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Curriculum and Syllabi

B.E. Computer Science and Engineering (Artificial Intelligence and Machine Learning)

Semesters I to VIII

Regulations 2019
(2022 Batch Onwards)

Programme: B.E Computer Science and Engineering
(Artificial Intelligence and Machine Learning)
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	Periods/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	Periods /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	தமிழரமரபு / Heritage of Tamils**	1	0	0	1	100	All
Total		**14**	**1**	**14**	**21**	**800**	

Semester III

Course Code	Course Title	Periods /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
19AMCN1301	Principles of Artificial Intelligence & Neural Networks	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 தொழில் நுட்பமும் / Tamils and Technology**	1	0	0	1	100	All
Total		**18**	**2**	**12**	**26**	**1000**	

Semester IV

Course Code	Course Title	Periods /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
19AMCN1401	Machine Learning Algorithms and Application	3	0	0	3	100	-
19AMCN1402	Neural Computing in Machine Learning	3	0	0	3	100	-
19AMCN3401	Machine Learning Laboratory	0	0	4	2	100	-
19AMCN3402	Neural Networks and AI Laboratory	0	0	4	2	100	-
19AMPN6401	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
19AMPN6001	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	Periods /Week			Credits	Marks	Common to Programmes
		L	T	P			
19AMCN1501	Deep Learning and Application	3	0	0	3	100	-
19AMCN1502	Embedded Systems and IoT	3	0	0	3	100	-
19AMCN1503	Software Engineering	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	-
19AMCN3501	Deep Learning and Application Laboratory	0	0	3	1.5	100	-
19AMCN3502	Embedded Systems and IoT 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	Periods /Week			Credits	Marks	Common to Programmes
		L	T	P			
19AMCN1601	AI Natural Language Processing	3	0	0	3	100	-
19AMCN1602	Vision and Image Processing	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	-
19AMCN3601	AI Natural Language Processing Laboratory	0	0	3	1.5	100	-
19AMCN3602	Vision and Image Processing Laboratory	0	0	3	1.5	100	-
19AMPN6601	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**	**900**	

Course Code	Course Title	Duration	Credits	Marks
19AMPN6002	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	Periods /Week			Credits	Marks	Common to Programmes
		L	T	P			
19AMCN1701	Big data Technology	3	0	0	3	100	-
19AMCN1702	Data Visualization Techniques	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	-
19AMCN3701	Big data Technology Laboratory	0	0	3	1.5	100	-
19AMCN3702	Data Visualization Techniques Laboratory	0	0	3	1.5	100	-
Total		**15**	**0**	**6**	**18**	**700**	

Semester VIII

Course Code	Course Title	Periods /Week			Credits	Marks	Common to Programmes
		L	T	P			
19SHVG6001	Entrepreneurship Development	1	0	0	1	100	All
19AMPN6801	Project	0	0	16	8	200	-
Total		**1**	**0**	**16**	**9**	**300**	

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 Data Science and AI							
Course Code	**Course Title**	**Periods /Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
19AMEN1001	Multivariate Data Analysis	3	0	0	3	100	-
19AMEN1002	Data Mining for Business Intelligence	3	0	0	3	100	-
19AMEN1003	Exploratory Data Analysis	3	0	0	3	100	-
19AMEN1004	Recommender Systems	3	0	0	3	100	-
19AMEN1005	Advanced Data and Visual Analytics in AI	3	0	0	3	100	-
19AMEN1006	Text and Speech Analysis	3	0	0	3	100	-
19AMEN1007	Business Analytics	3	0	0	3	100	-
19AMEN1008	Knowledge Engineering	3	0	0	3	100	-
19AMEN1041	Responsible AI	3	0	0	3	100	-

Vertical II AI in Cyber Security							
Course Code	**Course Title**	**Periods /Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
19AMEN1009	Applied Cryptography	3	0	0	3	100	-
19AMEN1010	Computer Network and Security	3	0	0	3	100	-
19AMEN1011	Intrusion Detection and Prevention Techniques	3	0	0	3	100	-
19AMEN1012	Software Vulnerability Analysis	3	0	0	3	100	-
19AMEN1013	Cybercrime Forensics and Digital Forensics	3	0	0	3	100	-
19AMEN1014	Distributed System Security	3	0	0	3	100	-
19AMEN1015	Ethical Hacking	3	0	0	3	100	-
19AMEN1016	Security and Privacy in Cloud	3	0	0	3	100	-

Vertical III IOT and Cloud							
Course Code	**Course Title**	**Periods /Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
19AMEN1017	IOT Architecture and Protocols	3	0	0	3	100	-
19AMEN1018	Data Science for IOT	3	0	0	3	100	-
19AMEN1019	IOT Security	3	0	0	3	100	-
19AMEN1020	Edge Computing	3	0	0	3	100	-
19AMEN1021	Storage Technologies	3	0	0	3	100	
19AMEN1022	Data Warehousing	3	0	0	3	100	-
19AMEN1023	Security and privacy in cloud	3	0	0	3	100	-
19AMEN1024	Cloud Computing	3	0	0	3	100	-

Vertical IV Full stack Development							
Course Code	**Course Title**	**Periods /Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
19AMEN1025	Web Technologies	3	0	0	3	100	-
19AMEN1026	App Development	3	0	0	3	100	-
19AMEN1027	UI and UX Design	3	0	0	3	100	-
19AMEN1028	Software Testing and Automation	3	0	0	3	100	-
19AMEN1029	Principles of Programming languages	3	0	0	3	100	-
19AMEN1030	DevOps	3	0	0	3	100	-
19AMEN1031	Web Application Security	3	0	0	3	100	-

Vertical V Emerging Technologies							
Course Code	**Course Title**	**Periods /Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
19AMEN1033	Augmented Reality/Virtual Reality	3	0	0	3	100	-
19AMEN1034	Robotic Process Automation	3	0	0	3	100	-
19AMEN1035	Solve Business Problems with AI	3	0	0	3	100	-
19AMEN1036	Real Time Cyber Security	3	0	0	3	100	-
19AMEN1037	Quantum Computing	3	0	0	3	100	-
19AMEN1038	Crypto currency and Block chain Technologies	3	0	0	3	100	-
19AMEN1039	Game Development	3	0	0	3	100	-
19AMEN1040	3D Printing and Design	3	0	0	3	100	-

Diversified Electives

Course Code	**Course Title**	**Periods /Week**			**Credits**	**Marks**	**Common to Programmes**
		L	**T**	**P**			
19ITEN1029	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	-
19SCEC2001	Cyber Security	2	0	2	3	100	-
19AMEN1032	Principles of Management	3	0	0	3	100	-
19MEEC2002	PLM for Engineers	2	0	2	3	100	AD,AM,AU, CS,EC,EE,EI, IT, ME & SC
19AMIC1001	AWS and DevOps Essentials	3	0	0	3	100	-
19ITEN1030	Integrated Big Data Solutions	3	0	0	3	100	-
19AMEN1041	Responsible AI	3	0	0	3	100	-

Open Electives (Offered to other Programmes)

Course Code	Course Title	Periods /Week			Credits	Marks
		L	T	P		
19AMOC1001	AI in Data Warehousing	3	0	0	3	100
19AMOC1002	Introduction to Machine Learning	3	0	0	3	100
19AMOC1003	Artificial Intelligence	3	0	0	3	100
19AMOC1004	Theory of computation Ecosystems	3	0	0	3	100
19AMOC1005	Machine Learning with Python	3	0	0	3	100
19AMOC1006	AI for everyone	3	0	0	3	100
19AMOC1007	Neural Networks and Deep Learning	3	0	0	3	100

Regulations 2019
(2022 Batch onwards)

Detailed 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-1

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, and 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-1

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
	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	PSO 1	PSO 2
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	PSO 1	PSO 2
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	PSO 1	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 (common to CS, 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. 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. Construct C Program using selection and iteration statements
6. 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 – circleof 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 Zdomain.

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	PSO1	PSO2
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 ofReport – 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:	
CO6: Listen actively and empathetically, and paraphrase discussions and presentations on complex and abstract themes and topics	Apply
CO2: Express one's views coherently, fluently and confidently highlighting the significant points with supporting details	Apply
CO3: Read and comprehend different types of texts and their contexts reasonably at moderate speed	Understand
CO4: Write detailed reports on variety of subjects synthesizing information gathered during listening & reading citing appropriate references	Apply

Text Book(s):

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

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

Reference Book(s):

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

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

Web References:

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

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	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 BooleanExpression 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	Apply
CO7: Explain the design of combinational logic circuits	Apply
CO8: Elucidate the analysis of synchronous sequential logic circuits	Apply
CO9: Elucidate the analysis of asynchronous sequential logic circuits	Apply
CO5: Categorize a computer system including Input /Output devices and Memory devices	Apply

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 Organizationand 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, 2004.
R4. Leach P Donald, Albert Paul Malvino and Goutam Saha, “Digital Principles and Applications”, 7th Edition, Mcgraw Hill, 2010.

Web References:

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

Course Articulation Matrix

CO	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	-	-	-	-
CO5	2	1	-	-	-	-	-	1	-	1	-	-	-	-

High-3; Medium-2; Low-1

Course Code: 19CSSN2201	Course Title: PROGRAMMING WITH C (common to CS, AD, AM & SC)		
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 – Pointerto 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 directivesFiles: Streams – File access: Sequential access, Random access – File type – File operations(open, close, read, write) – Command line arguments.

List of Exercises **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 agiven 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,

PearsonEducation 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”, 2ndEdition, Oxford University Press, 2013.

R3.Byron S Gottfried, “Programming with C”, Schaum’s Outlines, 2nd Edition, TataMcGraw-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
CO5	3	2	2	2	2	1	1	2	3	2	-	2	3	1

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.

