEVOPS 9 Hours

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

Unit II COMPILE AND BUILD USING MAVEN & GRADLE 9 Hours

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle

Unit III CONTINUOUS INTEGRATION USING JENKINS 9 Hours

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

Unit IV CONFIGURATION MANAGEMENT USING ANSIBLE 9 Hours

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible

Unit V **BUILDING DEVOPS PIPELINES USING AZURE** **9 Hours**

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1. Understand the basics of DevOps terminologies.	Understand
CO2. Explain the different Version control tools like Git, Mercurial	Apply
CO3. Build the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment)	Apply
CO4. Experiment Configuration management using Ansible	Apply
CO5. Construct cloud-based Devops tools to solve real world problems	Apply

Text Book(s):

T1. 1. Roberto Vormittag, “A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises”, Second Edition, Kindle Edition, 2016.

T2. Jason Cannon, “Linux for Beginners: An Introduction to the Linux Operating System and Command Line”, Kindle Edition, 2014

Reference Book(s):

R1. Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.
R2. Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing.

R3. Paul C. Jorgensen, Software Testing: A Craftsman’s Approach, Fourth Edition, 2014, Taylor & Francis Group.
R4. Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing.
R5. Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.
R6. Satya Avasarala, Selenium WebDriver Practical Guide, 2014, Packt Publishing.

R7. Varun Menon, TestNg Beginner's Guide, 2013, Packt Publishing

Web References:

1. https://azuredevopslabs.com/labs/vstsextend/azuredevopsprojectdotnet/

2. https://www.javatpoint.com/azure-devops-pipeline

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1007	Course Title: COMPILER DESIGN		
Course Category: Professional Elective		Course Level : Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Teach concepts of language translation and phases of compiler design
2. Explain the common forms of parsers.
3. Construct intermediate code generation
4. Implement run-time environment and code generation
5. Apply various optimization techniques for designing compilers

Unit I INTRODUCTION TO COMPILERS 9 Hours

Structure of a compiler — Lexical Analysis — Role of Lexical Analyzer — Input Buffering — Specification of Tokens — Recognition of Tokens — Lex — Finite Automata — Regular Expressions to Automata — Minimizing DFA.

Unit II SYNTAX ANALYSIS 9 Hours

Role of Parser — Grammars — Error Handling — Context-free grammars — Writing a grammar — Top Down Parsing — General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item Construction of SLR Parsing Table -Introduction to LALR Parser — Error Handling and Recovery in Syntax Analyzer-YACC.

Unit III INTERMEDIATE CODE GENERATION 9 Hours

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

Unit IV RUN-TIME ENVIRONMENT AND CODE GENERATION 9 Hours

Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management — Issues in Code Generation — Design of a simple Code Generator.

Unit V CODE OPTIMIZATION 9 Hours

Principal Sources of Optimization — Peep-hole optimization — DAG- Optimization of Basic Blocks-Global Data Flow Analysis — Efficient Data Flow Algorithm.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1. Explain the concepts of language translation and phases of compiler design	Understand
CO2. Summarize the common forms of parsers.	Understand
CO3. Build intermediate code generation	Analyze
CO4. Experiment run-time environment and code generation	Apply
CO5. Create various optimization techniques for designing compilers	Apply

Text Book(s):

T1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, “Compilers: Principles,

Reference Book(s):

R1. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.

R2. Steven S. Muchnick, Advanced Compiler Design and Implementation‖, Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 2003.

R3. Keith D Cooper and Linda Torczon, Engineering a Compiler‖, Morgan Kaufmann publishers Elsevier Science, 2004.

R4. V. Raghavan, Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.

Web References:
https://www.geeksforgeeks.org/phases-of-a-compiler/
https://www.javatpoint.com/compiler-phases

Course Articulation Matrix

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

High-3; Medium-2; Low-1

VERTICAL II MACHINE LEARNING			
Course Code: 19SCEN1008	**Course Title: DIGITAL IMAGE PROCESSING**		
Course Category: Professional 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 fundamentals of digital image.

2: Discuss image enhancement techniques in Spatial and Frequency domain.

3: Demonstrate the concepts of degradation function and restoration techniques.

4: Develop the image segmentation and representation techniques.

5: Experiment various image compression and recognition methods

Unit I DIGITAL IMAGE FUNDAMENTALS 9 Hours

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.

Unit II IMAGE ENHANCEMENT 9 Hours

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement

Unit III IMAGE RESTORATION 9 Hours

Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

Unit IV IMAGE SEGMENTATION 9 Hours

Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing-erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

Unit V IMAGE COMPRESSION AND RECOGNITION 9 Hours

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the fundamentals of digital image.	Understand
CO2: Illustrate image enhancement techniques in Spatial and Frequency domain.	Understand
CO3: Develop the concepts of degradation function and restoration techniques.	Apply
CO4: Develop the image segmentation and representation techniques.	Apply
CO5: Build various image compression and recognition methods	Apply

Text Book(s):

T1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing Pearson, Third Edition, 201

T2. Anil K. Jain, Fundamentals of Digital Image Processing Pearson, 2002Heidelberg; 2020

Reference Book(s):

R1. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.

R2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,Digital Image Processing using MATLAB Pearson Education, Inc., 2011..

Web References:

1.https://www.open.edu/openlearn/science-maths-technology/design-innovation/design-thinking/content-section-6

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1009	Course Title: MACHINE LEARNING TECHNIQUES FOR CYBER SECURITY		
Course Category: Professional Elective		Course Level: Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Understand the concepts of machine learning in security domain

2: Explain various Machine Learning Problems and approaches.

3: Choose appropriate classification Techniques

4: Experiment various Anomaly detection techniques**.**

5: Explain the concepts of Malware analysis using AI.

Unit I INTRODUCTION TO MACHINE LEARNING 9 Hours

Introduction to Machine learning and Cyber Security-Cyber threat landscape-The cyber attacker's economy –AI and machine learning-Real world uses of machine learning in cyber security.

Unit II MACHINE LEARNING PROBLEMS AND APPROACHES 9 Hours

Classifying and clustering- Machine Learning-Problems and approaches-Examples of machine learning models-Training algorithms to learn-Model families-Loss Functions-Optimization.

Unit III CLASSIFICATION TECHNIQUES 9 Hours

Supervised classification algorithms: Logistic regression -Decision Trees-Support vector machines-Naïve Bayes- k-Nearest neighbors -Neural Networks - Practical considerations in classification-Selecting a model family-Training data construction – Feature Selection-Overfitting and underfitting - clustering-Different clustering algorithms-Evaluating clustering result.

Unit IV ANOMALY DETECTION 9 Hours

Anomaly detection-Anomaly detection with data and algorithms-Challenges of using machine learning in anomaly detection-Practical system design concerns.

Unit V MALWARE ANALYSIS 9 Hours

Malware analysis - Understanding malware - Machine learning in malware classification- Implementation code - Network traffic analysis -Theory of network defense - Machine learning and network security - Building a predictive model to classify network attacks-Adversarial machine learning - Example models.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the concepts of machine learning in security domain	Understand
CO2: Illustrate various Machine Learning Problems and approaches.	Understand
CO3: Develop appropriate classification Techniques	Apply
CO4: Experiment various Anomaly detection techniques**.**	Apply
CO5: Construct the concepts of Malware analysis using AI.	Apply

Text Book(s):

T1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing Pearson, Third Edition, 2010.

T2. Anil K. Jain, Fundamentals of Digital Image Processing Pearson, 2002Heidelberg; 2020

Reference Book(s):

R1. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.

R2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,Digital Image Processing using MATLAB Pearson Education, Inc., 2011.

Web Reference:

1. https://www.tanium.com/blog/machine-learning-in-cybersecurity/?utm_source=chatgpt.com

2. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9277523

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1010	Course Title: DEEP LEARNING AND AI		
Course Category: Professional 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 basic AI Algorithms.

2: Demonstrate appropriate search algorithms to solve AI based problems.

3: Develop solutions using Prolog Programming and Ontological Engineering

4: Implement Various Agent systems.

5: Demonstrate various applications of AI

Unit I INTRODUCTION 9 Hours

Introduction–Definition – Foundation and History of AI - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Agents and Environments – Nature of Environments - Structure of Agents - Typical Intelligent Agents.

Unit II PROBLEM SOLVING METHODS 9 Hours

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing – Optimal Decisions in Games – Alpha - Beta Pruning.

Unit III KNOWLEDGE REPRESENTATION 9 Hours

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining- Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering- Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for categories – Reasoning with Default Information.

Unit IV SOFTWARE AGENTS IDENTITY – BASED KEY AGREEMENT 9 Hours

Architecture for Intelligent Agents – Examples - Agent communication – Speech Acts - KQML-KIF - FIPA ACL - Argumentation among Agents – Trust and Reputation in Multi- agent systems.

Unit V APPLICATIONS 9 Hours

AI applications – Language Models – Information Retrieval – Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware - Perception – Planning – Moving.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the basics of AI Algorithms.	Understand
CO2: Describe appropriate search algorithms to solve AI based problems.	Understand
CO3: Develop solutions using Prolog Programming and Ontological Engineering	Apply
CO4: Construct Various Agent systems.	Apply
CO5: implement various applications of AI	Apply

Text Book(s):

T1. Russell S and Norvig P, "Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.Cyber Forensics: from Data to Digital Evidence, Albert J. Marcella

T2. Gerhard Weiss, - Multi Agent Systems, Second Edition, MIT Press, 2013., Heidelberg; 2020

Reference Book(s):

R1. Tim Jones M - Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008

R2.Bratko I - Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

Web References:

1.https://www.open.edu/openlearn/science-maths-technology/design-innovation/design-thinking/content-section-6

Course Articulation Matrix

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

High-3; Medium-2; Low

Course Code: 19SCEN1011	Course Title: OPTIMIZATION TECHNIQUES		
Course Category: Professional Elective		Course Level: Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periodss:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Understand the different phases of compiler.

2: Explain different parsing algorithms.

3: Construct Syntax-directed translation and formulate the Intermediate Code.

4: Implement the Intermediate Code into basic blocks

5: Apply various optimization techniques for dataflow analysis

Unit I INTRODUCTION TO COMPILERS AND LEXICAL ANALYSIS 9 Hours

Translators - Compilation and Interpretation - Language processors - Compiler Construction Tools - Structure of a compiler - Lexical Analysis - Role of Lexical Analyzer - Specification of Tokens - Recognition of Tokens - Lex - Design of Lexical Analyzer for a sample Language- Finite Automata - Regular Expressions to Automata - Minimizing DFA

Unit II SYNTAX ANALYSIS 9 Hours

Need and Role of Parser - Context Free Grammars - Top-Down Parsing - Recursive Descent Parser - Predictive Parser- LL(1) Parser-Shift Reduce Parser-LR Parser - LR(0) Items - Construction of SLR Parsing Table - LALR Parser - Error Handling and Recovery in Syntax Analyzer – YACC.

Unit III INTERMEDIATE CODE GENERATION 9 Hours

Syntax Directed Definitions - Evaluation Orders for Syntax Directed Definitions - Intermediate

Languages: Syntax Tree, Three Address Code - Types and Declarations, Translation of Expressions - Type Checking

Unit IV RUN-TIME ENVIRONMENT AND CODE GENERATION 9 Hours

Storage Organization - Stack Allocation Space - Access to Non-local Data on the Stack- Heap

Management – Basic blocks and flow graphs-Issues in Code Generation - Design of a Simple Code Generator

Unit V CODE OPTIMIZATION **9 Hours**

Principal Sources of Optimization - Peep-hole Optimization - DAG - Optimization of Basic Blocks - Global Data Flow Analysis - Efficient Data Flow Algorithm

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1 Explain the different phases of compiler.	Understand
CO2: Described different parsing algorithms.	Understand
CO3: Build Syntax-directed translation and formulate the Intermediate Code.	Apply
CO4: Implement the Intermediate Code into basic blocks	Apply
CO5: Apply various optimization techniques for dataflow analysis	Apply

Text Book(s):

T1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles,

Techniques and Tools, Second Edition, Pearson Education, 2009.

Reference Book(s):

R1. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures:

R2. Steven S. Muchnick, Advanced Compiler Design and Implementation‖, Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 2003.

Web References:

1. https://www.open.edu/openlearn/science-maths-technology/design-innovation/design-thinking/content-section-6

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1012	Course Title: ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS		
Course Category: Professional 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:

CO1: Understand basics of Machine learning.

CO2: Describe various deep learning models

CO3: Construct various dimensionality reduction techniques

CO4. Implement optimization and generalization

CO5: Demonstrate the deep learning applications

Unit I INTRODUCTION 9 Hours

Introduction to machine learning - Linear models (SVMs and Perceptron, logistic regression)- Intro to Neural Nets: What a shallow network computes - Training a network: loss functions, back propagation and stochastic gradient descent - Neural networks as universal function approximates

Unit II DEEP NETWORKS 9 Hours

History of Deep Learning - A Probabilistic Theory of Deep Learning - Back propagation and regularization, batch normalization - VC Dimension and Neural Nets - Deep Vs Shallow Networks Convolutional Networks - Generative Adversarial Networks (GAN), Semi-supervised Learning

Unit III DIMENTIONALITY REDUCTION 9 Hours

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization.

Unit IV OPTIMIZATION AND GENERALIZATION 9 Hours

Optimization in deep learning – non-convex optimization for deep networks - Stochastic Optimization Generalization in neural networks - Spatial Transformer Networks - Recurrent

networks, LSTM - Recurrent Neural Network Language Models - Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

Unit V CASE STUDY AND APPLICATIONS **9 Hours**

Imagenet - Detection - Audio WaveNet - Natural Language Processing Word2Vec - Joint Detection Bioinformatics - Face Recognition - Scene Understanding - Gathering Image Captions.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe basics of Machine learning.	Understand
CO2: Explain various deep learning models	Understand
CO3: Build various dimensionality reduction techniques	Apply
CO4. Implement optimization and generalization	Apply
CO5: Develop various deep learning applications	Apply

Text Book(s):

T1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing Pearson, Third Edition, 2010.

T2. Anil K. Jain, Fundamentals of Digital Image Processing Pearson, 2002.Heidelberg; 2020

Reference Book(s):

R1. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.

R2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,Digital Image Processing using MATLAB Pearson Education, Inc., 2011.

Web References:

https://www.open.edu/openlearn/science-maths-technology/design-innovation/design-thinking/content-section-6

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1013	Course Title: NATURAL LANGUAGE PROCESSING		
Course Category: Professional 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: Teach basics of linguistics, probability and statistics associated with NLP

2: Demonstrate statistical NLP and sequence labelling.

3: Experiment the concept of contextual embedding.

4: Apply computational semantics for NLP

5: Develop Chabot's and Dialogue systems

Unit I INTRODUCTION 9 Hours

Natural Language Processing – Components - Basics of Linguistics and Probability and Statistics – Words –Tokenization - Morphology - Finite State Automata

Unit II STATISTICAL NLP AND SEQUENCE LABELING 9 Hours

N-grams and Language models –Smoothing -Text classification- Naïve Bayes classifier – Evaluation - Vector Semantics – TF-IDF - Word2Vec- Evaluating Vector Models -Sequence Labeling – Part of Speech – Part of Speech Tagging -Named Entities –Named Entity Tagging

Unit III CONTEXTUAL EMBEDDING 9 Hours

Constituency –Context Free Grammar –Lexicalized Grammars - CKY Parsing – Earley's algorithm- Evaluating Parsers - Partial Parsing – Dependency Relations- Dependency Parsing - Transition Based - Graph Based

Unit IV COMPUTATIONAL SEMANTICS 9 Hours

Word Senses and WordNet – Word Sense Disambiguation – Semantic Role Labeling – Proposition Bank – FrameNet - Selectional Restrictions - Information Extraction

Unit V DISCOURSE ANALYSIS AND SPEECH PROCESSING 9 Hours

Discourse Coherence – Discourse Structure Parsing – Centering and Entity Based Coherence – Question Answering –Factoid Question Answering – Classical QA Models – Chatbots and Dialogue systems – Frame-based Dialogue Systems – Dialogue – State Architecture

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain basics of linguistics, probability and statistics associated with NLP	Understand
CO2: Illustrate statistical NLP and sequence labelling.	Understand
CO3: Build the concept of contextual embedding.	Apply
CO4: Construct computational semantics for NLP	Apply
CO5: Build Chabot's and Dialogue systems	Apply

Text Book(s):

T1. Jacob Eisenstein. "Natural Language Processing ", MIT Press, 2019

T2: Samuel Burns "Natural Language Processing: A Quick Introduction to NLP with Python and NLTK, 2019

Reference Book(s):

R1. Christopher Manning, "Foundations of Statistical Natural Language Processing", MIT Press, 2009

R2. Nitin Indurkhya,Fred J. Damerau, "Handbook of Natural Language Processing", Second edition, Chapman & Hall/CRC: Machine Learning & Pattern Recognition, Hardcover,2010

Web References:

1. https://azuredevopslabs.com/labs/vstsextend/azuredevopsprojectdotnet/

2. https://www.javatpoint.com/azure-devops-pipeline

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1014	Course Title: EXPERT SYSTEMS		
Course Category: Professional Elective		Course Level: Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Teach the basic Concepts of Artificial Intelligence and Expert Systems.

2: Explain the Various Techniques and Tools involved in Artificial Intelligence

3: Implement search methods and knowledge representation

4: Construct the knowledge organization and communication

5: Build pattern recognition and learning techniques

Unit I INTRODUCTION 9 Hours

Introduction: History, Definition of AI, Emulation of human cognitive process, knowledge search trade off, stored knowledge, semantic nets. An abstract view of modelling, elementary knowledge. Computational logic, analysis of compound statements using simple logic connectives, predicate logic, knowledge organization and manipulation, knowledge acquisition.

Unit II PROGRAMMINGANDLOGICS IN ARTIFICIAL INTELLIGENCE 9 Hours

LISP and other programming languages- introduction to LISP, syntax and numerical function, LISP and PROLOG distinction, input output and local variables, Interaction and recursion, property list and arrays alternative languages, formalized symbolic logics - properties of WFRS, non-deductive inference methods. Inconsistencies and uncertainties - Truth maintenance systems, default reasoning and closed world assumption, Model and temporary logic

Unit III SEARCH METHODS AND KNOWLEDGE REPRESENTATION 9 Hours

Fuzzy logic - concepts, Introduction to Fuzzy logic with examples, probabilistic reasoning, Bayesian probabilistic inference, Dempstor Shafer theory, possible world representation, Ad-Hoc methods. Structure knowledge: Graph, frames and related structures, Object oriented representation- object classes, message and methods, simulation examples using OOPS programs, OOP languages. Search and control strategies - Concepts, search problems, uniformed or Blined search, searching AND – OR graphs.

Unit IV KNOWLEDGE ORGANISATION AND COMMUNICATION IN EXPERT SYSTEMS **9 Hours**

Matching techniques- Need for matching, matching problem, partial matching, Fuzzy matching, RETE matching algorithm. Knowledge organization- Indexing and retrieval techniques, integration of knowledge in memory organization systems, Perception, communication and Expert systems. Overview of Linguistics, Basic passim techniques, semantic analysis and representation structures, natural language generation and system

Unit V PATTERN RECOGNITION AND LEARNING TECHNIQUES **9 Hours**

Pattern recognition system- understanding speech recognition, Image transformation, low level processing, medium and high-level processing, vision system architecture, Rule based system architecture, knowledge acquisition and validation, knowledge system building tools, use of AI and ES in manufacturing and design, types of learning - general learning model, performance measures, learning automate genetic algorithm, learning by induction - LEX, ID3, INDUCE systems.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the basic Concepts of Artificial Intelligence and Expert Systems.	Understand
CO2: Summarize Various Techniques and Tools involved in Artificial Intelligence	Understand
CO3: Develop search methods and knowledge representation	Understand
CO4: Build the knowledge organization and communication	Analyse
CO5: Construct pattern recognition and learning techniques	Analyse

Text Book(s):

T1. Samuel Burns “Natural Language Processing: A Quick Introduction to NLP with Python and NLTK, 2019

Reference Book(s):

R1. Christopher Manning, “Foundations of Statistical Natural Language Processing”, MIT Press, 2009.

R2. Nitin Indurkhya,Fred J. Damerau, “Handbook of Natural Language Processing”, Second edition, Chapman & Hall/CRC: Machine Learning & Pattern Recognition, Hardcover,2010.

Web References:

1. https://azuredevopslabs.com/labs/vstsextend/azuredevopsprojectdotnet/

Course Articulation Matrix

CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1						2						2
CO2	2			2								
CO3		3	3								2	
CO4								2	2			
CO5					2		2					2

High-3; Medium-2; Low-1

Course Code: 19SCEN1015	Course Title: COGNITIVE SCIENCES		
Course Category: Professional 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: Teach the basics of Cognitive science.

2: Discuss about the sensory information and neural network models in real time

3: Implement Linguistic knowledge in terms of robots perspective

4: Compare the computational models.

5: Develop the knowledge of Memory and Social cognition.

Unit I INTRODUCTION 9 Hours

Introduction to the study of cognitive sciences. A brief history of cognitive science. Methodological concerns in philosophy, artificial intelligence and psychology. Structure and constituents of the brain; Brief history of neuroscience; Mathematical models; Looking at brain signals

Unit II REPRESENTATION OF SENSORY INFORMATION 9 Hours

Processing of sensory information in the brain- Neural Network Models; Processing of sensory information in the brain; motor and sensory areas; Brain Imaging, fMRI, MEG, PET, EEG-Multisensory integration in cortex; information fusion; from sensation to cognition, cybernetics

Unit III LANGUAGE AND LATERALIZATION 9 Hours

Linguistic knowledge: Syntax, semantics, (and pragmatics); Generative linguistics; Brain and language; Language disorders; Lateralization; Cognitivist and emergent standpoints ; A robotic perspective

Unit IV COGNITIVE DEVELOPMENT 9 Hours

Introduction to Psychology - Attention and related concepts; Human visual attention; Computational models of attention; Applications of computational models - Learning: Categories and concepts; Concept learning; Logic; Machine learning based Link Prediction –

Bayesian Probabilistic Models - Probabilistic Relational Models

Unit V MEMORY AND SOCIAL COGNITION 9 Hours

Constructing memories; Explicit vs. implicit memory; Information processing (three-boxes) model of memory; Sensory memory; Short term memory; Long term memory - Rationality; Bounded rationality; Prospect theory; Heuristics and biases; Reasoning in computers - social cognition; Context and social judgment; Schemas; Social signals

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the basics of Cognitive science.	Understand
CO2: Summarize about the sensory information and neural network models in real time	Understand
CO3: Develop Linguistic knowledge in terms of robots perspective	Apply
CO4: Experiment the computational models.	Apply
CO5: Build the knowledge of Memory and Social cognition.	Apply

Text Book(s):

T1. Gardner, The Mind‘s New Science, chapters 2,3,4. Gardner, Howard E. The mind's new science: A history of the cognitive revolution. Basic books, 2008.

T2. Wallace, Mark T., and Barry E. Stein. "Sensory organization of the superior colliculus in cat and monkey." Progress in brain research 112 (1996): 301-311.Heidelberg; 2020

Reference Book(s):

R1. Language and the Brain", https://web.stanford.edu/~zwicky/language-and-the-brain-ch4-8.pdf

Web References:

1.https://www.open.edu/openlearn/science-maths-technology/design-innovation/design-thinking/content-section-6

Course Articulation Matrix

CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1						2						2
CO2	2			2								
CO3		3	3								2	
CO4								2	2			
CO5					2		2					2

High-3; Medium-2; Low-1

VERTICAL III CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES			
Course Code: 19SCEN1016	**Course Title: CLOUD COMPUTING**		
Course Category: Professional Elective		**Course Level: Introductory**	
L:T:P(Hours/Week) **3: 0: 0**	**Credits:3**	**Total Contact Periods:45**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Teach the principles of cloud architecture, models and infrastructure
2. Explain the concepts of virtualization and virtual machines
3. Build the virtualization Infrastructure
4. Compare various Cloud deployment environments
5. Experiment the importance of Cloud security and access management

Unit I CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE 9 Hours

Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges

Unit II VIRTUALIZATION BASICS 9 Hours

Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts – Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices

Unit III VIRTUALIZATION INFRASTRUCTURE AND DOCKER 9 Hours

Desktop Virtualization – Network Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management – Containers vs. Virtual Machines – Introduction to Docker – Docker Components

– Docker Container – Docker Images and Repositories

Unit IV CLOUD DEPLOYMENT ENVIRONMENT 9 Hours

Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus – OpenStack.

Unit V CLOUD SECURITY 9 Hours

Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the principles of cloud architecture, models and infrastructure	Understand
CO2: Develop the concepts of virtualization and virtual machines	Apply
CO3: Experiment the virtualization Infrastructure	Apply
CO4: Model various Cloud deployment environments	Apply
CO5: Identify the importance of Cloud security and access management	Apply

Text Book(s):

T1. James Turnbull, “The Docker Book”, O’Reilly Publishers, 2014.

Reference Book(s):

R1. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005

R2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, “Cloud Security and Privacy: an enterprise perspective on risks and compliance”, O’Reilly Media, Inc., 2009

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_me108/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1017	Course Title: EDGE COMPUTING		
Course Category: Professional Elective		Course Level: Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Teach the fundamentals and evolution of edge computing.
2. Illustrate edge computing infrastructure.
3. Build the knowledge of diverse applications of edge computing across various industries...
4. Discuss various security and privacy challenges in edge computing environments.
5. Experiment emerging trends, challenges, and future directions in the field of edge computing.

Unit I INTRODUCTION TO EDGE COMPUTING 9 Hours

Definition and Fundamentals-Evolution -Key Components and Architecture-Edge Devices and Sensors-Edge Computing vs. Cloud Computing-Edge Computing Standards and Protocols-Edge Computing Security Considerations-Industry Trends and Future Outlook

Unit II EDGE COMPUTING INFRASTRUCTURE 9 Hours

Edge Data Centers and Facilities-Edge Servers and Gateways-Edge Storage Solutions Virtualization and Containerization-Edge Computing Orchestration-Energy Efficiency in Edge Infrastructure-Case Studies and Best Practices

Unit III EDGE COMPUTING APPLICATIONS 9 Hours

Edge AI and Machine Learning-Edge in Industrial IoT-Smart Cities and Edge Computing Healthcare Applications-Retail and Customer Engagement-Autonomous Vehicles and Edge - Gaming and Edge Computing

Unit IV EDGE SECURITY AND PRIVACY 9 Hours

Threats and Risks in Edge Computing-Security Measures in Edge Networks -Authentication and Authorization-Data Encryption and Integrity-Privacy Concerns in Edge Environments-Edge Security Best Practices-Incident Response in Edge Systems

Unit V FUTURE TRENDS AND CHALLENGES 9 Hours

Edge Computing and 5G Integration-Fog Computing and Multi-Access Edge Computing (MEC)-Edge-to-Cloud Synergy-Ethical Considerations in Edge Technology-Research Directions and Open Challenges

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1. Explain the fundamentals and evolution of edge computing.	Understand
CO2. Summarize edge computing infrastructure.	Understand
CO3. Develop the knowledge of diverse applications of edge computing across various industries...	Apply
CO4. Solve various security and privacy challenges in edge computing environments.	Apply
CO5. Use emerging trends, challenges, and future directions in the field of edge computing.	Apply

Text Book(s):

T1."Edge Computing: Models, Technologies, and Applications" by Rajkumar Buyya, Wiley, 2021

T2."Edge Computing: A Primer" by Eric D. Glass and Vinayak Tanksale by O'Reilly Media. 2019

Reference Book(s):

R1. Practical Guide to Edge Computing" by Tao Zhang and Frank H. Li, CRC Press,2020

R2. Edge Computing: Understanding the New Information Frontier, H. Peter Alesso, Springer,2019

Web Reference:

1. https://en.wikipedia.org/wiki/Edge_computing?utm_source=chatgpt.com
2. https://aws.amazon.com/what-is/edge-computing/?utm_source=chatgpt.com
3. https://onlinecourses.nptel.ac.in/noc24_cs66/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1018		Course Title: CLOUD SERVICES MANAGEMENT	
Course Category: Professional 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 Cloud Service Management.