Publications of Bureau of Indian Standards

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

Web References:

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

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 60 Hours

Web Applications

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

Mobile Applications

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

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

Reference Book(s):

R1. Harvey M. Deitel , Paul J. Deitel,"Internet and World Wide Web – How to Program", 4thEdition ,Pearson Education Asia, 2009.

R2. David Wolber , Hal Abelson , Ellen Spertus, Liz Looney, "App Inventor 2: Create YourOwn 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 disastermanagement	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 environmentalissues	Understand

Text Book(s):

T1.Benny Joseph, “Environmental Studies", Tata McGraw Hill, New Delhi, 2006.

T2.Mackenzie Davis and Susan Masten, “Principles of environmental engineering and science”, Mc-Graw Hill, 3rd Edition, 2014.

Reference Book(s):

R1.Trivedi R.K. “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol.I and II, Enviro Media.

R2.Cunningham, W.P.Cooper,T.H. Gorhani, “Environmental Encyclopedia",Jaico Publishing House, Mumbai, 2001.

Course Articulation Matrix

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

High-3; Medium-2; Low-1

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 – Codes and Group codes.

Unit V Divisibility and Congruence 9+3 Hours

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

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

Text Book(s):

T1. 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, Pearson Education India, 2011.

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

Course Articulation Matrix

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

4.Infix to post fix conversion

5.Postfix Evaluation

6.Implementation of Binary Search Trees

7.Implementation of search – Linear, Binary

8.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. Cormen.T.H.,Leiserson.C.E., Rivest

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 algorithms

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	1	1	-	-	2	1	2	-	1	-	-
CO2	2	1	-	2	2	-	-	2	1	2	-	1	-	1
CO3	2	1	-	2	2	-	-	2	1	2	-	1	-	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 Architecure “, Pearson Education, 2019.

R3. John P.Hayes, “Computer Architecure and Organization”, 3rd 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	PSO1	PSO2
CO1	1	1	-	-	-	-	-	-	-	2	-	1	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO3	2	1	1	1	-	-	-	-	-	-	-	1	-	1
CO4	1	1	-	-	-	-	-	-	-	-	-	1	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	1	-	-

High-3; Medium-2; Low-1

Course Code: 19AMCN1301	Course Title: PRINCIPLES OF ARTIFICIAL INTELLIGENCE & NEURAL NETWORKS		
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 artificial intelligence principles, techniques and uninformed search strategies.
2. Illustrate the principles of different informed search strategies and Optimization Algorithms.
3. Apply the Knowledge Representation and Reasoning Process for a real application.
4. Elucidate the concept of Neural Networks.
5. Explain the Basics of Fuzzy Logic and Genetic Algorithm.

Unit I Introduction to Artificial Intelligence 9 Hours

Introduction to AI – Types and Applications of AI - Intelligent Agents: Agents and Environments – Nature of Environments – Structure of Agent - Problem solving by searching: Problem-solving agents - Example problems - Search for solutions - Uninformed search strategies - Types.

Unit II Informed Search and Optimization Algorithms 9 Hours

Informed search strategies - Local Search Algorithms and Optimization Problems – Local Search in Continuous Spaces – Searching with Nondeterministic Actions – Online Search Agents and Unknown Environments – Game – Optimal Decisions in Games – Alpha-Beta Pruning – Imperfect Real-time Decisions.

Unit III Knowledge Representation and Reasoning 9 Hours

Knowledge -Based Agents - Propositional Logic – Agent based on propositional logic - First Order Logic: Representation – syntax – knowledge engineering in First Order Logic - Inference in First Order Logic- Forward chaining – Backward Chaining – Resolution and application.

Unit IV Neural Networks 9 Hours

Fundamentals of neural networks - Neural Network Architectures – Characteristics and Learning method - Adaline and Madaline Network – Backpropogation network architecture –

Backpropogation Learning – Applications – Effect of Tuning Parameters – Introduction to Associative memory.

Unit V Fuzzy Logic and Genetic Algorithms 9 Hours

Fuzzy set – Crisp logic – Predicate logic – Fuzzy Logic – Defuzzification – Application - Fundamentals of Genetic Algorithm – Encoding – Crossover - Mutation Operator– Application.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe artificial intelligence principles, techniques and uninformed search strategies.	Understand
CO2: Illustrate the principles of informed search and Optimization Algorithms.	Understand
CO3: Apply the Knowledge Representation and Reasoning Process for a real application.	Apply
CO4: Elucidate the concept of Neural Networks.	Understand
CO5: Explain the Basics of Fuzzy Logic and Genetic Algorithm.	Understand

Text Book(s):

T1. Stuart Russell And Peter Norvig,"Artificial Intelligence: A Modern Approach", Fourth Edition,Pearson Paperback publication 2022.

T2. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms – Synthesis and Applications", 2nd Edition, PHI Learning Pvt.Ltd, Newdelhi -2017.

Reference Book(s):

R1. Dr. C.K. Venugopal,"Artificial Intelligence And Machine Learning", Pacific Books International 2019.

R2. Robert J Schalkoff, "Artificial Neural Networks", McGraw-Hill International Edition, 2011.

R3. Ric, E., Knight, K and Shankar, B. 2009. Artificial Intelligence, 3rd edition, Tata McGraw

R4. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.

R5. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, 3rd edition, wiley publication, 2009.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	3	-	-	2	-	-	-	-	-	1	1
CO2	2	3	1	3	-	-	2	-	-	-	-	-	1	1
CO3	2	3	2	3	-	-	2	-	-	-	-	2	1	1
CO4	2	2	2	3	-	-	2	-	-	-	-	-	1	1
CO5	2	2	2	3	-	-	2	-	-	-	-	-	1	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 9 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 9 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 Recover.

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	PSO1	PSO2
CO1	2	1	-	1	1	-	-	-	1	3	-	-	3	2
CO2	2	1	1	2	2	-	1	-	1	3	-	-	3	2
CO3	2	2	1	2	2	-	1	-	1	3	-	-	3	2
CO4	2	2	-	2	2	-	1	-	1	3	-	-	3	2
CO5	2	2	-	2	2	-	-	-	-	3	-	-	3	2

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.” 3rd Edition, 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 References:

1.Official documentation of java 3.10: https://docs.java.org/3/tutorial/

2. Beginner to Advanced java developer guide: https://www.learnjava.org/

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Course Code: 19SCCN3302	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.

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.
   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.

4. Write a Python Program

   a. To find the factorial of a number using functions.

   b. To find the largest number in a list using functions.

5. 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.

6. 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.

7. Write a Python program to simulate bouncing ball using pygame.

8. 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 References:

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	PSO1	PSO2
CO1	1	2	1	3	3	-	-	-	-	2	-	-	1	-
CO2	1	2	1	3	3	-	-	-	-	2	-	-	1	-
CO3	1	2	1	3	3	-	-	-	-	2	-	-	1	-
CO4	1	2	1	3	3	-	-	-	-	2	-	-	1	-
CO5	1	2	1	3	3	-	-	-	-	2	-	-	1	-

High-3; Medium-2;Low-1

Course Code: 19PSHG6002	Course Title: UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY		
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)

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 Swasthya8

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	Valuing
CO5: Appreciate ethical behaviour as a result of value system in personal and professional situations	Receiving

Text Book(s):

T1. R R Gaur, R Sangal, G P Bagaria, “Human Values and Professional Ethics”, Excel books, newDelhi.

Reference Book(s):

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

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

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

Web Reference(s):

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

2.http://hvpenotes.blogspot.com/

3.https://nptel.ac.in/courses/109/104/109104068/

Course Articulation Matrix

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

High– 3; Medium– 2; Low– 1

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.)
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 – 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 – Baye's Theorem – Random Variables – Probability Mass Function – Probability Density Functions – Properties – Moments – Moment generating functions and their properties.

Unit II Standard Distributions **9+3 Hours**

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

Unit III Two Dimensional Random Variables **9+3 Hours**

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

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.

Web References:

1. https://onlinecourses.nptel.ac.in/111105041/
2. https://nptel.ac.in/courses/111105090/
3. https://nptel.ac.in/courses/111104075/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCCC2401	Course Title: BASICS OF OPERATING SYSTEMS (Common to SC & AM)		
Course Category: Professional Core		Course Level : Practice	
L: T: P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours: 60	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 **10 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: Hardware 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 **8 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 Exercise **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. AviSilberschatz, Galvin. P.B. and Gagne. G. “Operating System Concepts”, 10thEdition, John Wiley & Sons, 2018.

Reference Book(s):

R1. Andrew S. Tanenbaum, “Modern Operating Systems”, 4th Edition, Pearson Education, 2015.

R2. William Stallings, “Operating Systems Internals and Design Principles”, 9th Edition, Pearson

Web References:

1. MIT open course on operating system engineering: http://ocw.mit.edu/courses/electrical-engineering and-computer-science/6-828-operating-system-engineering-fall-2012/
2. Bell’s Course Notes on Operating Systems Processes: https://www2.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/3_Processes.html
3. 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	PSO1	PSO2
CO1	2	1	-	-	-	-	-	1	-	1	-	1	-	-
CO2	3	2	2	2	2	1	1	2	3	2	1	1	3	1
CO3	3	2	2	2	2	1	1	2	3	2	-	1	3	1
CO4	3	2	2	2	2	1	1	2	3	2	1	1	3	1
CO5	2	1	-	-	-	-	-	1	-	1	-	1	-	-

High-3; Medium-2; Low-1

Course Code: 19AMCN1401	Course Title: MACHINE LEARNING ALGORITHMS AND APPLICATION		
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 pre-processing techniques to prepare the data for machine learning applications
2. Implement supervised machine learning algorithms for different datasets
3. Illustrate unsupervised machine learning algorithms for different datasets
4. Correlate the Advanced Learning Algorithms
5. Construct the machine learning models for different applications

Unit I Introduction to Machine Learning **9 Hours**

Introduction to Machine Learning – Data and Features – Machine Learning Pipeline - Data Pre-processing: Standardization, Normalization, Missing data problem, Data imbalance problem – Data visualization - Setting up training, development and test sets – Cross validation – Problem of Over fitting, Bias vs. Variance.