2: Compare cloud service management with traditional IT service management

3: Experiment the concepts of cloud service Techniques

4: Explore structures for designing, deploying and running cloud-based services in a business environment

5: Build cloud service governance

Unit I CLOUD SERVICE MANAGEMENT FUNDAMENTALS 9 Hours

Cloud Ecosystem, The Essential Characteristics, Basics of Information Technology Service Management and Cloud Service Management, Service Perspectives, Cloud Service Models, Cloud Service Deployment Models.

Unit II CLOUD SERVICES STRATEGY 9 Hours

Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture

Unit III CLOUD SERVICE MANAGEMENT 9 Hours

Cloud Service Reference Model, Cloud Service LifeCycle, Basics of Cloud Service Design, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management

Unit IV CLOUD SERVICE ECONOMICS 9 Hours

Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models

Unit V CLOUD SERVICE GOVERNANCE & VALUE 9 Hours

IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO1: Summarize the concepts of Cloud Service Management.	Understand
CO2: Interpret cloud service management with traditional IT service management	Apply
CO3: Develop the concepts of cloud service Techniques	Apply
CO4: Construct structures for designing, deploying and running cloud-based services in a business environment	Apply
CO5: Apply cloud service governance	Apply

Text Book(s):

T1. Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications

Reference Book(s):

R1. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, Zaigham Mohammad 2013

R2: Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpou

R3: Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing

Web References:

1. NPTEL: https://nptel.ac.in/courses/112/108/112108093/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1019		Course Title: STORAGE TECHNOLOGIES	
Course Category: Professional Elective		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Classify the functionalities of logical and physical components of storage

2. Explain various storage networking technologies

3.Develop different storage networking and virtualization technologies

4. Implement the different backup and recovery strategies

5.Apply the principles of storage infrastructure management and compliance

Unit I STORAGE SYSTEMS 9 Hours

Introduction to Information Storage: Digital data and its types, Information storage, Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics, Cloud services and cloud deployment models

Unit II INTELLIGENT STORAGE SYSTEMS AND RAID 9 Hours

Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scale- out storage Architecture

Unit III STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION 9 Hours

Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage. Fibre Channel SAN: Software-defined networking, FC SAN components and architecture, FC SAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment

Unit IV BACKUP, ARCHIVE AND REPLICATION 9 Hours

Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, Disaster Recovery as a Service (DRaaS)

Unit V SECURING STORAGE INFRASTRUCTURE 9 Hours

Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes**.**

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the functionalities of logical and physical components of storage	Understand
CO2: Experiment various storage networking technologies	Apply
CO3: Create different storage networking and virtualization technologies	Apply
CO4: Construct the different backup and recovery strategies	Apply
CO5: Identify the principles of storage infrastructure management and compliance	Apply

Text Book(s):

T1. EMC Corporation, Information Storage and Management, Wiley, India.

Reference Book(s):

R1. Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein

Storage Networks Explained, Second Edition, Wiley, 2009

R2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017

Web References:

1. NPTEL on Robotics - Prof. Dilip Kumar Pratihar - IIT Kharagpur

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1020		Course Title: SOFTWARE DEFINED NETWORKS	
Course Category: Professional Elective		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Teach the need for SDN and its data plane operations

2. Explain the functions of control plane

3. Develop the migration of networking functions to SDN environment

4.Experiment various techniques of network function virtualization

5. Model the concepts behind network virtualization

Unit I SDN: INTRODUCTION 9 Hours

Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane , Control plane and Application Plane

Unit II SDN DATA PLANE AND CONTROL PLANE 9 Hours

Data Plane functions and protocols - OpenFLow Protocol - Flow Table - Control Plane Functions - Southbound Interface, Northbound Interface – SDN Controllers - Ryu, OpenDaylight, ONOS - Distributed Controllers

Unit III SDN APPLICATIONS 9 Hours

SDN Application Plane Architecture – Network Services Abstraction Layer – Traffic Engineering – Measurement and Monitoring – Security – Data Center Networking

Unit IV NETWORK FUNCTION VIRTUALIZATION 9 Hours

Network Virtualization - Virtual LANs – OpenFlow VLAN Support - NFV Concepts – Benefits

and Requirements – Reference Architecture

Unit V NFV FUNCTIONALITY 9 Hours

NFV Infrastructure – Virtualized Network Functions – NFV Management and Orchestration – NFV Use cases – SDN and NFV

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the need for SDN and its data plane operations	Understand
CO2: Identify the functions of control plane	Apply
CO3: Construct the migration of networking functions to SDN environment	Apply
CO4: Build various techniques of network function virtualization	Apply
CO5: Utilize the concepts behind network virtualization	Apply

Text Book(s):

T1. William Stallings, “Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud”, Pearson Education, 1st Edition, 2015

Reference Book(s):

R1. Ken Gray, Thomas D. Nadeau, “Network Function Virtualization”, Morgan Kauffman, 2016

R2. Thomas D Nadeau, Ken Gray, “SDN: Software Defined Networks”, O’Reilly Media, 2013.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_me108/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1021		Course Title: SECURITY AND PRIVACY IN CLOUD	
Course Category: Professional 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. Teach the Fundamentals of Cloud Security Concepts
2. Explain the security design and architectural considerations for Cloud
3. Build the Identity, Access control in Cloud
4. Experiment best practices for Cloud security using various design patterns
5. Construct and audit cloud applications for security

Unit I FUNDAMENTALS OF CLOUD SECURITY CONCEPTS 9 Hours

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non- repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures

Unit II SECURITY DESIGN AND ARCHITECTURE FOR CLOUD 9 Hours

Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key

Unit III ACCESS CONTROL AND IDENTITY MANAGEMENT 9 Hours

Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers- Storage and network access control options- OS Hardening and minimization - Verified and measured boot -

Intruder Detection and prevention.

Unit IV CLOUD SECURITY DESIGN PATTERNS 9 Hours

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud

Unit V MONITORING, AUDITING AND MANAGEMENT 9 Hours

Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the Fundamentals of Cloud Security Concepts	Understand
CO2: Identify the security design and architectural considerations for Cloud	Apply
CO3: Construct the Identity, Access control in Cloud	Apply
CO4: Develop the best practices for Cloud security using various design patterns	Apply
CO5: Model and audit cloud applications for security	Apply

Text Book(s):

T1. Raj Kumar Buyya , James Broberg, andrzejGoscinski, “Cloud Computing:‖, Wiley 2013

T2. Dave shackleford, “Virtualization Security‖, SYBEX a wiley Brand 2013.

Reference Book(s):

R1. Mark C. Chu-Carroll “Code in the Cloud‖,CRC Press, 2011

R2. Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_me108/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1022		Course Title: STREAM PROCESSING	
Course Category: Professional Elective		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:60	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Teach the Fundamentals of Data Systems

2: Explain the concept of Big Data and Real Time Data Processing

3: Experiment Data Models and Query Languages

4: Construct Event Processing with Apache Kafka

5: Develop Structured Streaming and operations to solve real world problems.

Unit I FUNDAMENTALS OF DATA SYSTEMS 9 Hours

Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges

Unit II REAL-TIME DATA PROCESSING 9 Hours

Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing, Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage

Unit III DATA MODELS AND QUERY LANGUAGES 9 Hours

Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many- to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL,

SPARQL

Unit IV EVENT PROCESSING WITH APACHE KAFKA 9 Hours

Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API

Unit V REAL-TIME PROCESSING USING SPARK STREAMING 9 Hours

Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation, Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the Fundamentals of Data Systems	Understand
CO2: Experiment the concept of Big Data and Real Time Data Processing	Apply
CO3: Identify Data Models and Query Languages	Apply
CO4: Model Event Processing with Apache Kafka	Apply
CO5: Solve Structured Streaming and operations for real world problems.	Apply

Text Book(s):

T1. Streaming Systems: The What, Where, When and How of Large-Scale Data Processing by Tyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication

T2. Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media

Reference Book(s):

R1. Practical Real-time Data Processing and Analytics: Distributed Computing and Event Processing using Apache Spark, Flink, Storm and Kafka, Packt Publishing

Web References:

1. https://spark.apache.org/docs/latest/streaming-programming-guide.html

Course Articulation Matrix

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

High-3; Medium-2; Low-1

VERTICAL IV CYBER SECURITY AND DATA PRIVACY			
Course Code: 19SCEN1023	**Course Title: SECURE CODING**		
Course Category: Professional Core		**Course Level: Introductory**	
L: T: P(Hours/Week) **3: 0: 0**	**Credits:3**	**Total Contact Periods:45**	**Max. Marks:100**

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Teach the concepts of programming errors, Exploitation and Mitigations

2: Explain string handling security problems.

3. Implement dynamic memory management

4: Experiment integer security and vulnerabilities

5: Implement secure code using file IO

Unit I SECURITY CONCEPTS 9 Hours

Introduction - Gauging the threat -Security concepts- –Security Policy –Security Flaws- SetUID Programs- Vulnerabilities–Exploitation and Mitigations.

Unit II STRINGS HANDLING 9 Hours

Strings – Common String Manipulation errors - Improperly Bounded String Copies - Off-by-One Errors - Null- Termination Errors - String Truncation - String Errors without Functions - String vulnerabilities - Buffer Overflow - Process memory organization – Stack management - Stack smashing – Mitigation techniques – String handling functions – Runtime protection strategies

Unit III DYNAMIC MEMORY MANAGEMENT 9 Hours

Dynamic Memory Management – C Memory management functions - Common C Memory Management Errors – Initialization Errors - Failing to Check Return Values - Dereferencing Null or Invalid Pointers - Referencing Freed Memory - Freeing Memory Multiple Times - Memory

Leaks - Zero-Length Allocations - Mitigation Strategies

Unit IV INTEGER SECURITY 9 Hours

Integer Security – Introduction to integer types - Integer Data Types - Integer Conversions – Integer operations - Integer Vulnerabilities – Mitigation strategies.

Unit V FILE IO 9 Hours

Formatted Output - Variadic Functions - Formatted Output Functions - Vulnerabilities - Mitigation Strategies. Concurrency - Common Errors - Race Conditions – File I/O - TOCTOU

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the concepts of programming errors, Exploitation and Mitigations	Understand
CO2: Identify string handling security problems.	Apply
CO3. Develop dynamic memory management	Apply
CO4: Experiment integer security and vulnerabilities	Apply
CO5: Construct secure code using file IO	Apply

Text Book(s):

T1. Robert C.Seacord, “Secure Coding in C and C++”, 2nd edition 2013

Reference Book(s):

R1. Chess,B. and West J, “Secure Programming with static Analysis”, 2007.

R2. Wenliang Du,”Computer Security-A hands –on Approach”,Second Edition 2017.

Web References:

https://wiki.sei.cmu.edu/confluence/display/c/SEI+CERT+C+Coding+Standard.

ourse Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1024	Course Title: MALWARE AND REVERSE ENGINEERING		
Course Category: Professional 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: Explore the evolution, classifications, lifecycle stages, and techniques of malware for effective threat analysis and defense strategies.

2: Discuss reverse engineering fundamentals, focusing on assembly language, analysis tools, and techniques for code reversing and malware patching.

3: Exploration of Malware Persistence and anti-analysis techniques.

4: Implement Dynamic Analysis and sandbox Evasion Techniques

5: Apply incident response strategies for malware attacks.

Unit I INTRODUCTION TO MALWARE 9 Hours

History and Evolution of Malicious Software -Types of Malwares: Viruses, Worms, Trojans, Backdoor, Botnet, Rootkit, Launcher, Spam-sending malware - Malware Lifecycle: Infection, Propagation, Execution - Common Malware Techniques: Obfuscation, Encryption.

Unit II MALWARE REVERSE ENGINEERING 9 Hours

Introduction to Reverse Engineering - Assembly Language Basics for Malware Analysts - Disassemblers and Decompilers - Dynamic Analysis Tools: Debuggers, Profilers-Code Reversing and Patching.

Unit III MALWARE PERSISTENCE AND EVASION TECHNIQUES 9 Hours

Malware Persistence Mechanisms - Rootkits and Bootkits - Anti-Analysis Techniques Polymorphic and Metamorphic Malware - DLL Injection and Code Injection

Unit IV ADVANCED MALWARE ANALYSIS 9 Hours

Advanced Dynamic Analysis Techniques - Sandbox Evasion Techniques - Malware Cryptography and Steganography - Shellcode Analysis - Exploit Analysis - Android Malware Analysis

Unit V MALWARE INCIDENT RESPONSE AND MITIGATION 9 Hours

Incident Response in Malware Attacks - Malware Incident Handling Procedures - Malware Forensics: Disk and Memory Analysis – Network - Based Malware Incident Response

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the evolution, classifications, lifecycle stages, and techniques of malware malicious software and malwares.	Understand
CO2: Summarize the basics of Malware Reverse Engineering.	Understand
CO3: Develop Malware Persistence and anti-analysis techniques.	Apply
CO4: Implement dynamic malware analysis and countermeasures against sandbox evasion techniques.	Apply
CO5: Identify incident response strategies for malware attacks.	Apply

Text Book(s):

T1.” Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software " by Michael Sikorski, Andrew Honig, No Starch Press; 1st edition (1 February 2012)

T2. Monnappa K A, “Learning Malware Analysis: Explore the concepts, tools, and techniques to analyze and investigate Windows malware”, Packt Publishing; 1st edition (29 June 2018)

T3: “Malware Analyst's Cookbook and DVD: Tools and Techniques for Fighting Malicious Code " Michael Hale Ligh, Steven Adair, Wiley,2010.

Reference Book(s):

R1. “Malware: Fighting Malicious Code", Ed Skoudis and Lenny Zeltser, Pearson, November 7, 2003.

R2: “The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory " Michael Hale Ligh, Wiley,2014

R3: Malware Forensics: Investigating and Analyzing Malicious Code Cameron H. Malin, Eoghan Casey, James M. Aquilina, Syngress,2008.

Web References:

1. https://www.udemy.com/course/malware-analysis-and-reverse-engineering

2. https://www.coursera.org/learn/malware-analysis-and-assembly

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1025	Course Title: SOCIAL NETWORK SECURITY		
Course Category: Professional Elective		Course Level: Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Teach the foundation of social network security and policies.

2: Explain threats and vulnerabilities in social networks.

3: Implement two-factor authentication and privacy settings, protecting personal information, and promoting safe sharing practices.

4: Develop security features in social platforms

5: Apply social network forensics, Legal and Regulatory Compliance in Social Networks.

Unit I INTRODUCTION TO SOCIAL NETWORK SECURITY 9 Hours

Overview of Social Network Security-Evolution and Growth of Social Networks-Types of Social Networks: Public, Private, Professional-Security Challenges in Social Networks-Social Engineering Attacks-Security Policies.

Unit II THREATS AND VULNERABILITIES IN SOCIAL NETWORKS 9 Hours

Social Media Phishing Attacks-Identity Theft and Impersonation-Malware Propagation through Social Networks-Data Mining and Profiling Techniques - Account Hijacking and Unauthorized Acces - Location-Based Threats-Fake News and Disinformation.

Unit III USER EDUCATION AND AWARENESS 9 Hours

Creating Strong Passwords and Two-Factor Authentication-Recognizing and Avoiding Social Engineering Attacks-Understanding Privacy Settings-Protecting Personal Information-Educating Users on Safe Sharing Practices-Security Awareness Campaigns

Unit IV SOCIAL NETWORK PLATFORM SECURITY 9 Hours

Security Features in Popular Social Platforms-Role of Social Network Administrators in Security-Securing User Data and Communications-Incident Response in Social Networks-Third-Party App Security

Unit V ADVANCED TOPICS IN SOCIAL NETWORK SECURITY 9 Hours

Social Network Forensics-Security in Enterprise Social Networks-Geopolitical and Cultural Considerations-Legal and Regulatory Compliance in Social Networks

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the foundation of social network security and policies.	Analyze
CO2: Illustrate threats and vulnerabilities in social networks.	Understand
CO3: Construct two-factor authentication and privacy settings, protecting personal information, and promoting safe sharing practices.	Apply
CO4: Experiment security features in social platforms	Apply
CO5: Construct social network forensics, Legal and Regulatory Compliance in Social Networks.	Understand

Text Book(s):

T1: " Social Engineering: The Art of Human Hacking " by Christopher Hadnagy, Wiley, 2010

T2. Social Media Security: Leveraging Social Networking While Mitigating Risk " by Michael Cross, Syngress, 2013.

Reference Book(s):

R1. “The Art of Deception: Controlling the Human Element of Security” by Kevin D. Mitnick, Wiley,2015

R2. “Open-Source Intelligence Techniques: Resources for Searching and Analyzing Online Information”, Michael Bazzell, CreateSpace,2019

Web Reference:

1. https://ieeexplore.ieee.org/document/5755600

2. https://www.sciencedirect.com/science/article/abs/pii/S0020025517309106

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1026	Course Title: WIRELESS SENSOR NETWORK SECURITY		
Course Category: Professional 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: Teach the characteristics and components of Wireless Sensor Networks (WSNs)

2: Implement WSN Security Protocols and Algorithms

3: Develop strategies to address physical layer threats in WSNs

4: Experiment secure routing protocols

5: apply privacy-aware localization techniques.

Unit I INTRODUCTION TO WIRELESS SENSOR NETWORKS (WSNs) 9 Hours

Overview of Wireless Sensor Networks (WSNs) - Characteristics and Components of WSNs Security Challenges in WSNs - Threat Models and Attack Vectors - Security Requirements in WSNs – Energy - Efficient Security Solutions

Unit II WSN SECURITY PROTOCOLS AND ALGORITHMS 9 Hours

Key Distribution Schemes in WSNs-Secure Routing Protocols - Intrusion Detection and Prevention Systems for WSNs - Secure Localization Techniques - Data Integrity and Authentication in WSNs - Secure Aggregation and Data Fusion-Secure Time Synchronization Protocols

Unit III PHYSICAL LAYER SECURITY 9 Hours

Physical Layer Threats and Countermeasures - Jamming Attacks and Defense Mechanisms - Channel Authentication and Protection-Secure Modulation and Transmission Techniques - Hardware Security in WSN Nodes - Secure Antenna Design for WSNs – Cross - Layer Security

Integration

Unit IV TRUST AND PRIVACY 9 Hours

Building Trust Models in WSNs-Privacy-Preserving Data Collection and Sharing-Identity Management in WSNs-User Authentication in Resource-Constrained Devices-Secure Group Communication-Trust-Based Routing Protocols-Privacy-Aware Localization Techniques

Unit V RESILIENCE AND SURVIVABILITY 9 Hours

Secure Software Updates in WSNs-Resilience and Survivability in WSNs-Security in Heterogeneous WSNs (IoT Integration)-Secure WSNs for Critical Infrastructures-Standardization and Certification in WSN Security

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the characteristics and components of Wireless Sensor Networks (WSNs)	Understand
CO2: Construct WSN Security Protocols and Algorithms	Apply
CO3: Build strategies to address physical layer threats in WSNs	Apply
CO4: Develop secure routing protocols	Apply
CO5: Construct privacy-aware localization techniques.	Apply

Text Book(s):

T1. Security in Wireless Sensor Networks: Risk Engineering", Kresimir Malaric, Dijana Petrovska-Delacrétaz, Pietro Zanarini, Wiley, 2020

T2. " Wireless Sensor Networks: Principles, Design and Applications " by Nirupama Bulusu, Sanjay Jha, Springer,2013

Reference Book(s):

R1. "Wireless Sensor Networks: Security, Coverage, and Localization"by Zheng Yan, Tarek F. Abdelzaher, Springer,2006

R2. "Wireless Sensor Networks: A Networking Perspective", Jun Zheng, Wiley,2009

Web Reference:

1.https://www.researchgate.net/publication/376079862_Wireless_sensor_network_security_A_recent_review_based_on_state-of-the-art_works

2. https://ieeexplore.ieee.org/document/7494109

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1027	Course Title: DIGITAL AND MOBILE FORENSICS		
Course Category: Professional 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: Teach standard procedures in computer forensics investigations.

2. Explain the foundations of network forensics.

3: Build the strategies for internet forensics.

4: Construct various acquisition and authentication techniques

5: Identify the legal and ethical considerations in digital forensics.

Unit I COMPUTER FORENSICS 9 Hours

Standard procedure - Incident verification - System identification - Recovery of coed and damaged data - Disk imaging and preservation. - Data encryption and compression -Automated search techniques - Forensic software - Digital forensic framework - Digital forensic models.

Unit II NETWORK FORENSICS 9 Hours

'Tracking network traffic - Reviewing network logs, Tools - Performing acquisitions - Order of volatility - Standard procedure. Internet forensics: Internet and world wide web threats (Email, Chat-rooms, Search engines,) - Domain name ownership investigation - Reconstructing past internet activities and events.

Unit III INTERNET FORENSICS 9 Hours

Email forensics: E-mail analysis - Email headers and spoofing - Laws against email crime. Messenger forensics: AOL, Yahoo, MSN, and Chats. Browser forensics: Analyzing cache and

temporary Internet files - Cookie storage and analysis. File system forensic.

Unit IV DATA ACQUISITION 9 Hours

Data acquisition: authorization to collect the evidence - Acquisition of evidence - Authentication of the evidence -Analysis of the evidence - Reporting on the findings - Testimony. Collecting and analyzing mobile phone - Analyzing CD, DVD, Flash memory, and other storage devices

Unit V ADVANCED FORENSICS TECHNIQUES 9 Hours

Digital camera forensics - Reconstructing users activities - Recovering and reconstructing deleted data. Memory data collection and examination - Extracting and examining processes. Steganography tools and tricks - Data hiding and data recovery.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the standard procedures in computer forensics investigations.	Understand
CO2. Describe the foundations of network forensics.	Understand
CO3: Develop the strategies for internet forensics.	Understand
CO4: Implement various acquisition and authentication techniques	Analyze
CO5: Identify the legal and ethical considerations in digital forensics.	Apply

Text Book(s):

T1. Fundamentals of digital forensics: theory, methods, and real-life applications by joakim kävrestad Springer international publishing,2018

T2. “Digital Forensics by Anders Flaglien, Inger Marie Sunde Addison-Wesley 2005.

Reference Book(s):

R1. "Computer Forensics: Principles and Practices ",Linda Volonino, Pearson, 2014

R2. "Network Forensics: Tracking Hackers through Cyberspace" Sherri Davidoff, Jonathan Ham, 2012

Web Reference:

https://www.eccouncil.org/cybersecurity-exchange/computer-forensics/mobile-device-forensics/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1028	Course Title: CRPTO CURRENCY AND BLOCK CHAIN TECHNOLOGIES		
Course Category: Professional 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: Teach the foundations of Blockchain

2: Explain the basics of bitcoin and cryptocurrency

3: Experiment various bitcoin mining techniques.

4: Identify hyperledger fabric & ethereum

5: Use various blockchain applications

Unit I INTRODUCTION TO BLOCKCHAIN 9 Hours

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions- The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

Unit II BITCOIN AND CRYPTOCURRENCY 9 Hours

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay

Unit III BITCOIN CONSENSUS 9 Hours

Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

Unit IV HYPERLEDGER FABRIC & ETHEREUM 9 Hours

Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

Unit V BLOCKCHAIN APPLICATIONS 9 Hours

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance, etc- Case Study.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the foundations of Block chain	Understand
CO2: Build the basics of bit coin and crypto currency	Apply
CO3: Construct various bit coin mining techniques.	Apply
CO4: Identify hyper ledger fabric & ethereal	Apply
CO5: Select various block chain applications	Apply

Text Book(s):

T1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017

T2. Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, O’Reilly, 2014.

Reference Book(s):

R1. Daniel Drescher, “Blockchain Basics”, First Edition, Apress, 2017.

R2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

R3. Melanie Swan, “Blockchain: Blueprint for a New Economy”, O’Reilly, 2015

R4. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Blockchain”, Packt Publishing

R5. 5. Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.

Web References:

https://www.techtarget.com/searchcio/definition/blockchain

https://blockgeeks.com/guides/what-is-blockchain-technology/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1029	Course Title: ETHICAL HACKING PENETRATION TESTING		
Course Category: Professional Elective		Course Level: Introductory	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Teach the basics of ethical hacking.

2: Explain network security principles and strategies for securing complex network architectures.

3: Construct system security principles.

4: Construct Vulnerability Assessment reports

5: Implement various phases of Penetration Testing

Unit I INTRODUCTION TO ETHICAL HACKING 9 Hours

Overview of Ethical Hacking - History and Evolution of Hacking - Legal and Ethical Considerations - Common Hacking Techniques-Introduction to Cybersecurity Frameworks-Information Gathering and Footprinting-Scanning and Enumeration Techniques-Vulnerability Assessment and Management

Unit II NETWORK SECURITY 9 Hours

`Network Architecture and Protocols-Wireless Network Security-Firewall Technologies and Implementation-Intrusion Detection Systems (IDS)-Intrusion Prevention Systems (IPS)-Virtual Private Networks (VPNs)-Securing Network Devices (Routers, Switches)-Web Application Security-Cloud Security Concepts

Unit III SYSTEM SECURITY 9 Hours

Operating System Security (Windows, Linux)-User Authentication and Authorization-Security Policies and Procedures-Patch Management and Software Updates-Endpoint Security-Data Encryption and Decryption-Secure Coding Practices-Physical Security Measures-Incident

Response and Handling

Unit IV VULNERABILITY MANAGEMENT 9 Hours

Vulnerability Assessment reports, Stages of Vulnerability: Identify Assess, Remediate, Report, Improve, Monitor, Vulnerability management tools: Nessus, report customization, report automation, audit policies, Compliance reporting, auditing infrastructure, Compliance check for different OS and databases

Unit V INTRODUCTION TO PENETRATION TESTING 9 Hours

Phases of Penetration Testing, methodologies (Black Box / White Box / Fuzz), penetration testing for software (Operating system, services, application), Hardware< Network, Processes, End – user behavior, tools used for penetration testing, Virtual box, Configuration, Reading: Sample Pen Test Report, Sample test cases or scenarios.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the basics of ethical hacking.	Understand
CO2: Build network security principles and strategies for securing complex network architectures.	Apply
CO3: Apply system security principles.	Apply
CO4: Develop Vulnerability Assessment reports	Apply
CO5: Experiment various phases of Penetration Testing.	Apply

Text Book(s):

T1. Ethical Hacking and Countermeasures: Secure Network Infrastructures" by EC-Council , Cengage Learning, 2014

T2. Hacking: The Art of Exploitation" by Jon Erickson, No Starch Press, 2008

Reference Book(s):

R1. Metasploit: The Penetration Tester's Guide" by David Kennedy , No Starch Press, 2011

R2. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" Dafydd Stuttard,, Wiley,2011

Course Articulation Matrix

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

High-3; Medium-2; Low-1

VERTICAL V EMERGING TECHNOLOGIES			
Course Code: 19SCEN1030	**Course Title: AUGMENTED REALITY/VIRTUAL REALITY**		
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

- Nil

Course Objectives

The course is intended to:

1:Teach the foundation of augmented reality and virtual reality

2: Explain various VR Modeling techniques.

3: Implement VR programming

4: Identify various AR/VR based applications.

5: Build the concept of Computer vision for AR

Unit I INTRODUCTION 9 Hours

Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System

Unit II VR MODELING 9 Hours

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World

Unit III VR PROGRAMMING 9 Hours

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D

Unit IV APPLICATIONS 9 Hours

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications

Unit V AUGMENTED REALITY 9 Hours

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation- Navigation-Wearable devices

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1:Explain the foundation of augmented reality and virtual reality	Understand
CO2: Experiment various VR Modeling techniques.	Apply
CO3: Build VR programming	Apply
CO4: Construct various AR/VR based applications.	Understand
CO5: Develop the concept of Computer vision for AR	Apply

Text Book(s):

T1. Charles Palmer, John Williamson, “Virtual Reality Blueprints: Create compelling VR experiences for mobile”, Packt Publisher, 2018

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:

http://webpages.uncc.edu/ras/ITCS2215.html

http://www.pearsoned.co.in/prc/book/anany-levitin-introduction-design-analysisalgorithms-2e-2/9788131718377

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1031		Course Title: ROBOTIC PROCESS AUTOMATION	
Course Category: Professional 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: Teach the basic concepts of Robotic Process Automation.