Unit II Supervised Learning **9 Hours**

Supervised learning - Regression: Linear regression, logistic regression – Classification: K-Nearest Neighbour, Naïve Bayes, Decision Tree, Support Vector Machine, Perceptron, Error analysis.

Unit III Unsupervised Learning **9 Hours**

Unsupervised learning – Clustering: K-means, Hierarchical, Spectral, subspace clustering, Gaussian Mixture Model, Hidden Markov Model, Parameter Estimation: MLE and Bayesian Estimate, Expectation Maximization, Dimensionality Reduction Techniques, Principal component analysis, Linear Discriminant Analysis.

Unit IV Advanced Learning Algorithms **9 Hours**

Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Types and Task – Q –Learning – Temporal Difference Learning - Ensemble Learning - Random Forest – Bagging - Boosting - Stacking - AdaBoost – Gradian Boosting.

Unit V Machine Learning Applications **9 Hours**

AI applications – Computer Vision – Driverless Cars - Speech Regeneration - Text Mining – Industrial Applications – Health Care Systems.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe pre-processing techniques to prepare the data for machine learning applications	Understand
CO2: Implement supervised machine learning algorithms for different datasets	Apply
CO3: Illustrate unsupervised machine learning algorithms for different datasets	Apply
CO4: Correlate the Advanced Learning Algorithms	Analyze
CO5: Construct the machine learning models for different applications	Apply

Text Book(s):

T1. Kevin P. Murphey, “Machine Learning, a probabilistic perspective”, The MIT Press Cambridge, Massachusetts, 2012.

T2. Christopher M Bishop,” Pattern Recognition and Machine Learning”, Springer 2010.

Reference Book(s):

R1. Andrew Ng, Machine learning yearning, URL: http://www. mlyearning.org/(96) 139 (2017).

R2. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (India) Private Limited, 2013.

R3. Richard O. Duda, Peter E. Hart, David G. Stork. Pattern Classification. Wiley, Second Edition;2007

Web References:

https://nptel.ac.in

https://www.cin.ufpe.br/~cavmj/Machine%20-%20Learning%20-20Tom%20Mitchell.pdf

https://ai.stanford.edu/~nilsson/MLBOOK.pdf

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN1402	Course Title: NEURAL COMPUTING IN MACHINE LEARNING		
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 concept of single layer perceptron model
2. Implement various multilayer feed forward network terminologies
3. Demonstrate the latest trends in single layer feedback networks.
4. Illustrate the various memory techniques in neural network
5. Articulate the concepts of Self organized network

Unit I Single Layer Perceptron Model **9 Hours**

Single-layer perceptron classifiers: Classification model - Features and decision regions, Discriminant functions - Linear machine and Minimum distance classification - Non-parametric training concept - Training and Classification using the Discrete perceptron: algorithm and example - Single layer continuous Perceptron networks for linearly separable classifications.

Unit II Multi-Layer Feed Forward Networks **9 Hours**

Multilayer feed forward Networks: Linearly separable Pattern classification - Delta learning rule for Multi perceptron model - Generalized Delta learning rule - Feed forward recall and error back propagation training.

Unit III Single Layer Feedback Networks **9 Hours**

Single-layer Feedback Networks: Basic concepts of dynamic systems - Mathematical foundations of Discretetime Hopfield Networks - Mathematical foundations of Gradient type Hopfield networks - Associative memories: Basic concepts - Linear Associator.

Unit IV Associative Memory **9 Hours**

Bidirectional associative memory - associative memory for spatio-temporal patterns - Case study: Implementation of NN in anysimulator. Self-Learning: Bidirectional Associative memory.

Unit V Self Organized Network **9 Hours**

UN supervised learning of clusters - winner-take-all learning recall mode - Initialization of weights, seperability limitations.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1:Describe the concept of single layer perceptron model	Understand
CO2: Implement various multilayer feed forward network terminologies	Apply
CO3: Demonstrate the latest trends in single layer feedback networks	Apply
CO4: Illustrate the various memory techniques in neural network	Apply
CO5: Articulate the concepts of Self organized network	Understand

Text Book(s):

T1. Jacek M.Zurada, “Introduction to Artificial Neural Systems”, Jaico Publ.House, 1994.

T2. Robert J. Schalkoff, “Artificial Neural”, McGraw-Hill, 1997.

Reference Book(s):

R1. Simon Haykin, “Neural Networks – A Comprehensive formulation”, AW, 1998.

R2. Koko, “Neural Networks”, PHI, 1992.

R3. N.K. Bose, P.Liang, “Neural Network Fundamentals”, M.H, 2002.

Web References:

1. https://page.mi.fu-berlin.de/rojas/neural/neuron.pdf

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN3401	Course Title: MACHINE LEARNING 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. Design a program using Data set libraries in python
2. Design a program using Data sets
3. Implementation of different algorithm techniques
4. Implementation of Logistic Regression and SVM classification

List of Exercises **60 Hours**

1. Implementation of Python Basic Libraries such as Math, Numpy and Scipy.
2. Implementation of Python Libraries for Ml application such as Pandas and Matplotlib.
3. Write a python program to create and load different datasets.
4. Write a python program to compute Mean, Median, Mode, Variance and Standard Deviation using Datasets.
5. Write a Python program to Reshape, Filter, Merge the data, and handle missing values in datasets.
6. Write a Python program to implement Find-S Algorithm
7. Write a Python program to implement Candidate elimination Algorithm.
8. Write a Python program to implement Simple Linear Regression and plot the graph.
9. Write a Python program to implement Logistic Regression using sklearn.
10. Write a Python program to implement navie bayes classifier algorithm.
11. Write a Python program to implement SVM classification.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Design a program using Data set libraries in python	Apply
CO2: Design a program using Data sets	Apply
CO3: Implementation of different algorithm techniques	Apply
CO4: Implementation of Logistic Regression and SVM classification	Apply

Text Book(s):

T1. Giuseppe BOnaccorso, “Machine Learning Algorithms”, Packet Publishing, 2017.

T2. Yuxi (Hayden) Liu, “Python Machine Learning By Example”, Packet Publishing,2017

Reference Book(s):

R1. Simon Haykin, “Neural Networks and Learning Machines”, 3rd Edition,Pearson India Education ServicesPvt.Ltd,, 2018.

R2. Scikit-learn, and Tensor Flow “Machine Learning and Deep Learning with Python”, 2nd illustrated reprint edition, Packt Publishing, 2017.

Web References:

1. https:Python_Machine_Learning/GOVOCwAAQBAJ?kptab=editions&sa=X&ved=2ahUKEwjNs5ny-YD-AhUFTmwGHZ9MCUMQmBZ6BAgIEAg

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN3402	Course Title: NEURAL NETWORKS AND AI 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. Create and train PROLOG programming language
2. Implementation of various search algorithms to solve problem
3. Develop a simple AI application
4. Implementation of perceptron class in sklearn

List of Exercises **60 Hours**

1. Study of PROLOG Programming language and its functions
2. Implementation of Depth First Search for Water jug problem
3. Implementation of Breath First Search for Tic-Tac-Toe Problem
4. Implementation of backtracking technique or N-Queen Problem
5. Implementation of Traveling salesman Problem
6. Develop a simple AI application (Build a chatbot, spam filtering in email, speech recognition)
7. Develop a snake game
8. Implementation of Perceptron class in sklearn

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Describe PROLOG programming language	Apply
CO2: Implementation of various search algorithms to solve problem	Apply
CO3: Develop a simple AI application	Apply
CO4: Implementation of perceptron class in sklearn	Apply

Text Book(s):

T1. Hoon Heng Teh “Neural Logic Networks: A New Class Of Neural Networks”, World Scientific Publishing Company, 1995.

T2. Yuxi (Hayden) Liu, “Python Machine Learning By Example”, Packet Publishing, 2017.

Reference Book(s):

R1. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, “Foundations of Machine Learning”, 1st Edition, MIT Press, 2018.

R2. Sebastian Raschka, Vahid Mirjalili “Machine Learning and Deep Learning with Python, Scikit-learn, and TensorFlow”, 2nd illustrated reprint edition, Packt Publishing, 2017.

Web References:

1.https:Python_Machine_Learning/GOVOCwAAQBAJ?kptab=editions&sa=X&ved=2ahUKEwjNs5ny-YD-AhUFTmwGHZ9MCUMQmBZ6BAgIEAg

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMPN6401	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	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	-	-	3	-	-	-	-

High-3; Medium-2; Low-1

Course Code: 19AMPN6401	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	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	-	-	3	-	-	-	-

High– 3; Medium– 2; Low– 1

SEMESTER V

Course Code: 19AMCN1501	Course Title: DEEP LEARNING AND APPLICATION		
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

- Machine Learning

Course Objectives

The course is intended to:

1. Introduce basic concepts of Deep Learning and Neural Networks
2. Provide in-depth knowledge about architecture and Models of Convolution Neural Network
3. Teach about the Graphical Model in CNN
4. Explain the concepts of Generative Modelling
5. Make the students to design and develop Deep Learning Applications

Unit I: Introduction to Deep Learning and Neural Networks **9 Hours**

Deep Networks: Definition, Motivation, Applications; Principal Component Analysis; Restricted Boltzmann Machine; Sparse Auto-encoder.

Unit II: Convolutional Neural Networks (CNN) and Advanced Techniques **9 Hours**

Convolution Neural Network (CNN): Basic architecture, Activation functions, Pooling, Handling vanishing gradient problem, Dropout, Greedy Layer-wise Pre-training, Weight initialization methods, Batch Normalization; Different CNN Models: Alex Net, VGG Net, Google Net, Res Net, Dense Net.

Unit III Graphical Models **9 Hours**

Graphical Model: Bayes Net, Variational Auto-encoders. Sequence Learning: 1D CNN, Recurrent Neural Network (RNN), Gated RNN, Long short-term memory (LSTM).

Unit IV Generative Modelling **9 Hours**

Generative Modeling: Generative adversarial network. Zero Shot Learning. Applications. Overview of MIL, Highway Network, Fractal Network, Siamese Net.

Unit V Deep Learning Applications **9 Hours**

Image Processing: Applications in image recognition - Video analytics: Application in object detection- Natural Language Processing (NLP) Applications in modelling and sentiment analysis- Healthcare and Biomedical: Applications in medical image analysis and diagnostics.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the basic concepts of Deep Learning and Neural Networks	Understand
CO2: Create Models based on Convolution Neural Network for different applications	Apply
CO3: Describe the Graphical Model in CNN	Understand
CO4: Apply Generative Modelling for building solutions for different applications	Apply
CO5: Design deep learning models to solve different domain problems	Apply

Text Book(s):

T1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT Press 2016.

T2. Indranath Chatterjee, “Machine Learning and Its ApplicationA Quick Guide for Beginners”, Bentham Science Publishers, December 2021

Reference Book(s):

R1. Michael A. Nielsen, “Neural Networks and Deep Learning”, Determination Press, 2015.

R2. Yoshua Bengio,” Learning Deep Architectures for AI”, now Publishers Inc., 2009

Web References:

1. https://onlinecourses.nptel.ac.in/noc20_cs62/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN1502	Course Title: EMBEDDED SYSTEMS AND IOT		
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

- Programming using C

The course is intended to:

1. Introduce the architecture of embedded processors
2. Teach embedded C programs
3. Make students to design simple embedded applications
4. Provide understanding about the communication models in IOT
5. Provide clear knowledge to 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 94 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: Explain the architecture of embedded processors.	Understand
CO2: Develop embedded C programs.	Apply
CO3: Design and implement simple embedded applications.	Apply
CO4: Describe different communication models in IoT.	Understand
CO5: Implement 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, 2nd Edition, 2014.

T2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.

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.

Web References:

1. https://nptel.ac.in/courses/108102045
2. https://onlinecourses.nptel.ac.in/noc22_cs53/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN1503	Course Title: SOFTWARE ENGINEERING		
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. Introduce various Software Development Lifecycle Models.
2. Provide ability to Perform software requirements analysis and work on AI tool.
3. Provide design knowledge for software system analysis and design using UML.
4. Teach software testing and maintenance approaches and AI tool.
5. Make students to plan project management scheduling using DevOps.

Unit I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9 Hours

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile process-Extreme programming-XP Process-Case Study.

Unit II REQUIREMENTS ANALYSIS AND SPECIFICATION 9 Hours

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets – Data Flow Diagram- AI Tools for requirement analysis.

Unit III SOFTWARE DESIGN 9 Hours

Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles

Unit IV SOFTWARE TESTING AND MAINTENANCE 9 Hours

Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging - Program analysis – Symbolic execution – Model Checking, AI in testing- Benefits, tools.

Unit V PROJECT MANAGEMENT 9 Hours

Software Project Management- Software Configuration Management - Project Scheduling- DevOps: Motivation-Cloud as a platform-Operations- Deployment Pipeline: Overall Architecture Building and Testing-Deployment- Tools- Case Study.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain various Software Development Lifecycle Models.	Understand
CO2: Identify the software requirements for various software problems.	Apply
CO3: Analysis and Design UML models for software problems.	Apply
CO4: Understand software testing and maintenance approaches.	Understand
CO5: Implement project management scheduling using DevOps.	Apply

Text Book(s):

T1. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java", 3rd Edition, Pearson Education, 2009

T2. Roger S. Pressman, "Object-Oriented Software Engineering: An Agile Unified Methodology", 1st Edition, Mc Graw-Hill International Edition, 2014.

Reference Book(s):

R1. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, "Fundamentals of Software Engineering", 2nd Edition, PHI Learning Pvt. Ltd., 2010.

R2. Craig Larman," Applying UML and Patterns", 3rd Edition, Pearson Education, 2005

Web Reference(s):

1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN3501		Course Title: DEEP LEARNING AND APPLICATION LABORATORY	
Course Category: Professional Core		Course Level: Practice	
L: T: P(Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours: 45	Max. Marks:100

Pre-requisites

- C / Python Programming

Course Objectives

The course is intended to:

1. Make students to build deep neural networks for simple problems
2. Teach how to build models using Convolution Neural Network for image processing
3. Teach how to apply Recurrent Neural Network and its variants for text analysis problems
4. Provide knowledge for Designing augment data using generative models

List of Experiments **45 Hours**

1. Solving XOR problem using Multilayer perceptron
2. Implement character and Digit Recognition using ANN
3. Implement the analysis of X-ray image using auto encoders
4. Implement Speech Recognition using NLP
5. Develop a code to design object detection and classification for traffic analysis using CNN
6. Implement online fraud detection of share market data using any one of the data
7. Implement image augmentation using deep RBM.
8. Implement Sentiment Analysis using LSTM for a real world problem as team.
9. Mini Project(15 Hours).

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Design and decide up on a deep learning technique and built solutions for a given problem.	Apply
CO2: Search internet and clarify doubts by themselves while designing a solution.	Apply
CO3: Document and communicate the developed deep learning model to the concerned stack holder.	Apply
CO4: Perform team responsibilities in an effective manner while developing a team-based solutions.	Apply

Text Book(s):

T1. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), "Deep Learning Applications", Volume 3, Springer Publications 2022.

T2. Indranath Chatterjee, “Machine Learning and Its Application A Quick Guide for Beginners”, Bentham Science Publishers, December 2021.

Reference Book(s):

R1. Stone, James, " Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning", Sebtel Press, United States, 2019.

Web References:

1. https://onlinecourses.nptel.ac.in/noc23_ee87/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN3502	Course Title: EMBEDDED SYSTEMS AND IOT LABORATORY		
Course Category: Professional Core		Course Level : Practice	
L: T: P(Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours: 45	Max. Marks:100

Pre-requisites

- C / Python Programming

Course Objectives

The course is intended to:

1. Teach Implementation of assembly Language experiments using simulator
2. Make students to implement basic and arithmetic programs using Embedded C
3. Train the students for designing an IOT based system

List of Experiments **45 Hours**

1. Write 8051 Assembly Language experiments using simulator.
2. Test data transfer between registers and memory.
3. Perform ALU operations.
4. Write Basic and arithmetic Programs Using Embedded C.
5. Introduction to Arduino platform and programming.
6. Explore different communication methods with IoT devices (Zigbee, GSM, Bluetooth).
7. Introduction to Raspberry PI platform and python programming.
8. Design an IOT based system.
9. Build a real time application for innovative ideas with all necessary components(15 Hours).

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Design an IOT based system for a given problem.	Apply
CO2: Consider ethical social and environmental implications while designing an IOT based solutions.	Apply
CO3: Analyse and adopt latest IOT devices and techniques while developing a solution for a problem.	Apply
CO4: Communicate and explain the solution to the stockholders for effective usage of the created model.	Apply

Text Book(s):

T1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, “The 8051 Microcontroller and Embedded Systems”, Pearson Education, 2nd Edition, 2014

T2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, CISCO Press, 2017.

Reference Book(s):

R1. Michael J. Pont, “Embedded C”, Pearson Education, 2007.

Web References:

1. https://nptel.ac.in/courses/128108016

Course Articulation Matrix

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

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: 19AMCN1601	Course Title: AI NATURAL LANGUAGE PROCESSING		
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

- Deep Learning

Course Objectives

The course is intended to:

1. Introduce Natural language concepts and word processing techniques
2 Teach Language modelling through N-grams and statistical models
3. Teach syntactic parsing using Regular and Context-Free Languages and dependency parsing
4. Make students to use machine learning and deep learning techniques for NLP
5. Make students to provide solutions for real-world NLP applications

Unit I Introduction and word representation **9 Hours**

Introduction to NLP Tokenization, Stemming and Lemmatization, spell correction, normalization, One-hot encoding, Bag-of-Words (BoW) Term Frequency – Inverse Document Frequency (TF-IDF), Word2vec, Glove and Fasttext.

Unit II Language Modelling and Syntax **9 Hours**

N-grams, smoothing techniques, Statistical Models - HMM (Hidden Markov Model), MEMM (Maximum Entropy Markov Model), CRF (Conditional Random Fields).

Unit III Syntactic and Dependency parsing **9 Hours**

Syntactic Parsing: Regular and Context-Free Languages, Context-Free Parsing, CKY Algorithm; Dependency Parsing: Dependency Grammar, Graph-based dependency parsing, Transition-based dependency parsing.

Unit IV Machine learning and deep learning for NLP **9 Hours**

Sequence to sequence modelling (Encoder decoder), Attention mechanism, Transformer Networks – BERT, Reinforcement learning for NLP.

Unit V NLP Applications **9 Hours**

Basics of sentiment analysis. Text classification techniques. Machine Translation and Question Answering, Text Summarization and Emerging Trends.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Understand Natural language concepts and word processing techniques.	Understand
CO2: Discuss language modelling through N-grams and statistical models.	Understand
CO3: Describe syntactic parsing using Regular and Context-Free Languages and dependency parsing.	Understand
CO4: Construct models using machine learning and deep learning techniques for NLP problems.	Apply
CO5: Built NLP based solutions using NPL principles and techniques for real-world NLP applications.	Apply

Text Book(s):

T1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition" , Pearson, 2023.