2: Explain automation process activities and VR modeling

3: Experiment the app integration, recording and scraping

4: Develop the Exception Handling, Debugging and Logging operations in RPA

5: Build the deployment and maintenance of RPA

Unit I INTRODUCTION 9 Hours

Emergence of Robotic Process Automation (RPA), Evolution of RPA, Differentiating RPA from Automation - Benefits of RPA - Application areas of RPA, Components of RPA, RPA Platforms. Robotic Process Automation Tools - Templates, User Interface, Domains in Activities, Workflow Files.

Unit II AUTOMATION PROCESS ACTIVITIES VR MODELING 9 Hours

Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events

Unit III APP INTEGRATION, RECORDING AND SCRAPING 9 Hours

App Integration, Recording, Scraping, Selector, Workflow Activities. Recording mouse and keyboard actions to perform operation, Scraping data from website and writing to CSV. Process Mining.

Unit IV EXCEPTION HANDLING AND CODE MANAGEMENT 9 Hours

Exception handling, Common exceptions, Logging- Debugging techniques, Collecting crash dumps, Error reporting. Code management and maintenance: Project organization, Nesting workflows, Reusability, Templates, Commenting techniques, State Machine.

Unit V DEPLOYMENT AND MAINTENANCE 9 Hours

Publishing using publish utility, Orchestration Server, Control bots, Orchestration Server to deploy bots, License management, Publishing and managing updates. RPA Vendors - Open-Source RPA, Future of RPA

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the basic concepts of Robotic Process Automation.	Understand
CO2: Summarize automation process activities and VR modeling	Understand
CO3: Develop the app integration, recording and scraping	Understand
CO4: Experiment the Exception Handling, Debugging and Logging operations in RPA	Apply
CO5: Build the deployment and maintenance of RPA	Apply

Text Book(s):

T1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath by Alok Mani Tripathi, Packt Publishing, 2018.

Reference Book(s):

R1. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018

R2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018.

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
CO1						2						2
CO2	2			2								
CO3		3	3								2	
CO4								2	2			
CO5					2		2					2

High-3; Medium-2; Low-1

Course Code: 19SCEN1032		Course Title: NEURAL NETWORKS AND DEEP LEARNING	
Course Category: Professional 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: Teach the basics of neural networks

2: Explain associative memory and unsupervised learning networks

3: Implement third-generation neural networks

4: Develop Foundation of deep learning

5: Experiment. Recurrent Neural Networks

Unit I INTRODUCTION 9 Hours

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction- Evolution of Neural Networks-Basic Models of Artificial Neural Network-Important Terminologies of ANNs-Supervised Learning Network.

Unit II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS 9 Hours

Training Algorithms for Pattern Association-Auto associative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Auto associative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps

Unit III THIRD-GENERATION NEURAL NETWORKS 9 Hours

Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation– Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms

Unit IV FOUNDATION OF DEEP LEARNING 9 Hours

A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.

Unit V RECURRENT NEURAL NETWORKS 9 Hours

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the basics of neural networks	Understand
CO2: Summarize associative memory and unsupervised learning networks	Analyze
CO3: Build third-generation neural networks	Analyze
CO4: Construct Foundation of deep learning	Analyze
CO5: Experiment. Recurrent Neural Networks	Apply

Text Book(s):

T1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.

Reference Book(s):

R1. Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn and TensorFlow”, Oreilly, 2018.

R2. Josh Patterson, Adam Gibson, “Deep Learning: A Practitioner’s Approach”, O’Reilly Media, 2017.

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
CO1						2						2
CO2	2			2								
CO3		3	3								2	
CO4								2	2			
CO5					2		2					2

High-3; Medium-2; Low-1

Course Code: 19SCEN1033		Course Title: QUANTUM COMPUTING	
Course Category: Professional 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: Teach the concepts of classical computing and quantum computing.

2: Discuss the fundamental concepts behind quantum computation.

3: Implement the quantum algorithms

4: Implement quantum information theory

5: Build the concepts of quantum cryptography

Unit I QUANTUM COMPUTING BASIC CONCEPTS 9 Hours

Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits - Superpositions

Unit II QUANTUM GATES AND CIRCUITS 9 Hours

Universal logic gates - Basic single qubit gates - Multiple qubit gates - Circuit development - Quantum error correction

Unit III QUANTUM ALGORITHMS 12 Hours

Quantum parallelism - Deutsch's algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm

Unit IV QUANTUM INFORMATION THEORY 12 Hours

Data compression - Shannon's noiseless channel coding theorem - Schumacher's quantum noiseless channel coding theorem - Classical information over noisy quantum channels

Unit V QUANTUM CRYPTOGRAPHY 12 Hours

Classical cryptography basic concepts - Private key cryptography - Shor's Factoring Algorithm - Quantum Key Distribution - BB84 - Ekart 91

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the concepts of classical computing and quantum computing.	Understand
CO2: Summarize the fundamental concepts behind quantum computation.	Apply
CO3: Develop the quantum algorithms	Apply
CO4: Experiment quantum information theory	Apply
CO5: Build the concepts of quantum cryptography	Apply

Text Book(s):

T1. Parag K Lala, Mc Graw Hill Education, "Quantum Computing, A Beginners Introduction", First edition

Reference Book(s):

R1. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013.

R2. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.

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
CO1						2						2
CO2	2			2								
CO3		3	3								2	
CO4								2	2			
CO5					2		2					2

High-3; Medium-2; Low-1

Course Code: 19SCEN1034		Course Title: REAL TIME CYBER SECURITY	
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

- Nil

Course Objectives

The course is intended to:

1: Teach the foundations of cybercrime and cyberlaw

2: Explain various cyber-attacks and tools

3: Compare different information gathering techniques

4: Develop intrusion detection techniques.

5: Implement the firewalls and Intrusion Prevention Systems

Unit I INTRODUCTION 9 Hours

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment

Unit II ATTACKS AND COUNTERMEASURES 9 Hours

OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures

Unit III RECONNAISSANCE 9 Hours

Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques

Unit IV INTRUSION DETECTION 9 Hours

Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort

Unit V INTRUSION PREVENTION 9 Hours

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the foundations of cybercrime and cyberlaw	Understand
CO2: Summarize various cyber-attacks and tools	Apply
CO3: Develop different information gathering techniques	Apply
CO4: Experiment intrusion detection techniques.	Apply
CO5: Build the firewalls and Intrusion Prevention Systems	Apply

Text Book(s):

T1. Anand Shinde, “Introduction to Cyber Security Guide to the World of Cyber Security”, Notion Press, 2021 (Unit 1)

Reference Book(s):

R1. David Kim, Michael G. Solomon, “Fundamentals of Information Systems Security”, Jones & Bartlett Learning Publishers, 2013 (Unit 2)

R2. Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy”, Elsevier, 2011 (Unit 3)

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_me108/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1035		Course Title: GAME DEVELOPMENT	
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

- Nil

Course Objectives

The course is intended to:

1: Teach the basics of 2D and 3D graphics for game development

2: Discuss various game design principles.

3: Illustrate the basics of a game engine design.

4: Demonstrate Gaming Platforms and Frameworks

5: Implement Game Development Using Pygame

Unit I 3D GRAPHICS FOR GAME DESIGN 9 Hours

Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation

Unit II GAME DESIGN PRINCIPLES 9 Hours

Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design – Proposals – Writing for Preproduction, Production and Post – Production

Unit III GAME ENGINE DESIGN 9 Hours

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Pathfinding

Unit IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS 9 Hours

Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity Single player and multi-Player games

Unit V GAME DEVELOPMENT USING PYGAME 9 Hours

Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Games

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1 Explain the basics of 2D and 3D graphics for game development	Understand
CO2: Summarize the stages of game development.	Apply
CO3: Experiment the basics of a game engine	Apply
CO4: Build various Gaming Platforms and Frameworks.	Apply
CO5: Develop simple games using Pygame environment	Apply

Text Book(s):

T1. Sanjay Madhav, “Game Programming Algorithms and Techniques: A Platform Agnostic Approach”, Addison Wesley,2013

Reference Book(s):

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

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_me76/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1036		Course Title: 3D PRINTING AND DESIGN	
Course Category: Professional 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: Teach the basics of 3D printing

2: Explain the principles of 3D printing technique

3: Describe the foundations of inkjet technology

4: Illustrate the importance of laser technology

5: Explain the applications of 3D printing

Unit I INTRODUCTION 9 Hours

Introduction; Design considerations – Material, Size, Resolution, Process; Modelling and viewing - 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats

Unit II PRINCIPLE 9 Hours

Processes – Extrusion, Wire, Granular, Lamination, Photopolymerisation; Materials - Paper, Plastics, Metals, Ceramics, Glass, Wood, Fiber, Sand, Biological Tissues, Hydrogels, Graphene; Material Selection - Processes, applications, limitations

Unit III INKJET TECHNOLOGY 9 Hours

. Printer - Working Principle, Positioning System, Print head, Print bed, Frames, Motion control; Print head Considerations – Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication – Continous jet, Mulitjet; Powder based fabrication – Colourjet.

Unit IV LASER TECHNOLOGY 9 Hours

Light Sources – Types, Characteristics; Optics – Deflection, Modulation; Material feeding and flow – Liquid, powder; Printing machines – Types, Working Principle, Build Platform, Print bed Movement, Support structures

Unit V INDUSTRIAL APPLICATIONS 9 Hours

Product Models, manufacturing – Printed electronics, Biopolymers, Packaging, Healthcare, Food, Medical, Biotechnology; Displays; Future trends;

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Summarize the basics of 3D printing	Understand
CO2: Explain the principles of 3D printing technique	Understand
CO3: Describe the foundations of inkjet technology	Understand
CO4: Illustrate the importance of laser technology	Apply
CO5: Describe the applications of 3D printing	Understand

Text Book(s):

T1. Christopher Barnatt, 3D Printing: The Next Industrial Revolution, CreateSpace Independent Publishing Platform, 2013.

Reference Book(s):

R1: Chua, C.K., Leong K.F. and Lim C.S., Rapid prototyping: Principles and applications, second edition, World Scientific Publishers, 2010

R2: Ibrahim Zeid, Mastering CAD CAM Tata McGraw-Hill Publishing Co., 2007

R3:Joan Horvath, Mastering 3D Printing, APress, 2014

Web References:

1. NPTEL: https://nptel.ac.in/courses/112/108/112108093/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEN1037	Course Title: EMBEDDED SYSTEMS AND IOT		
Course Category: Professional 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.Teach the basics of Embedded Processor

2: Explain the fundamentals of Embedded C Programming

3: Experiment Arduino Programming for IoT.

4: Compare the communication models in IoT

5: Design IoT applications using Arduino / Raspberry Pi /open platform.

Unit I 8-BIT EMBEDDED PROCESSOR 9 Hours

8-Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports–Timers and Serial Port – Interrupt Handling

Unit II EMBEDDED C PROGRAMMING 9 Hours

Memory And I/O Devices Interfacing – Programming Embedded Systems in C – Need For RTOS – Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies.

Unit III IOT AND ARDUINO PROGRAMMING 9 Hours

Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino– Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino

Unit IV IOT COMMUNICATION AND OPEN PLATFORMS 9 Hours

IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee– GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.

Unit V APPLICATIONS DEVELOPMENT 9 Hours

Complete Design of Embedded Systems – Development of IoT Applications – Home Automation – Smart Agriculture – Smart Cities – Smart Healthcare.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Summarize the basics of Embedded Processor	Understand
CO2: Describe the fundamentals of Embedded C Programming	Understand
CO3: Experiment Arduino Programming for IoT.	Apply
CO4: Compare the communication models in IoT	Apply
CO5: Design IoT applications using Arduino / Raspberry Pi /open platform.	Apply

Text Book(s):

T1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, “The 8051 Microcontroller and Embedded Systems”, Pearson Education, Second Edition, 2014

Reference Book(s):

R1. Michael J. Pont, “Embedded C”, Pearson Education, 2007.

R2. Wayne Wolf, “Computers as Components: Principles of Embedded Computer System Design”, Elsevier, 2006

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PSO2**
CO1	3	3	3	3	-				1	2	3	3	2	1
CO2	2	1	3	2	2				1	2	2	3	3	1
CO3	3	1	3	3	1				1	2	1	1	1	3
CO4	3	2	3	2	1				1	2	2	3	2	2
CO5	2	3	3	2	2				1	3	3	2	3	1

High-3; Medium-2; Low-1

Open Electives (Offered to other Programmes)			
Course Code: 19SCOC1001	**Course Title: CYBER LAWS**		
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: Teach the legal foundations and frameworks governing cyberspace.

2: Discuss the provisions of the Information Technology Act, 2000, in various scenarios.

3: Describe the legal aspects of electronic commerce in the digital environment.

4: Illustrate the types of Cyber Crimes.

5: Analyze the legal implications of emerging technologies.

Unit I Introduction to Cyber Laws 9 Hours

Definition and Scope of Cyber Laws-Historical Development -Cyber Crime and its Classification-Key Legal Frameworks in India-International Perspectives on Cyber Laws-Cyber Jurisdiction and its Challenges-Regulatory Authorities in Cyber Space-Role of Judiciary in Cyber Law Cases-Cyber Ethics and Governance

Unit II Information Technology Act, 2000 9 Hours

Overview of the Information Technology Act, 2000- Digital Signatures and Certificates- Offenses and Penalties under the IT Act- Cyber Regulations Appellate Board- Intermediaries and their Legal Liability - Data Protection and Privacy Issues–Recent Amendments and Case Studies.