T2. Jason Brownlee, “Deep Learning for Natural Language Processing”, Machine learning Mastery 2020.

Reference Book(s):

R1. Christopher D. Manning, Hinrich Schiitze,”Foundations of Statistical Natural Language Processing”, MIT Press, 2000.

R2. J. Eisenstein, “Introduction to Natural Language Processing”, MIT Press, 2019.

R3. Nitin Indurkhya Fred J. Damerau, “Handbook of Natural Language Processing, Chapman & Hall/CRC Taylor & Francis group,2010.

Web References:

1. https://nptel.ac.in/courses/106106211
2. https://nptel.ac.in/courses/106105158

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN1602	Course Title: VISION AND IMAGE PROCESSING		
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

- Deep Learning and Application

Course Objectives

The course is intended to:

1. Teach geometric primitives, transformations, and photometric formation in computer vision.
2. Make students to execute point operators, filtering, and segmentation for image enhancement.
3. Provide knowledge for applying feature detection and matching for alignment and pose estimation.
4. Make students to implement dense motion estimation and image stitching algorithms effectively.
5. Make students to be expert in recognition tasks and context understanding in computer vision.

Unit I Introduction and Image formation **9 Hours**

Introduction, Image Formation – geometric primitives and transformations, photometric image formation, digital camera

Unit II Image Processing and segmentation **9 Hours**

Image Processing-point operators, linear filtering, neighbourhood operators, Fourier transforms, segmentation-Active contours, split and merge, mean shift and mode, finding, Normalized cuts

Unit III Feature Detection and Matching **9 Hours**

Feature Detection and Matching – points and patches, edges, lines, Feature-based Alignment-2D, 3D feature-based alignment, pose estimation.

Unit IV Dense motion estimation and image stitching **9 Hours**

Dense motion estimation – Optical flow – layered motion, parametric motion, Structure from Motion. Image Stitching-motion models, global alignment, compositing.

Unit V Recognition **9 Hours**

Recognition – object detection, face recognition, instance recognition, category recognition, context and scene understanding.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply geometric primitives, transformations, and photometric formation in computer vision.	Apply
CO2: Execute point operators, filtering, and segmentation for image enhancement.	Apply
CO3: Employ feature detection and matching for alignment and pose estimation.	Apply
CO4: Implement dense motion estimation and image stitching algorithms effectively.	Apply
CO5: Demonstrate proficiency in recognition tasks and context understanding in computer vision.	Apply

Text Book(s):

T1. Szeliski R., “Computer Vision: Algorithms and Applications”, Springer, 2010.

T2. Forsyth D. A. and Ponce J., “Computer Vision – A Modern Approach”, 2nd Edition, Pearson Education, 2012.

Reference Book(s):

R1. Shapiro L. G. and Stockman G., “Computer Vision”, Prentice Hall, 2001.

R2. Davies E. R., “Machine Vision: Theory, Algorithms, Practicalities”, Morgan Kaufmann, 2004.

Web Reference(s):

1. https://onlinecourses.nptel.ac.in/noc23_ee39/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN3601	Course Title: AI NATURAL LANGUAGE PROCESSING LABORATORY		
Course Category: Professional Core		Course Level: Practice	
L: T: P(Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours: 45	Max. Marks:100

Pre-requisites

- C / Python Programming

Course Objectives

The course is intended to:

1. Teach fundamental NLP techniques and word representation methods in practical scenarios.
2. Teach Implementation of syntactic and dependency parsing algorithms such as the CKY algorithm
3. Provide knowledge for Developing machine learning and deep learning models for NLP tasks
4. Teach students to create advanced NLP models like transformer networks and BERT to solve complex language understanding tasks
5. Provide coding proficiency in Python and relevant NLP libraries, by practical implementation of real-world applications.

List of Experiments **45 Hours**

1. Implement tokenization, stemming, and lemmatization on a dataset.
2. Implement N-gram models on a given corpus.
3. Implement a syntactic parser using CKY algorithm.
4. Implement a sequence-to-sequence model (encoder-decoder) for a specific NLP task.
5. Implement a transformer network for a specific NLP task.
6. Implement a sentiment analysis model using a dataset.
7. Implement a basic machine translation model.
8. Implement a text summarization model using a dataset.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Apply fundamental NLP techniques and word representation methods in practical scenarios.	Apply
CO 2: Apply machine learning and deep learning models for NLP tasks	Apply
CO 4: Compile and present the built solutions in an effective manner	Apply

CO 5: Demonstrate coding proficiency in Python and latest relevant NLP libraries, by practical implementation of real-world applications.	Apply

Text Book(s):

T1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson, 2023.

T2. Jason Brownlee, “Deep Learning for Natural Language Processing”, Machine learning Mastery 2020.

Reference Book(s):

R1. Christopher D. Manning, Hinrich Schiitze ,”Foundations of Statistical Natural Language Processing”, MIT Press, 2000.

R2. J. Eisenstein, “Introduction to Natural Language Processing”, MIT Press, 2019.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_cs98/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN3602	Course Title: VISION AND IMAGE PROCESSING LABORATORY		
Course Category: Professional Core		Course Level: Practice	
L: T: P(Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours: 45	Max. Marks:100

Pre-requisites

- C / Python Programming

Course Objectives

The course is intended to:

1. Provide ability to apply advanced techniques to analyze visual data effectively.
2. Teach implementation of segmentation methods for image region extraction and analysis.
3. Make students to create solutions using recognition techniques for object, face, and instance recognition problems.
4. Provide knowledge to Design and implement complex image stitching techniques for seamless compositions.
5. Provide knowledge for developing algorithms for category recognition and contextual scene understanding.

List of Experiments **45 Hours**

1. Implement geometric primitives, transformations, and basic image processing using point operators.
2. Implement linear filtering techniques
3. Implement segmentation methods, including active contours, split and merge, mean shift, and mode finding.
4. Implement feature detection and matching techniques, covering points, patches, edges, and lines.
5. Implement optical flow for dense motion estimation, covering layered motion and parametric motion models.
6. Implement image stitching techniques, including motion models, global alignment, and compositing.
7. Implement algorithms for object detection, face recognition, and instance recognition.
8. Implement recognition techniques for category recognition, context understanding, and scene understanding.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Apply advanced techniques to analyze visual data effectively.	Apply

CO 2: Evaluate segmentation methods for image region extraction and analysis.	Apply
CO 3: Apply recognition techniques for object, face, and instance recognition problems.	Apply
CO 4: Design and implement complex image stitching techniques for seamless compositions.	Apply
CO 5: Develop algorithms for category recognition and contextual scene understanding.	Apply

Text Book(s):

T1. Szeliski R., “Computer Vision: Algorithms and Applications”, Springer, 2010.

Reference Book(s):

R1. Forsyth D. A. and Ponce J., “Computer Vision – A Modern Approach”, 2nd Edition, Pearson Education, 2012.

R2. Shapiro L. G. and Stockman G., “Computer Vision”, Prentice Hall, 2001.

Web References:

1.https://onlinecourses.nptel.ac.in/noc23_ee39/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMPN6601	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: 19AMCN1701	Course Title: BIG DATA TECHNOLOGY		
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

- Database Design

Course Objectives

The course is intended to:

1. Introduce the basic foundation of big data analytics
2. Teach the appropriate techniques and tools to solve big data problems
3. Teach students to apply mining techniques for big data problems
4. Provide students ability to build mining models for data stream applications
5. Teach how to Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

Unit I Introduction to big data **9 Hours**

Introduction to Big Data Platform, Traits of Big data, Challenges of Conventional Systems, Web Data, Evolution of Analytic Scalability, Analysis vs Reporting, Statistical Concepts: Sampling Distributions, Re-Sampling, Statistical Inference, Prediction Error.

Unit II Basic data analysis and data analytic methods using R **9 Hours**

Regression Modelling, Multivariate Analysis, Bayesian Modelling, Inference and Bayesian Networks, Support Vector and Kernel Methods, Analysis of Time Series: Linear Systems Analysis, Nonlinear Dynamics and Rule Induction.

Unit III Frequent item sets and clustering **9 Hours**

Mining Frequent item sets: Market Based Model, Apriori Algorithm, Handling Large Data Sets in Main Memory, Limited Pass Algorithm and Counting Frequent item sets in a Stream - Clustering Techniques: Hierarchical, K-Means, Frequent Pattern based Clustering Methods.

Unit IV Mining data streams **9 Hours**

Introduction to Streams Concepts: Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream: Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window.

Unit V Framework, technologies, tools and visualization **9 Hours**

Map Reduce: Hadoop, Hive, MapR, Sharding, NoSQL Databases: S3, Hadoop Distributed File Systems.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the basic functionalities of big data analytics	Understand
CO2: Describe the various big data analytic tools and techniques	Understand
CO3: Apply the mining techniques for large data sets	Apply
CO4: Build the mining models for various data stream applications	Apply
CO5: Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics	Apply

Text Book(s):

T1. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to data Science and its Applications”, Wiley publications, 2014.

T2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2020.

Reference Book(s):

R1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2003.

(ISBN 978-93-82609-131) Learning 2.1, Now Publishers, 2009.

Web Reference(s):

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. https://archive.nptel.ac.in/courses/106/104/106104189/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN1702	Course Title: DATA VISUALIZATION TECHNIQUES		
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. Introduce the principles of visual perception for meaningful data representation.
2. Teach to Identify time-series patterns, interpret ranking displays, and effectively communicate and analyze deviations in data.
3. Teach to analyze multivariate patterns using appropriate displays
4. Provide knowledge to assess dashboard design considerations, and create eloquent dashboards for effective data communication
5. Teach to Apply critical design practices for optimal information dashboard creation.

Unit I Introduction to visual analysis 9 Hours

Information visualization– visual perception –making abstract data visible – building blocks of information visualization – analytical interaction – analytical navigation – optimal quantitative scales

Unit II Time-Series, Ranking and Deviation Analysis 9 Hours

Time-series analysis – time-series patterns – time-series displays – time-series best practices – part-to-whole and ranking patterns – part-to-whole and ranking displays – best practices – deviation analysis – deviation analysis displays – deviation analysis best practices.

Unit III Distribution, Correlation and Multivariate Analysis 9 Hours

Distribution analysis – describing distributions – distribution patterns – distribution displays – correlation analysis – describing correlations – correlation patterns – correlation displays – multivariate analysis– multivariate displays – multivariate analysis techniques and best practices

Unit IV Basics of Dashboard Design 9 Hours

Information dashboard – Introduction– dashboard design issues and assessment of needs – Considerations for designing dashboard-visual perception – Achieving eloquence

Unit V Advancements in Dashboard Design 9 Hours

Advantages of Graphics _Library of Graphs – Designing Bullet Graphs – Designing Sparklines – Dashboard Display Media –Critical Design Practices – Putting it all together- Unveiling the dashboard.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Demonstrate ability in designing and implementing effective information visualizations.	Apply
CO2: Identify time-series patterns, interpret part-to-whole and ranking displays, and effectively communicate and analyze deviations in data.	Apply
CO3: Exhibit knowledge in distribution, correlation, and multivariate analysis in data visualization	Apply
CO4: Design information dashboards that meet user needs and visual perception principles.	Apply
CO5: Develop practical skills in implementing graphics libraries and critical design practices.	Apply

Text Book(s):

T1. Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014.

T2. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.

Reference Book(s):

R1. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.

R2. Gert H. N. Laursen and Jesper Thorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010.

Web Reference(s):

1. https://elearn.nptel.ac.in/shop/iit-workshops/completed/data-visualization-with-r/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN3701		Course Title: BIG DATA TECHNOLOGY LABORATORY	
Course Category: Professional Core		Course Level: Practice	
L: T:P (Hours/Week) 0: 0: 3	Credits: 1.5	Total Contact Hours: 45	Max Marks:100

Pre-requisites

- C / Python Programming

Course Objectives

The course is intended to:

1. Provide ability to Implement MapReduce programs for processing big data.
2. Make students to implement data storage of big data using MongoDB.
3. Provide ability to Analyze big data using machine learning techniques such as Decision tree classification and clustering.

List of Experiments **45 Hours**

1. Install, configure and run python, numPy and Pandas
2. Install, configure and run Hadoop and HDFS.
3. Visualize data using basic plotting techniques in Python.
4. Implement NoSQL Database Operations: CRUD operations, Arrays using MongoDB.
5. Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB.
6. Implement word count / frequency programs using MapReduce.
7. Implement a MapReduce program that processes a dataset.
8. Implement clustering techniques using SPARK.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Develop MapReduce programs for processing big data.	Apply
CO2: Design data storage for big data using MongoDB.	Apply
CO3: Utilize machine learning techniques such as Decision Tree Classification and clustering for analyzing big data	Apply

Text Book(s):

T1. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), "Deep Learning Applications", Volume 3, Springer Publications 2022.

T2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2020.

Reference Book(s):

R1. Stone, James. (2019), " Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning", Sebtel Press, United States, 2019

Web Reference(s):

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMCN3702		Course Title: DATA VISUALIZATION TECHNIQUES LABORATORY	
Course Category: Professional Core		Course Level: Practice	
L: T: P (Hours/Week) 0: 0: 3	Credits: 1.5	Total Contact Hours: 45	Max Marks:100

Pre-requisites

- Python Programming

Course Objectives

The course is intended to:

1. Provide ability to acquire, clean, and preprocess financial datasets to enable comprehensive statistical analysis and clustering.
2. Teach students to apply time-series forecasting techniques, including ARIMA and LSTM, to build accurate models for predicting stock prices.
3. Enhance student's ability to Utilize Tableau for effective visualization of large datasets from various domains, offering insights and data exploration capabilities.
4. To Provide knowledge to Set up data streaming pipelines, implement real-time dashboards, and ensure efficient performance for monitoring dynamic datasets.
5. Make students to Conduct multivariate analysis techniques and translate findings into clear visualizations and a comprehensive report.

List of Experiments **45 Hours**

1. Acquiring and plotting data.
2. Statistical Analysis-such as Multivariate Analysis, PCA, LDA, Correlation, regression and analysis of variance.
3. Financial analysis using Clustering, Histogram and HeatMap.
4. Time-series analysis stock market.
5. Visualization of various massive dataset - Finance – Healthcare.
6. Visualization of various massive dataset- Census –Geospatial.
7. Visualization on Streaming dataset (Stock market dataset).
8. Visualization on Streaming dataset (weather forecasting).

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

CO1: Develop capabilities to acquire, clean, and preprocess financial datasets to enable comprehensive statistical analysis and clustering.	Apply
CO2: Develop precise time-series models for real-time stock market predictions and present insights through dynamic dashboards.	Apply
CO3: Create interactive visualizations for diverse datasets, enhancing data exploration and understanding.	Apply
CO4: Implement responsive dashboards to visualize and monitor streaming data efficiently.	Apply
CO5: Conduct multivariate analysis, including PCA and LDA, and communicate relationships between variables through clear visualizations and a detailed report.	Apply

Text Book(s):

T1. Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014

T2. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.

Reference Book(s):

R1. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.

R2. Gert H. N. Laursen and Jesper Thorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010.

Web Reference(s):

1. https://elearn.nptel.ac.in/shop/iit-workshops/completed/data-visualization-with-r/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	3	1	-	-	-	-	2	-	-	-	2	2
CO2	3	2	3	1	-	-	-	-	2	-	-	-	2	2
CO3	3	2	3	2	-	-	-	-	2	-	-	-	2	2
CO4	3	2	3	2	-	-	-	-	2	-	-	-	2	2
CO5	3	2	3	2	-	-	-	-	2	-	-	-	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(Hours/Week) 1:0:0	**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. Prototying- 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: 19AMPN6801	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

Diversified Electives

Course Code: 19ITEN1029	Course Title: Intellectual Property Rights (common to all B.E/B.Tech programmes)		
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. Describe the basic concepts of Intellectual Property Law.
2. Explain the classification of Patents and its Rights and Limitations.
3. Explain the Patent Searching Process and Application Filling Process.
4. Describe the concepts and principles of Trademark.
5. Explain 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 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-1

Course Code: 19MEEC1025	Course Title: Fundamentals of Entrepreneurship (common to all B.E/B.Tech programmes)		
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. Describe the types, characteristics of entrepreneurship and its role in economic development.
2. Define 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 in enterprise.
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 Tourism-Need, 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-Problems of Micro and Small Enterprises- Identification of Business Opportunity-Steps in Setting Up of a Small Business Enterprise – Content of Business Plan- Significance of Business Plan, Formulation of Business Plan – Guidelines for Formulating Project Report– Project Appraisal.

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-Difference between Management and Administration-Management of Working Capital-Methods of Inventory Management-Production Design-Market Segmentation-Marketing Mix

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 and its role in economic development.	Apply
CO2: Classify various types of entrepreneurship and highlight the opportunities to improve the economy of India.	Apply
CO3: Select the appropriate form of business ownership in setting up an enterprise.	Apply
CO4: Determine the financial planning to become an entrepreneur and manage tax benefits that can be provided to the small Entrepreneurs	Analyze
CO5: Identify the techniques involved in the development of the small enterprise for the growth 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.

R1. Mathew J Manimala,” Entrepreneurship theory at cross roads: paradigms and praxis” Dream tech, 2nd edition 2006.

R2. Rabindra N. Kanungo, “Entrepreneurship and innovation”, Sage Publications, New Delhi, 2003.

R3. Singh, A. K., “Entrepreneurship Development and Management”, University Science Press, 2009.

Web References:

1. https://nptel.ac.in/courses/127105007
2. https://ncert.nic.in/ncerts/l/lebs213.pdf

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19MEEC1026		Course Title: Design Thinking and Innovation (common to all B.E/B.Tech programmes)	
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. Disseminate the fundamental concepts and principles of design thinking
2. Explain the design thinking methods in each stage of the problem
3. Conceptualize innovative ideas using prototypes
4. Explain the significance of Evaluating and Testing Ideas
5. Describe 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 8 Hours

Tasks in Prototyping – Understanding Different Prototypes - Developing different prototypes – Demonstration – Prototyping Tools. Case Study: Prototype the solution.

Unit IV EVALUATING AND TESTING IDEAS 10 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: Apply the key concepts of design thinking	Apply
CO2: Relate design thinking in all stages of problem solving	Apply
CO3: Identify the diverse methods employed in design thinking and establish a workable design thinking framework to use in their practices	Analyze
CO4:Determine the significance of testing and evaluating the solution	Analyze
CO5: Apply design thinking skills to solve real time user experience problems	Apply

Text Book(s):

T1. Muller-Roterberg "Design thinking for dummies" John Wiley & Sons,2020.(Unit-I,III & IV)

T2. Andrew Pressman "Design Thinking A Guide to Creative Problem Solving for Everyone", Routledge Publication, 2019.(Unit-II & V)

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

R3. Brown.T, "Change by design: How design thinking transforms organizations and inspires innovation", HarperCollins, 2009.