Unit III E-Commerce and Cyber Contracts 9 Hours

Legal Framework for E-Commerce in India- Electronic Contracts and their Validity- Consumer Protection in E-Commerce- Cyber Fraud and E-Banking Regulations- Intellectual Property Issues in Cyberspace- Domain Names and Trademark Protection- Emerging Trends in E-

Commerce Laws

Unit IV Cyber Crimes and Investigations **9 Hours**

Types of Cyber Crimes- Hacking and Unauthorized Access-Identity Theft and Cyber Stalking-Cyber Espionage and National Security- Challenges in Cyber Crime Investigations- Cyber Crime Reporting Mechanisms- Case Studies and Legal Precedents

Unit V Emerging Issues in Cyber Laws **9 Hours**

Artificial Intelligence and Legal Implications- Internet of Things (IoT) and Regulatory Challenges- Deepfake Technology and Legal Consequences- Cyber Warfare and International Law- Social Media Regulations- Future Trends and Policy Recommendations

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the legal foundations and frameworks governing cyberspace.	Understand
CO2: Summarize the provisions of the Information Technology Act, 2000, in various scenarios.	Understand
CO3: Describe the legal aspects of electronic commerce in the digital environment.	Apply
CO4: Illustrate the types of Cyber Crimes.	Apply
CO5: Experiment the legal implications of emerging technologies.	Apply

Text Book(s):

T1. "Cyber Law in India" by Pavan Duggal Bloomsbury India, 2021

T2. "Information Technology Law in India" by Rodney D. Ryder, LexisNexis,2022

Reference Book(s):

R1. Cyber Laws and IT Protection" by S. Ravi (Publisher: Wolters Kluwer, Year of Publication: 2020

R2. Cyber Crimes and the Law" by Brett Trout (Publisher: Apress, Year of Publication: 2018.

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCOC1002	Course Title: 5g 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: Teach the fundamentals, evolution, and global deployments of 5G technologies.

2: Discuss the components of 5G network architecture

3: Compare the advanced radio technologies used in 5G

4: Describe the basics of 5G Security and Privacy

5: Experiment the Applications and Future Trends of 5G.

Unit I Introduction to 5G **9 Hours**

Evolution from 4G to 5G - Key Features and Requirements - Standardization Bodies in 5G - Spectrum Allocation for 5G - 5G Architecture and Components - Global Deployments and Rollouts - Industry Trends and Future Outlook

Unit II 5G Network Architecture **9 Hours**

Radio Access Network (RAN) - Core Network (CN) - Network Slicing – Software - Defined Networking (SDN) in 5G - Network Function Virtualization - Multi-Access Edge Computing – Service - Based Architecture

Unit III 5G Radio Technologies **9 Hours**

Multiple Access Schemes - Massive MIMO and Beamforming - Millimeter Wave Technology - Small Cells and HetNets - Spectrum Sharing and Carrier Aggregation - Ultra-Reliable Low Latency Communication - Vehicle-to-Everything (V2X) Communication

Unit IV 5G Security and Privacy **9 Hours**

Security Challenges in 5G Networks - Network Slicing Security - Privacy Concerns in 5G - End-to-End Security Measures - 5G Security Standards - Incident Response and Management - Regulatory Compliance in 5G.

Unit V Applications and Future Trends **9 Hours**

Industry 4.0 and 5G- 5G in Healthcare- Smart Cities and 5G- 5G for Critical Communications- Satellite Communication.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the fundamentals, evolution, and global deployments of 5G technologies.	Understand
CO2: Summarize the components of 5G network architecture	Understand
CO3: Compare the advanced radio technologies used in 5G	Apply
CO4: Describe the basics of 5G Security and Privacy	Apply
CO5: Explore the Applications and Future Trends of 5G.	Apply

Text Book(s):

T1. "5G NR: The Next Generation Wireless Access Technology" by Erik Dahlman, Stefan Parkvall, and Johan Sköld, Academic Press, 2018.

T2." 5G System Design: An End-to-End Perspective by Veli-Matti Tapani Mäkynen Wiley. 2020.

Reference Book(s):

R1. “5G Mobile Communications: Concepts and Technologies" by Raj Pandya, Cambridge University Press,2020

R2. 5G: The Convergence of Wireless Communications”, Peter Alesso, BY Sajal K. Das and Chandra K. Jaggi, CRC Press,2020

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCOC1003	Course Title: Digital Watermarking and Steganography		
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: Teach the concepts of information hiding, steganography, and watermarking.

2: Compare different watermarking systems based on specified criteria.

3: Experiment embedding and coding techniques in practical watermarking scenarios.

4: Implement Watermark Security & Authentication.

5: Implement the basics of Steganography.

Unit I Introduction 9 Hours

Information Hiding, Steganography and Watermarking – History of watermarking – Importance of digital watermarking – Applications – Properties – Evaluating watermarking systems. watermarking models & message coding: Communication based models – Geometric models

Unit II Watermarking With Side Information & Analyzing Errors 9 Hours

Informed Embedding – Informed Coding – Structured dirty-paper codes – Message errors – False positive errors – False negative errors – ROC curves – Effect of whitening on error rates.

Unit III Perceptual Models 9 Hours

Evaluating perceptual impact – General form of a perceptual model – Examples of perceptual models – Robust watermarking approaches – Redundant Embedding, Spread Spectrum Coding, Embedding in Perceptually significant coefficients

Unit IV Watermark Security & Authentication 9 Hours

Security requirements – Watermark security and cryptography – Attacks – Exact authentication – Selective authentication – Localization – Restoration.

Unit V Steganography **9 Hours**

Steganography communication – Notation and terminology – Informationtheoretic foundations of steganography – Practical steganographic methods – Minimizing the embedding impact – Steganalysis.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the concepts of information hiding, steganography, and watermarking.	Understand
CO2: Compare different watermarking systems based on specified criteria.	Apply
CO3: Experiment embedding and coding techniques in practical watermarking scenarios.	Apply
CO4: Develop Watermark Security & Authentication.	Apply
CO5: Implement the basics of Steganography.	Apply

Text Book(s):

T1. "Digital Watermarking and Steganography: Fundamentals and Techniques" Frank Y. Shih, CRC Press, 2018

T2. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, “Digital Watermarking and Steganography”, Margan Kaufmann Publishers, New York, 2008.

Reference Book(s):

R1. Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, “Techniques and Applications of Digital Watermarking and Contest Protection”, Artech House, London, 2003.

R2. Peter Wayner, “Disappearing Cryptography – Information Hiding: Steganography & Watermarking”, Morgan Kaufmann Publishers, New York, 2002.

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCOC1004	Course Title: Criminal Psychology And Behavioural Intelligence		
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: Teach the scope and historical development of criminal psychology.

2: Examine theories, motivations, and typologies of criminal behavior.

3: Discuss the application of profiling and behavioral intelligence in criminal investigations.

4: Explain the role of forensic psychology in legal proceedings and the criminal justice system.

5: Illustrate the application of behavioral science in crime prevention and counterterrorism..

Unit I Introduction to Criminal Psychology 9 Hours

Definition and Scope-Historical Development-Theories of Crime Causation-Criminal Profiling Psychopathy and Antisocial Behavior-Ethics in Criminal Psychology-Forensic Psychology and the Legal System-Emerging Trends in Criminal Psychology

Unit II Understanding Criminal Behavior 9 Hours

Criminal Motivations-Typologies of Offenders-Criminal Personality Traits-Behavioral Analysis in Crime Scenes -Criminal Modus Operandi-Serial Offenders vs. Spree Killers-Victimization and Criminal Behavior-Cultural and Societal Influences

Unit III Behavioral Intelligence and Profiling 9 Hours

Introduction to Behavioral Intelligence-Role of Profiling in Investigations-Criminal Investigative Analysis (CIA) Creating Offender Profiles-Crime Scene Analysis-Linkage Analysis-Geographic Profiling-Challenges in Behavioral Intelligence

Unit IV Forensic Psychology in Legal Proceedings 9 Hours

Expert Witness Testimony-Competency and Insanity-Eyewitness Testimony and Memory-Jury Selection and Decision-Making-False Confessions and Interrogation Techniques-Psychiatric Evaluations in Criminal Cases-Mitigation Strategies in Sentencing-Mental Health in Correctional Settings

Unit V Applied Behavioral Science and Prevention 9 Hours

Behavioral Analysis in Threat Assessment-Profiling in Cybercrime-Behavioral Science in Counterterrorism-Crime Prevention Strategies-Rehabilitation and Recidivism-Community Policing and Behavioral Insights-Ethics in Applied Behavioral Science

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Summarize the scope and historical development of criminal psychology.	Understand
CO2: Examine theories, motivations, and typologies of criminal behavior.	Understand
CO3: Experiment the application of profiling and behavioral intelligence in criminal investigations.	Understand
CO4: Explain the role of forensic psychology in legal proceedings and the criminal justice system.	Understand
CO5: Illustrate the application of behavioral science in crime prevention and counterterrorism.	Understand

Text Book(s):

T1. ""Criminal Profiling: An Introduction to Behavioral Evidence Analysis" Brent E. Turvey Publisher: Academic Press, Year of Publication: 2011

T2. "Forensic Psychology: A Very Short Introduction" David Canter ,Oxford University Press, 2010

Reference Book(s):

R1."Criminal Psychology: Understanding the Criminal Mind and Its Nature Through Criminal Profiling" James Julian ,CreateSpace Independent Publishing Platform, 2016

R2."Forensic and Legal Psychology: Psychological Science Applied to Law" Mark Costanzo and Daniel Krauss ,Worth Publishers, 2018

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCOC1005	Course Title: Biometric And 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: Teach the principles of biometrics.

2: Discuss various biometric modalities and their characteristics..

3: Design and implement of biometric systems

4: Analyze and counteract security threats and challenges in biometric systems.

5: Develop creative solutions using biometrics

Unit I Introduction to Biometrics and Security 9 Hours

Definition and Principles of Biometrics-Types of Biometric Modalities-Biometric System Components-Challenges and Concerns -Legal and Ethical Considerations -Emerging Trends in Biometric Security

Unit II Biometric Modalities 9 Hours

Fingerprint Recognition-Iris Recognition-Facial Recognition -Voice Recognition-Palmprint Recognition-Retina and Ocular Recognition-Behavioral Biometrics-Multimodal Biometrics

Unit III Biometric System Design and Implementation 9 Hours

Biometric Database Management-Feature Extraction and Matching Algorithms-Template Protection and Encryption-Biometric System Integration-Performance Evaluation Metrics-Usability and Accessibility-Human Factors in Biometric Systems-Biometric Standards and Protocols

Unit IV Biometric Security: Threats and Countermeasures 9 Hours

Spoofing and Presentation Attacks-Biometric Data Privacy-Template Storage and Transmission Security-Biometric Cryptography-Biometric Key Management-Secure Biometric Template Protection-Continuous Authentication

Unit V Recent Trends **9 Hours**

Biometrics in IoT and Wearables- Biometrics and Blockchain-Ethical Hacking for Biometric Security- Quantum Biometric Security-User-Centric Biometrics

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the principles of biometrics.	Understand
CO2: Summarize various biometric modalities and their characteristics..	Understand
CO3: Design and implement of biometric systems	Apply
CO4: Analyze and counteract security threats and challenges in biometric systems.	Apply
CO5: Develop creative solutions using biometrics	Apply

Text Book(s):

T1. "Biometric Recognition: Challenges and Opportunities" ,Anil K. Jain, Arun Ross, and Karthik Nandakumar ,Springer, 2010.

T2. "Handbook of Biometrics" edited by Anil K. Jain, Patrick Flynn, and Arun A. Ross Springer,2007

Reference Book(s):

R1. Biometric Security and Privacy: Opportunities & Challenges in The Big Data Era" by Anne K. Watson and Samuel P. Watson ,Springer, 2017

R2. "Biometrics in Support of Military Operations: Lessons from the Battlefield" by National Research Council ,National Academies Press, 2014

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCOC1006	Course Title: Security Audit and Risk Assessment		
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: Teach the basics of Information Security Performance Metrics and Audit

2:Explain Information Security Audit Tasks and Reports

3: Demonstrate the importance of Vulnerability Management

4:Build the plan for Information Security Assessments

5: Implement configuration management and control policies.

Unit I Information Security Performance Metrics and Audit 9 Hours

Introduction to Security Audit- Servers and Storage devices-Infrastructure and Networks, Communication Routes- Information Security Methodologies (Black-box, White-box, Greybox), Phases of Information Security Audit and Strategies-Ethics of an Information Security Auditor etc.

Unit II Information Security Audit Tasks and Reports 9 Hours

Information Gathering -Vulnerability Analysis-External Security Audit-Internal Network Security Audit-Firewall Security Audit-IDS Security Auditing-Social Engineering Security Auditing-Web Application Security Auditing, Information Security Audit Deliverables & Writing Report.

Unit III Vulnerability Management 9 Hours

Information Security Vulnerabilities – Threats and Vulnerabilities, Human-based Social Engineering-Computer-based Social Engineering, Social Media Countermeasures, Vulnerability Management – Vulnerability Scanning, Testing, Threat management, Remediation etc.

Unit IV Information Security Assessments 9 Hours

Vulnerability Assessment Phases, Vulnerability Analysis Stages, Characteristics of a Good Vulnerability Assessment Solutions &Considerations, Vulnerability Assessment Reports – Tools and choosing a right Tool, Information Security Risk Assessment, Risk Treatment, Residual Risk, Risk Acceptance, Risk Management Feedback Loops etc.

Unit V Configuration Reviews **9 Hours**

Introduction to Configuration Management-Configuration Management Requirements-Plan Control-Development of configuration Control Policies- Testing Configuration Management

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the basics of Information Security Performance Metrics and Audit	Understand
CO2:Summarize Information Security Audit Tasks and Reports	Understand
CO3: Demonstrate the importance of Vulnerability Management	Apply
CO4:Build the plan for Information Security Assessments	Apply
CO5: Implement configuration management and control policies.	Apply

Text Book(s):

T1. Assessing Information Security (strategies, tactics, logic and framework) by A Vladimirov, K.Gavrilenko, and A.Michajlowski., IT Governance Publishing,2010

T2. The Art of Computer Virus Research and Defense by Peter Szor.", Addison-Wesley 2005.