Web References:

1. https://www.open.edu/openlearn/science-maths-technology/design-innovation/design-thinking/content-section-6
2. https://www.interaction-design.org/literature/topics/design-thinking
3. https://venturewell.org/class-exercises/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19SCEC2001		Course Title: Cyber security	
Course Category: Professional 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, Legalperspective 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 unauthorised 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 mediaplatforms.
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. Cyber Crime Impact in the New Millennium, R. C Mishra. Auther Press.T2, 2010

T2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, 1st Edition, Wiley India Pvt. Ltd, 2011.

T3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform, PearsonEducation, 2001.

Reference Book(s):

R1. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition,Wiley India Pvt. Ltd, 2001

R2. Security Fundamentals of Network by E. Maiwald, McGraw Hill ,2014

R3. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K,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/

4. https://www.meity.gov.in/cyber-security-division
5. https://intellipaat.com/blog/what-is-cyber-security/

Course Articulation Matrix:

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

High-3; Medium-2;Low-1

Course Code: 19AMEN1032	Course Title: PRINCIPLES OF MANAGEMENT		
Course Category: Professional Elective		Course Level : Mastery	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Sketch the Evolution of Management.
2. Teach the functions and principles of management.
3. Teach the application of the principles in an organization.
4. Teach about the various HR related activities
5. Provide ability to analyse 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: ORGANISING 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: Discuss of managerial functions like planning, organizing, staffing, leading & controlling.	Understand
CO2: Articulate international aspect of management.	Understand
CO3: Describe management concept of organizing.	Understand
CO4: Discuss management concept of directing	Understand
CO5: Articulate management concept of controlling.	Understand

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 MamataMohapatra, “ Management”, Biztantra, 2008.

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

Web Reference(s):

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	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	3	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: 19ITEN1030	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

Course Code: 19AMEN1041	Course Title: RESPONSIBLE AI		
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

- Machine Learning

Course Objectives

The course is intended to:

1. Introduce Responsible AI principles, challenges, and ethical implications.
2. Make students analyze biases, fairness metrics, and mitigation techniques.
3. Explore explainability, interpretability, and evaluation methods in AI systems.
4. Teach AI safety, security, privacy, and resilience strategies.
5. Guide students to evaluate societal impacts of AI applications.

Unit I: INTRODUCTION TO RESPONSIBLE AI **9 Hours**

Overview of AI – Common misconception of AI – Introduction to Responsible AI – Characteristics of Responsible AI – Key principles of responsible AI - Challenges in implementing responsible AI – ELSI Framework and AI - Safety and Alignment – Fairness and Privacy.

Unit II: FAIRNESS AND BIAS **9 Hours**

Human Bias - Types of biases - Effects of biases on different demographics - Bias vs Fairness – Sources of Biases - Exploratory data analysis - Bias Mitigation Techniques - Pre-processing techniques - In- processing techniques - Post-processing techniques - Bias detection tools - Overview of fairness in AI - Demographic parity - Equalized odds - Simpson's paradox and the risks of multiple testing – Group fairness and Individual fairness - Counterfactual fairness - Fairness metrics - Bias and disparity mitigation with Fairlearn.

Unit III EXPLAINABILITY & INTERPRETABILITY **9 Hours**

Importance of Explainability and Interpretability – Challenges - Interpretability through simplification and visualization - Intrinsic interpretable methods - Post Hoc interpretability – Interpretability Evaluation methods - Explainability through causality - Model agnostic Interpretation - LIME (Local Interpretable Model-agnostic Explanations) - SHAP (SHapley Additive exPlanations).

Unit IV SAFETY, SECURITY, AND PRIVACY **9 Hours**

Overview of safety – security – privacy - resilience - Taxonomy of AI safety and Security – Adversarial attacks and mitigation - Model and data security - The ML life cycle - Adopting an ML life cycle MLOps and ModelOps - Model drift - Data drift - Concept drift - Privacy-preserving AI techniques- Differential privacy - Federated learning

Unit V CASE STUDIES **9 Hours**

COMPAS Algorithm - Google Photos Tagging Controversy - ProPublica's Analysis of Recidivism Predictions - Amazon's AI Recruiting Tool - Facial Recognition Technology Misidentification - AI in Healthcare: Predictive Analytics in Patient Care - Tesla Autopilot and Ethical Implications of Autonomous Vehicles.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Understand the principles and challenges of Responsible AI.	Understand
CO2: Implement fairness metrics and techniques to mitigate biases in AI.	Apply
CO3: Demonstrate methods for explain ability and interpretability in AI systems.	Apply
CO4: Develop strategies for ensuring AI safety, security, and privacy.	Apply
CO5: Evaluate ethical principles and societal impacts of AI applications	Apply

Text Book(s):

T1. Virginia Dignum, "Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way", 2019.

T2. Adnan Masood, Heather Dawe, "Responsible AI in the Enterprise", 2023.

T3. Beena Ammanath, "Trustworthy AI", O' Reilly, 2022.

T4. Christoph Molnar "Interpretable Machine Learning", 1st edition, 2019.

Reference Book(s):

R1. I Almeida, "Responsible AI in the Age of Generative Models: Governance, Ethics and Risk Management", 2024.

R2. Silja Voeneky, Philipp Kellmeyer et. al, "The Cambridge Handbook of Responsible Artificial Intelligence", Cambridge University Press, 2022

Web References:

1. https://onlinecourses.nptel.ac.in/noc24_cs132/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Open Electives
(Offered to other Programmes)

Course Code: 19AMOC1001		Course Title: AI IN DATA WAREHOUSING	
Course Category: Open Elective		Course Level: Practice	
L: T: P(Periods/Week) 3: 0: 0	Credits:3	Total Contact Periods:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Make students to understand the basics of data warehouse and its Architecture.
2. Make students to examine the OLAP Technology.
3. Make students to understand the partitioning strategy.
4. Provide ability to differentiate various schema.
5. Make students to understand the roles of process manager & system manager.

Unit I INTRODUCTION TO DATA WAREHOUSE 9 Hours

Data warehouse Introduction - Data warehouse components- operational database Vs data warehouse – Data warehouse Architecture – Three-tier Data Warehouse Architecture - Autonomous Data Warehouse- Autonomous Data Warehouse Vs Snowflake - Modern Data Warehouse.

Unit II ETL AND OLAP TECHNOLOGY 9 Hours

What is ETL – ETL Vs ELT – Types of Data warehouses - Data warehouse Design and Modeling - Delivery Process - Online Analytical Processing (OLAP) - Characteristics of OLAP - Online Transaction Processing (OLTP) Vs OLAP - OLAP operations- Types of OLAP- ROLAP Vs MOLAP Vs HOLAP.

Unit III META DATA, DATA MART AND PARTITION STRATEGY 9 Hours

Meta Data – Categories of Metadata – Role of Metadata – Metadata Repository – Challenges for Meta Management - Data Mart – Need of Data Mart- Cost Effective Data Mart- Designing Data Marts- Cost of Data Marts- Partitioning Strategy – Vertical partition – Normalization – Row Splitting – Horizontal Partition.

Unit IV DIMENSIONAL MODELING AND SCHEMA 9 Hours

Dimensional Modeling- Multi-Dimensional Data Modeling – Data Cube- Star Schema- Snowflake schema- Star Vs Snowflake schema- Fact constellation Schema- Schema Definition - Process Architecture- Types of Data Base Parallelism – Data warehouse Tools.

Unit V SYSTEM & PROCESS MANAGERS 9 Hours

Data Warehousing System Managers: System Configuration Manager- System Scheduling Manager - System Event Manager - System Database Manager - System Backup Recovery Manager - Data Warehousing Process Managers: Load Manager – Warehouse Manager- Query Manager – Tuning – Testing.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Understand the components and architecture of a data warehouse.	Understand
CO 2: Examine OLAP technology and its various operations in data warehousing.	Apply
CO 3: Identify and describe different metadata, data mart, and partitioning strategies.	Understand
CO 4: Implement schema models such as star and snowflake schemas in data warehousing.	Apply
CO 5: Demonstrate the roles and responsibilities of process managers and system managers in data warehousing.	Apply

Text Book(s):

T1.Steinbach and Vipin Kumar, “Introduction to Data Mining”, Tan, Pearson Education, 2016

T2.Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata Mc Graw– Hill Edition, Thirteenth Reprint 2008.

Reference Book(s):

R1.Ralph Kimball, “The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling”, 3rd edition, 2013.

R2.Paul Raj Ponniah, “Data warehousing fundamentals for IT Professionals”, 2012.

R3.K.P. Soman, ShyamDiwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_ee32/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMOC1002		Course Title: INTRODUCTION TO MACHINE LEARNING	
Course Category: Open Elective		Course Level: Practice	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Teach the fundamentals of Machine Learning technologies
2. Makes the students to acquire the ability to apply diverse machine learning models to various datasets.
3. Make students to perform classification using supervised learning technique.
4. Make students to perform clustering using unsupervised learning technique.
5. Make students to apply various concept of machine learning algorithms to different datasets.

Unit I Introduction to Machine Learning **9 Hours**

Introduction - Defining learning in the context of Machine Learning - Evaluation methods and processes - handling datasets - Feature sets, dataset division, and cross-validation techniques

Unit II Basics of Machine Learning Techniques **9 Hours**

Overview of Supervised, Unsupervised, and Reinforcement Learning - Real-life examples illustrating Machine Learning applications and processes.

Unit III Supervised Learning Techniques **9 Hours**

Classification and Regression methods-In-depth study of K-Nearest Neighbor -Linear Regression - Logistic Regression – SVM -Evaluation Measures – SSE – MME - R2 - confusion matrix - precision – recall - F-Score - ROC-Curve

Unit IV Unsupervised Learning and Clustering **9 Hours**

Introduction to clustering -Types of Clustering: Hierarchical, Agglomerative, and Divisive Clustering Partitional Clustering: K-means clustering.