Reference Book(s):

R1. "Information Security Management Principles" by David Alexander, Amanda Finch, and David Sutton BCS Learning & Development Limited, 2019

R2. "NIST Special Publication 800-37: Guide for Applying the Risk Management Framework to Federal Information Systems" NIST National Institute of Standards and Technology, 2018

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCOC1007	Course Title: Software Engineering		
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: Teach the phases in Software Process And Agile Development

2: Explain the concepts of requirements engineering

3: Illustrate various software design methodologies

4: Compare various testing, SQA and maintenance measures

5: Implement the concept of software Project Management And Sqa

Unit I Software Process And Agile Development 9 Hours

Introduction: The Evolving Role of Software, Software Characteristics, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile Process-Extreme programming-XP Process

Unit II Requirements Analysis And Specification 9 Hours

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirement‘s elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary

Unit III Software Design 9 Hours

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components

Unit IV Testing And Maintenance 9 Hours

Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging –Software Implementation Techniques: Coding Practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering

Unit V Project Management And Sqa **9 Hours**

Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection - Risk Management-Risk Identification-RMMM Plan, SQA-Concepts, Cost of Quality, Software Quality Group (SQA)

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the phases in Software Process And Agile Development	Understand
CO2: Summarize the concepts of requirements engineering	
CO3 Demonstrate various software design methodologies	Apply
CO4: Develop various testing, SQA and maintenance measures	Evaluate
Build the concept of software Project Management And Sqa	Apply

Text Book(s):

T1.Roger S. Pressman, ―Software Engineering – A Practitioner‘s Approach‖, Seventh Edition, McGraw-Hill International Edition, 2010.

T2.Ian Sommerville, ―Software Engineering‖, 9th Edition, Pearson Education Asia, 2011

Reference Book(s):

R1. Rajib Mall, ―Fundamentals of Software Engineering Third Edition,PHI Learning PrivateLimited, 2009

R2.Pankaj Jalote, ―Software Engineering, A Precise Approach‖, Wiley India, 2010

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCOC1008	Course Title: Theory of Computing		
Course Category: Open Elective		Course Level : Introductory	
L: T: P(Hours/Week)	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

-

Course Objectives

The course is intended to:

1: Teach foundations of computation including automata theory

2: construct models of regular expressions and languages.

3: design context free grammar and push down automata

4: Explain understand Turing machines and their capability

5. Experiment Unsolvable Problems and Computable Functions

Unit I Automata And Regular Expressions 9 Hours

Need for automata theory - Introduction to formal proof – Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Equivalence between NFA and DFA – Finite Automata with Epsilon transitions – Equivalence of NFA and DFA- Equivalence of NFAs with and without ε-moves- Conversion of NFA into DFA – Minimization of DFAs

Unit II Regular Expressions And Languages 9 Hours

Regular expression – Regular Languages- Equivalence of Finite Automata and regular expressions – Proving languages to be not regular (Pumping Lemma) – Closure properties of regular languages

Unit III Context Free Grammar And Push Down Automata 9 Hours

Types of Grammar - Chomsky‘s hierarchy of languages -Context-Free Grammar (CFG) and Languages – Derivations and Parse trees – Ambiguity in grammars and languages – Push Down Automata (PDA): Definition – Moves - Instantaneous descriptions -Languages of pushdown automata – Equivalence of pushdown automata and CFG-CFG to PDA-PDA to CFG – Deterministic Pushdown Automata.

Unit IV Normal Forms And Turing Machines 9 Hours

Normal forms for CFG – Simplification of CFG- Chomsky Normal Form (CNF) and Greibach Normal Form (GNF) – Pumping lemma for CFL – Closure properties of Context Free Languages – Turing Machine : Basic model – definition and representation – Instantaneous Description – Language acceptance by TM – TM as Computer of Integer functions – Programming techniques for Turing machines (subroutines).

Unit V Undecidability **9 Hours**

Unsolvable Problems and Computable Functions –PCP-MPCP- Recursive and recursively enumerable languages – Properties - Universal Turing machine -Tractable and Intractable problems - P and NP completeness – Kruskal's algorithm – Travelling Salesman Problem- 3-CNF SAT problems

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Teach foundations of computation including automata theory	Understand
CO2: construct models of regular expressions and languages.	Apply
CO3: design context free grammar and push down automata	Apply
CO4: Explain understand Turing machines and their capability	Apply
CO5: Experiment Unsolvable Problems and Computable Functions	Apply

Text Book(s):

T1.Hopcroft J.E., Motwani R. & Ullman J.D., "Introduction to Automata Theory, Languages and

Reference Book(s):

R1.Harry R Lewis and Christos H Papadimitriou , "Elements of the Theory of Computation", 2nd Edition, Prentice Hall of India, 2015.

R2.Peter Linz, "An Introduction to Formal Language and Automata", 6th Edition, Jones & Bartlett, 2016

Web References:

http://webpages.uncc.edu/ras/ITCS2215.html

http://www.pearsoned.co.in/prc/book/anany-levitin-introduction-design-analysisalgorithms-2e-2/9788131718377

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCOC1009	Course Title: Android Programming		
Course Category: Open Elective		Course Level : Introductory	
L: T: P(Hours/Week)	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Understand the Fundamentals of Android Development

2. Apply Advanced UI Design Principles in Android Development

3. Implement Data Storage Solutions in Android Applications

4. Integrate Multimedia and Location Services in Android Apps

5. Optimize App Performance and Deploy on the Google Play Store

Unit I Introduction to Android Development 9 Hours

Android Architecture Overview-Setting up Android Studio Environment-Basic UI Components: Text View, Button, Edit Text-Layouts: Linear Layout, Relative Layout, Constraint Layout-Event Handling and User Input-Activities and Intents

Unit II Building User Interfaces 9 Hours

Advanced UI Components: Recycler View, Card View-Fragment Lifecycle and Communication-Custom Views and View Groups-Styling and Themes-Animation and Transitions-Accessibility in Android Apps

Unit III Data Storage and Retrieval 9 Hours

SQLite Database Integration-Content Providers and URIs- Shared Preferences for Data Storage-Working with Files and Directories-Network Operations and AsyncTask-SON Parsing in Android.

Unit IV Multimedia and Location Services 9 Hours

Image Loading and Caching-Audio and Video Playback-Camera API and Photo CaptureLocation-Based Services and GPS-Google Maps Integration-Multimedia Accessibility-Handling Large Media Files .

Unit V Advanced Topics and App Deployment 9 Hours

Background Processing and Services-JobIntentService and Work Manager-Optimizing App Performance-Memory Management in Android-Google Play Store Guidelines-Analytics and User Tracking

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the key components of Android architecture	Understand
CO2: Designing and implementing complex user interfaces in Android.	Apply
CO3: Develop Android apps that effectively utilize SQLite databases, content providers, and Shared Preferences	Apply
CO4: Synthesize knowledge by incorporating multimedia elements, implementing location-based services	Apply
CO5:Evaluate and implement advanced topics such as background processing, memory management	Apply

Text Book(s):

T1. Android Application Development: A Beginner's Tutorial by Budi Kurniawan and Vishal Layka, O'Reilly,2017.

T2.Learn Android Studio 3: Efficient Android App Development by Ted Hagos, Apress,2017

Reference Book(s):

R1."Android Programming: The Big Nerd Ranch Guide" by Bill Phillips and Chris Stewart, Big Nerd Ranch publishers, Third Edition, 2013..

R2. Professional Android" by Reto Meier, Wrox, 2018(4th edition

Web References:

1.https://developer.android.com/

Course Articulation Matrix

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

Course Code: 19SCOC2010	Course Title: Cyber security		
Course Category: Open Elective		Course Level: Introductory	
L:T:P (Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max Marks:100

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Discuss the various concepts in Cyber security and infrastructures involved.
2. Describe the cyber-crimes, reporting procedures and legal remedies.
3. Explain various social media related security issues and reporting flaws.
4. Explain various settings related to E-Commerce and digital payments.
5. Demonstrate the security aspects related to digital devices and technology.

Unit I Introduction to Cyber Security **6 Hours**

Defining Cyberspace and Overview of Computer and Web-technology - Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security

Unit II Cyber crime and Cyber law **6 Hours**

Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India, Case studies

Unit III Social Media Overview and Security **6 Hours**

Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.

Unit IV E-Commerce and Digital Payments 6 Hours

Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorized banking transactions. Relevant provisions of Payment Settlement Act,2007.

Unit V Digital Devices Security, Tools and Technologies for Cyber Security 6 Hours

End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions

List of Exercises 30 Hours

1. Prepare checklist for following scenarios :
   a) Reporting cybercrime at Cybercrime Police Station.
   b) Reporting cybercrime online.
   c) Using popular social media platforms.
   d) Secure net banking.
2. Demonstrate the following:
   a) Reporting phishing emails, email phishing attack and preventive measures.
   b) Reporting and redressal mechanism for violations and misuse of Social media platforms.
3. Manage the following activities:
   a) Privacy and security settings for popular Social media platforms, Mobile Wallets and UPIs.
   b) Application permissions in mobile phone.
4. Perform the following activities:
   a) Setting, configuring and managing three password policy in the computer (BIOS, Administrator and Standard User).
   b) Setting and configuring two factor authentication in the Mobile phone.
5. Demonstrate the following:
   a) Security patch management and updates in computer and mobiles.
   b) Wi-Fi security management in computer and mobile.
6. Install and configure computer Anti-virus & Computer Host Firewall.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Describe the concept of Cyber Security and infrastructure involved.	Understand
CO2: Develop procedures for reporting various cyber-crimes through available platforms.	Apply
CO3: Demonstrate various social media related security issues and reporting flaws.	Apply
CO4: Illustrate various settings in e-commerce and digital payment applications.	Apply
CO5: Demonstrate the digital devices security, tools and technologies for cyber security.	Apply

Text Book(s):

T1. R.C Mishra, “Cyber Crime Impact in the New Millennium” Authors Press, 2010.

T2. Sumit Belapure and Nina Godbole, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, 1st Edition, Wiley India Pvt. Ltd, 2011.

T3. Henry A.Oliver, “Security in the Digital Age: Social Media Security Threats and Vulnerabilities” Create Space Independent Publishing Platform, Pearson Education, 2001.

Reference Book(s):

R1. Eric Cole, Ronald Krutz, James W. Conley, “Network Security Bible”, 2nd Edition, Wiley India Pvt. Ltd, 2001

R2. E. Maiwald, “Security Fundamentals of Network” McGraw Hill ,2014

R3. Kumar K, “ Cyber Laws: Intellectual Property & E-Commerce Security” Dominant Publishers, 2011.

Web Reference(s):

1. https://unacademy.com/content/upsc/study-material/science-and- technology/initiatives-taken-by-indian-government-for-cyber-security/
2. https://cybercrime.gov.in/
3. https://www.meity.gov.in/cyber-security-division
4. https://intellipaat.com/blog/what-is-cyber-security/

Course Articulation Matrix:

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

High-3; Medium-2;Low-1

Diversified Electives			
Course Code: 19ITEN1029	**Course Title: Intellectual Property Rights**		
Course Category: Professional Elective		**Course Level : Introductory**	
L: T: P(Hours/Week)	**Credits:3**	**Total Contact Hours:45**	**Max. Marks:100**

Pre-requisites

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Course Objectives

The course is intended to:

1: Teach the basic concepts of Intellectual Property Law.

2: Explain the classification of Patents Rights and Limitations.

3: Describe the Patent Searching Process and Application Filling Process

4: Explain the concepts and principles of Trademark.

5:Summarize the principles of copyright and its sources.

Unit I Intellectual Property: An Introduction 9 Hours

Intellectual Property Law: Patent Law-Copyright Law-Trademark Law- Trade secret Law - Right of Publicity-Paralegal tasks in Intellectual Property Law-Ethical obligations of the paralegal in Intellectual Property Law-Trade secrets: Protectible as a trade secret-Maintaining trade secretsProtecting an Idea

Unit II Patents: Rights and Limitations 9 Hours

Sources of patent law-Subject matter of Patents: Utility Patents-Plant Patents-Design Patents - Design Patents and copyright-Design Patents and trademarks-Computer Software, Business methods and Patent Protection-Rights under Patent Law-Patent Requirements-Limitations on Patent Rights-Patent Ownership

Unit III Patents: Research, Applications, Disputes, and International 9 Hours

Considerations

Patent Search Process-Patent Application Process-Patent Infringement-Patent Litigation,

International Patent laws.

Unit IV Principles of Trademark 9 Hours

Trademarks and Unfair Competition-Acquiring Trademark Rights-Types of Marks, Strong Marks Versus Weak Marks-Selecting and Evaluating a Trademark-International Trademark Law

Unit V Principles of Copyrights **9 Hours**

Sources of Copyright Law- The Eight Categories of Works of Authorship-Derivative Works and Compilations- Rights and Limitations :Grant of Exclusive Rights–Copyrights Ownership-International Copyright Law

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the basic concepts of Intellectual Property Law.	Understand
CO2: Understand the classification of Patents Rights and Limitations.	Understand
CO3: Describe the Patent Searching Process and Application Filling Process	Understand
CO4: Explain the concepts and principles of Trademark.	Understand
CO5: Summarize the principles of copyright and its sources.	Understand

Text Book(s):

T1 Richard Stim, “Intellectual Property: Copyrights, Trademark and Patents”, Cengage learning, 2nd edition 2012.

Reference Book(s):

R1. Deborah E. Bouchoux, “Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets”, Cengage Learning, Third Edition, 2013.

R2. Prabuddha Ganguli,”Intellectual Property Rights: Unleashing the Knowledge Economy”, McGraw Hill Education, 2017.

Web References:
http://webpages.uncc.edu/ras/ITCS2215.html
http://www.pearsoned.co.in/prc/book/anany-levitin-introduction-design-analysisalgorithms-2e-2/9788131718377

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19ITEN1029	Course Title: Fundamentals of Entrepreneurship		
Course Category: Professional Elective		Course Level : Introductory	
L: T: P(Hours/Week)	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1: Teach the types, characteristics of entrepreneurship.

2: Compare the types of entrepreneurship.

3: Explain the appropriate form of business ownership in setting up an enterprise

4: Disseminate the support and management to entrepreneurs in the growth strategies

5 .Explain the techniques involved in development of industries.

Unit I Entrepreneurship 9 Hours

Entrepreneur – Characteristics – Entrepreneurial Decision Process-Types of Entrepreneurs – Difference between Entrepreneur and a manager-Intrapreneur-Social Entrepreneur – Entrepreneurial Growth- Role of Entrepreneurship in Economic Development.

Unit II Types of Entrepreneurship 9 Hours

Women Entrepreneurship-Rural Entrepreneurship-Tourism Enterprise, Entrepreneurship

Policy Measure of Tourism Entrepreneurship-Eco-Tourism/Nature Tourism/Rural TourismNeed, Opportunities, Challenges for Developing Agri-preneurship- -Social Entrepreneurship

Unit III Start-Up 9 Hours

Small Enterprises-Micro and Macro Units-Essentials, Features and Characteristics Relationship between Micro and Macro Enterprises-Scope of Micro and Small Enterprises - Enterprise and Society-Package for Promotion of Micro and Small-Scale Enterprises.

Unit IV Support and Management 9 Hours

Institutional Finance-Types of Lease Agreements-Lease Financing-Concept and Procedure for Hire-Purchase-Institutional Support to Small Entrepreneurs-Tax Benefits-Depreciation, Rehabilitation Allowance- Investment Allowance-Expenditure to Scientific Research-Tax Concession in Rural and Backward Areas.

Unit V Development **9 Hours**

Accounting for Small Enterprise-Types of Growth Strategies-Signal and Symptoms, Causes and Consequences of Industrial Sickness-Forms of Export Business-Types of Documents-E-Commerce Suitability for Small Enterprises-Types of Franchising-Evaluation of Franchise Arrangement-Corporate Citizenship.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the types, characteristics of entrepreneurship.	Understand
CO2: Summarize the types of entrepreneurship.	Understand
CO3: Build the appropriate form of business ownership	Apply
CO4: Disseminate the support and management to entrepreneurs in the growth strategies	Apply
CO5 .Explain the techniques involved in development of industries.	Apply

Text Book(s):

T1 S.S.Khanka, “Entrepreneurial Development” S.Chand & Co. Ltd. Ram Nagar New Delhi, 2020

Reference Book(s):

R1. Charantimath, P. M., “Entrepreneurship Development and Small Business Enterprises”, Pearson, 2006

R2. .Mathew J Manimala,” Entrepreneurship theory at cross roads: paradigms and praxis” Dream tech, 2nd edition 2006.

Web References:

http://webpages.uncc.edu/ras/ITCS2215.html

http://www.pearsoned.co.in/prc/book/anany-levitin-introduction-design-analysisalgorithms-2e-2/9788131718377

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19ITEN1029	Course Title: Design Thinking and Innovation		
Course Category: Professional Elective		Course Level : Introductory	
L: T: P(Hours/Week)	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

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Course Objectives

The course is intended to:

1: Teach the fundamental concepts and principles of design thinking.

2: Explain the design thinking methods in each stage of the problem.

3: Demonstrate innovative ideas using prototypes

4: Discuss the significance of Evaluating and Testing Ideas.

5: Build the design thinking approach to real world problems.

Unit I Introduction To Design Thinking 9 Hours

Design thinking overview - Impact of Design Thinking - Design Process – Principles of Design Thinking – Creating Ideal Conditions – Case Study: Identify problem in AI.

Unit II Understand The Problem 9 Hours

Information Gathering – Analysis – Storytelling tool- Innovation- Ideation Finding and Evaluating Ideas –Mind Mapping Tool. Case Study: Analysis of the Identified Problem

Unit III Defining Prototypes 9 Hours

Asks in Prototyping – Understanding Different Prototypes - Developing different prototypes – Demonstration – Prototyping Tools. Case Study: Prototype the solution.

Unit IV Evaluating And Testing Ideas 9 Hours

Finding Ideas – Developing Ideas Intuitively and Creatively - Selecting Evaluation method – Evaluating Ideas with checklist –Testing Ideas and Assumptions – Tasks in the Test Phase – Testing with Interviews – Testing with Online Studies – Case Study: Evaluate the solution

Unit V Applications 9 Hours

Politics and Society – Business – Strategic technology Plan – Creativity – Visioning, Listening and Diagramming - HealthCare and Science – Approach to treat Cancer – Law – Problem Definition – Alternatives

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Teach the fundamental concepts and principles of design thinking.	Understand
CO2: Explain the design thinking methods in each stage of the problem.	Understand
CO3: Demonstrate innovative ideas using prototypes	Understand
CO4: Discuss the significance of Evaluating and Testing Ideas.	Understand
CO5: Build the design thinking approach to real world problems.	Apply

Text Book(s):

T1 Muller-Roterberg "Design thinking for dummies" John Wiley & Sons,2020.(Unit-I,III & IV

Reference Book(s):

R1. Robert Curedale, "Design Thinking Process & Methods" Design Community College, 5th Edition, 2019.

R2. Alyssa Gallagher and Kami Thordarson, "Design Thinking in Play: An Action Guide for Educators", ASCD Book, 2020

Web References:

http://webpages.uncc.edu/ras/ITCS2215.html

http://www.pearsoned.co.in/prc/book/anany-levitin-introduction-design-analysisalgorithms-2e-2/9788131718377

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code:19MEEC2002	Course Title: PLM FOR ENGINEERS (All branches)		
Course Category: Professional Elective		Course Level: Mastery	
L:T:P (Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max. Marks:100

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. To explain the fundamentals of PLM
2. To provide an in-depth understanding of business processes in the PLM.
3. To explain the management concept for product development in PLM.
4. To explain the importance of Digital Manufacturing in PLM.
5. To explain the use case scenarios through various customer case studies.

UNIT I BUSINESS STRATEGY IN THE PLM **6**

Definition, PLM Lifecycle Model, Threads of PLM, Need for PLM, Opportunities and Benefits of PLM, Components and Phases of PLM, PLM feasibility Study, PLM Visioning, Strategy, Impact of strategy, Implementing a PLM strategy, PLM Initiatives to Support Corporate Objectives, Infrastructure Assessment.

UNITII BUSINESS PROCESSES IN THE PLM **6**

Characteristics of PLM, Environment Driving PLM, PLM Elements, Drivers of PLM, Conceptualization, Design, Development, Validation, Production, Support of PLM. Engineering Vaulting, Product Reuse, Smart Parts, Engineering Change Management, Workflow Management.

UNIT III PRODUCT DEVELOPMENT CONCEPTS IN THE PLM **6**

Bill of Materials (E-BOM, M-BOM, S-BOM) and Process Consistency, Product Structure, Configuring BOM, Simulation Process Management, Variant Management, Digital Mock-Up and Prototype Development, Design for Environment, Virtual Testing and Validation, Marketing Collateral.

UNIT IV DIGITAL MANUFACTURING IN THE PLM **6**

Digital Manufacturing, Benefits of Digital Manufacturing, Manufacturing the First-One, Ramp Up, Virtual Learning Curve, Manufacturing the Rest, Production Planning.

UNIT VCUSTOMER USE CASES OF THE PLM **6**

Impact and Challenges faced while implementing a successful PLM strategy -Rolls Royce, Nissan Motor, SunseekerInternational ,Xtrac,Kesslers international and Monier and Weatherford international.

List of Experiments **30**

1. Demonstrate the 2-Tier & 4-Tier Architectures and Basic Teamcenter applications like Organization, Project, and Schedule Manager.

2.Create CAD and Non-CAD datasets (MS Office, Notepad, etc.) by using explicit and implicit Check-In and Check-Out to create multiple iterations.

3. Create the access control (Read, Write, and Delete) for the given dataset and block the access rights to other group members belongs to the same department. Also Perform the Impact Analysis (Where Used and Where Referenced) of a given dataset which is used in multiple assemblies.

4.createthe Product Structure in Structure Manager with 5 components assembled in first level and 3 components Assembled in second, third and fourth level with the sub-assemblies and export the assembly in local drive. Also, demonstrate the Variant Management.

5.Export the CAD dataset as a JT file and perform the various visualization tasks like Measurements, Sectioning, PMI, and Mark-up using JT2GO application.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Understand PLM strategy based on the business needs	Understand
CO2: Explain various business processes in the PLM	Understand
CO3: Understand the product development concepts involved in the PLM	Understand
CO4: Explain the use of Digital Manufacturing environment in the PLM.	Understand
CO5: Understand the various customer use cases of the PLM	Understand

Text Book(s):

T1. John Stark, “Product Lifecycle Management: Volume 1: 21st Century Paradigm for Product Realisation”, Springer International Publishing Switzerland, 3rd edition, 2015.

T2. Grieves Michael, “Product Lifecycle Management- Driving the Next Generation of Lean Thinking”, McGraw-Hill, 2010.

T3. Wang, Lihui; Nee, Andrew Y.C. (Eds.) Collaborative Design and Planning for Digital Manufacturing, Springer, 2009.

Reference(s):

R1. Elangovan, U., “Product Lifecycle Management (PLM)”. Boca Raton, CRC Press, 2020.

R2. Fabio Giudice, Guido La Rosa, Product Design for the environment-A life cycle approach, Taylor & Francis 2006.

R3. AnttiSaaksvuori, “ Product Life Cycle Management” - AnselmiImmonen, Springer, 1st Edition, 2003.

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	2	1
CO2	2	1	-	-	1	-	-	1	-	1	-	1	2	1
CO3	2	1	-	-	1	-	-	1	-	1	-	1	2	1
CO4	2	1	-	-	1	-	-	1	-	1	-	1	2	1
CO5	2	1	-	-	1	-	-	1	-	1	-	1	2	1

High-3; Medium-2; Low-1

Course Code: 19AMIC1001		Course Title: AWS and DevOps Essentials (common to AM & SC)	
Course Category: Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Prerequisites: Nil

Course Objectives

The course is intended to:

1. Demonstrate the various Amazon web services
2. Build CI/CD strategy followed in project development
3. Develop python applications using advanced features
4. Demonstrate the PowerShell basic commands
5. Design the PowerShell script for processes, services, management and remote execution

Unit I Amazon Web Services Fundamentals **10 Hours**

Overview of Amazon Web Services (AWS) - Identity Management and Governance in AWS-AWS Administration-Networking and Security-NetworkConnectivity-Network Traffic Management-AWS Storage-EC2-Data Protection-Containers and Serverless Computing-Monitoring

Unit II Core Concepts of DevOps **6 Hours**

Fundamentals of DevOps -GIT-Ansible-Jenkins-Dockers-DevOps with Azure and AWS.

Unit III Python Programming for DevOps **11 Hours**

Python Introduction-Data Structures-Functions and Decorators-Modules-Error Handling-Input/ Output-Classes in Python - Regular Expressions-GUI in Python.

Unit IV Basic Concepts of PowerShell **9 Hours**

PowerShell Introduction-Data Structures-Objects-Conditional-Loops-Functions and Pipelines- Script Execution-Error Handling-Input / Output

Unit V PowerShell Advanced Automation and Configuration **9 Hours**

Text Processing and Regular Expressions-Configuration using XML-Windows Registry-Processes, Services and Event Log Management-WMI Management-Remote Execution-Workflow-Desired State Configuration (DSC)

Course Outcomes	Cognitive Level
At the end of the course the student will be able to:	
CO1: Demonstrate the various Amazon web services for deploying applications and monitoring services	Apply
CO2: Build CI/CD strategy followed in project development using GIT, Docker and AWS	Apply
CO3: Develop python applications using advanced features	Apply
CO4: Demonstrate the powershell basic commands for file management with error handling	Apply
CO5: Design the powershell script for processes, services, management and remote execution	Apply

Web References:

1. https://aws.amazon.com/free/?
2. https://git-scm.com/docs/git#_git_commands
3. Official documentation of python 3.10: https://docs.python.org/3/tutorial/
4. https://www.pdq.com/powershell/

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Course Code: 19ITIC1001	Course Title: Integrated Big Data Solutions (Common to AD,AM CS,IT &SC)		
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, Database Management Systems

Course Objectives

The course is intended to:

1. Apply the principles of distributed computing to analyze and solve complex computing problems.
2. Implement and configure NoSQL databases to handle large-scale data storage and retrieval.
3. Develop and construct a data warehouse system to support data analysis.
4. Utilize the MapReduce programming model for processing large datasets.
5. Design an analytics machine using big data analytic tools.

Unit I Distributed Computing 9 Hours

Introduction – Message Passing – Shared Memory – Consensus algorithms – Distributed Transactions, Mutual exclusions, dead locks – Local & Global time and state – Distributed file systems.

Unit II NoSQL 9 Hours

Introduction to NoSQL Databases – Definition and Purpose – CAP Theorem – Overview of CAP – Consistency and Availability – Type of NoSQL Databases – Key-Value Stores – Document Stores Column – Family Stores – Graph Databases.

Unit III Data Warehouse & Mining 9 Hours

Data Warehouse Basics – Data Warehouse Architecture – Modeling Facts – Modeling Dimensions – Schemas – Data Cleansing Techniques – ETL Process – Data Mining – Introduction to Techniques.

Unit IV Introduction to Big Data computing 9 Hours

Defining Big Data, 3 Vs – Challenges and Opportunities – Role of Computing Frameworks– Hadoop – Introduction to Apache Hadoop – Components of the Hadoop Ecosystem – MapReduce Programming Model – HDFS: Architecture – HDFS Commands –Data Replication and Fault Tolerance.

Unit V Big Data Analytics Tools 9 Hours

Apache Spark – Spark's Role in Big Data Analytics – PySpark – Overview of PySpark – Data Processing with PySpark – Data Processing – Data Lakehouse Concepts – Performance Considerations.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply distributed computing concepts to design and implement solutions for parallel and scalable systems.	Apply
CO2: Implement optimized data storage and retrieval techniques in NoSQL databases for high-performance applications.	Apply
CO3: Utilize data warehousing concepts and data mining techniques to extract insights and inform decision-making in real-world scenarios	Apply
CO4: Apply the MapReduce programming model to develop and execute big data applications efficiently.	Apply
CO5: Implement data visualization techniques to effectively communicate insights from data.	Apply

Text Book(s):

T1. Andrew S. Tanenbaum, Maarten Van Steen, “Distributed Systems”, 3rd Edition, Pearson Education, 2017. (Unit 1)

T2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013. (Unit 2,3,4,5)

Reference Book(s):

R1. Jiawei Han, Micheline Kamber and Jian Pei, “Data mining concepts and Techniques”, 3rd Edition, Elsevier, 2012

R2. Tom White, “Hadoop: The Definitive Guide”, O"Reilly Publication and Yahoo! Press, 4th Edition, 2015.

Web References:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/
2. https://hadoop.apache.org

Course Articulation Matrix

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

High-3; Medium-2; Low-1