Unit V Advanced Topics and Applications **9 Hours**

Dimensionality reduction techniques - PCA, LDA, ICA - Introduction to Deep Learning

Gaussian Mixture Models - Applications in Natural Language Processing and Computer Vision.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Understand basic applications and issues of Machine Learning.	Understand
CO2: Articulate various machine learning techniques.	Apply
CO3: Create classification models for various data sets.	Apply
CO4: Create clustering models for various datasets.	Apply
CO5: Apply various advanced machine learning algorithms to different datasets.	Apply

Text Book(s):

T1. Alpaydin, Ethem - "Introduction to Machine Learning" - The MIT Press – 2020.

T2. Bishop, Christopher M. - "Pattern Recognition and Machine Learning" - Springer – 2006.

Reference Book(s):

R1. Raschka, Sebastian - "Python Machine Learning" - Packet Publishing – 2015.

R2. Geron, Aurélien - "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" - O'Reilly Media – 2019.

R3. Goodfellow, Ian, Bengio, Yoshua, Courville, Aaron - "Deep Learning" - The MIT Press – 2016.

Web References:

1. https://onlinecourses.nptel.ac.in/noc23_cs18/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs87/preview

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMOC1003		Course Title: ARTIFICIAL INTELLIGENCE	
Course Category: Open Elective		Course Level: Practice	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Teach the basic concepts and techniques of Artificial Intelligence.
2. Make students to develop AI algorithms for solving practical problems.
3. Work on Predicate logics.
4. Teach about Knowledge Representation schemes.
5. Make students to perform multi agent planning.

Unit I Introduction 9 Hours

Artificial Intelligence and its applications - Artificial Intelligence Techniques - Level of models - criteria of success - Intelligent Agents - Nature of Agents - Learning Agents - AI Techniques, advantages, and limitations of AI - Impact and Examples of AI - Application domains of AI.

Unit II Problem solving techniques 9 Hours

State space search - control strategies - heuristic search, problem characteristics - production system characteristics - Generate and test - Hill climbing - best first search - A* search - - Min-Max Search - Alpha-Beta Pruning.

Unit III Logic 9 Hours

Propositional logic - predicate logic – Resolution - Resolution in proportional logic and predicate logic - Clause form - unification algorithm.

Unit IV Knowledge Representation schemes and reasoning 10 Hours

Mapping between facts and representations - Approaches to knowledge representation - procedural vs declarative knowledge - Forward vs. Backward reasoning – Matching - conflict resolution - Non-monotonic reasoning - Default reasoning - statistical reasoning.

Unit V Planning 8 Hours

The Planning problem - planning with state space search - partial order planning - planning graphs - planning with propositional logic - Analysis of planning approaches - Hierarchical planning - conditional planning - Continuous and Multi Agent planning.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain the fundamental concepts and applications of Artificial Intelligence.	Understand
CO2: Develop AI algorithms to solve practical real-world problems.	Apply
CO3: Demonstrate the application of propositional and predicate logic in AI.	Apply
CO4: Use knowledge representation schemes and reasoning techniques for problem-solving.	Apply
CO5: Design and implement multi-agent planning strategies for complex systems.	Apply

Text Book(s):

T1. M.C. Trivedi, ”A Classical Approach to Artificial Intelligence”, Khanna Book Publishing, 2019.

T2. Stuart Russel, “Artificial Intelligence: A modern approach”, Pearson Education, 2010.

Reference Book(s):

R1. Rich and Knight, ”Artificial Intelligence”, The McGraw Hill, 2017.

R2. Nils and Nilson, “Artificial Intelligence: A new synthesis”, Elsevier, 1997.

R3. A Luger, “Artificial Intelligence”, Pearson Education, 2002

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview

2.https://www.udemy.com/course/artificial-intelligence-az/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code:19AMOC1004		Course Title: THEORY OF COMPUTATION ECOSYSTEMS	
Course Category: Open Elective		Course Level: Practice	
L: T: P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Provide knowledge in the development of start-up projects in the realm of globalization, crowd sourcing and the emergence of "open-source" innovations.
2. Provide ability to search for the governmental means of support for open innovation projects, private investment resources, and assess the level of maturity of the project.
3. Make students to learn how to manage open innovation projects.
4. Provide ability to analyze government programs supporting innovative projects.
5. Make students to perform operation analysis for efficient project management.

Unit I Introduction 9 Hours

Introduction to Entrepreneurship Strategy: from Ideation to Exit - identifying the trade-offs - Intellectual activity & knowledge economy - sharing economy – approach to construct social-economic models - Business as construction of value creation chain in the context of open knowledge.

Unit II Digital technologies as an open innovation's environment 9 Hours

Transaction costs: trust and reviewing system (personification) - Hard & software - Robotics and Intelligence - Computing Recognition and Decision Making - Infrastructure Building - Cyber-physical systems as a product and as an infrastructure.

Unit III The organization and management of open innovation projects 9 Hours

History the emergence of open innovation - Analysis of elements of open innovation in the traditional management - Agile – flexible project management - Methodologies within agile approach, from project to product - steps of converting ideas into goods - Stakeholders of open innovation project - customers, investors - employees etc. Indicators of effectiveness for the various groups of stakeholders.

Unit IV Start-up environment **9 Hours**

institutions that support and finance innovative projects Types of financing - Infrastructure supporting small innovative enterprises and start-ups, Programs to support innovative projects at the federal and regional level.

Unit V Operational and Strategy Management **9 Hours**

Introduction to Operations Management: Operations Analysis - Coordination and Planning - Quality Management - Project Management - and Logistics and Supply Chain Management - strategy management - technological strategy.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the strategies for developing start-up projects in the context of globalization and open-source innovations.	Understand
CO2: Evaluate government and private support mechanisms for open innovation projects and assess their maturity level.	Apply
CO3: Implement agile methodologies to manage open innovation projects.	Apply
CO4: Recognize government programs supporting innovative projects and assess their effectiveness.	Apply
CO5: Conduct operational analysis and strategic management tasks to improve project management efficiency.	Apply
Text Book(s):	
T1. Peter F. Drucker, “Innovation and Entrepreneurship”, Classic Drucker Collection, 2007	

T2. Eric Ries, "The Lean Startup: How Today’s Entrepreneurs Use Continuous Innovation to create Radically Successful Businesses", Crown Publishing Group, 2011.

Reference(s):

R1. Rishikesha T. Krishnan and Vinay Dabholkar,”8 Steps To Innovation: Going From Jugaad to Excellence”- Publisher Collins India, 2013.

Web References:

1. https://www.coursera.org/learn/startups-in-open-innovation
2. https://www.coursera.org/learn/entrepreneurship-strategy

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMOC1005		Course Title: MACHINE LEARNING WITH PYTHON	
Course Category: Open Elective		Course Level: Practice	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Provide ability to handle various data types and datasets in python.
2. Provide ability to implement various machine learning models in python.
3. Teach various regression techniques.
4. Teach various classification methods.
5. Teach various clustering methods.

Unit I Python Basics and Fundamentals 9 Hours

Basics of Python: Data types, operators, expressions - Advanced Python concepts: Indexing, icing, sets, dictionaries - Control structures: Conditionals, loops, functions - Nested loops and their applications.

Unit II Python for Machine Learning 9 Hours

Introduction to Machine Learning- Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning - Python libraries for Machine Learning: Pandas, Numpy, Scikit-learn, Matplotlib.

Unit III Regression Techniques 9 Hours

Simple Linear Regression - Multiple Linear Regression - Non-linear Regression - Model Evaluation in Regression- Evaluation Metrics for Regression Models.

Unit IV Classification Methods 9 Hours

Introduction to Classification- K-Nearest Neighbour (KNN) - Decision Trees Logistic Regression - Support Vector Machines (SVM) - Logistic Regression vs Linear Regression - Evaluation Metrics for Classification Models.

Unit V Unsupervised Learning and Clustering 9 Hours

Introduction to Unsupervised Learning - Clustering basics - K-Means Clustering - Hierarchical Clustering - Applications of clustering in real-world datasets.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Demonstrate the handling of various data types and datasets using Python.	Understand
CO2: Implement machine learning models using Python libraries like Pandas, Numpy, Scikit-learn, and Matplotlib.	Apply
CO3: Employ regression techniques to solve predictive problems effectively.	Apply
CO4: Distinguish between various classification methods and utilize them for real-world data analysis.	Apply
CO5: Implement clustering techniques to analyze and categorize unlabeled data.	Apply

Text Book(s):

T1. Hands–On Machine Learning with Scikit–Learn and TensorFlow 2e: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurelien Geron, O'Reilly, 2017.

T2. Python Machine Learning – 3rd Edition, Sebastian Raschka , Vahid Mirjalili, Packt Publishers, 2019.

Reference Book(s):

R1. Introduction to Machine Learning with Python: A Guide for Data Scientists 1st Edition by Andreas C. Müller, Sarah Guido, O'Reilly, 2016

Web References:

1. https://www.coursera.org/learn/machine-learning-with-python
2. https://www.edx.org/course/machine-learning-with-python-a-practical-introduct

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMOC1006		Course Title: AI FOR EVERYONE	
Course Category: Open Elective		Course Level: Practice	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Provide fundamental knowledge in AI.
2. Make students to design application and use cases of AI.
3. Teach how to use AI in our day to day lives.
4. Teach how to assess and choose suitable AI tools for data processing and visualization.
5. Teach how to implement real world applications.

Unit I Introduction to AI and Machine Learning Basics 9 Hours

Define AI and its applications - understand the basics of machine learning - Explore the terminology associated with AI - Identify characteristics of AI companies - Examine the capabilities and limitations of machine learning - Provide a non-technical explanation of deep learning - Introduce the basics of neural networks - Illustrate examples and application domains of AI.

Unit II Workflow and Tools for AI Projects 9 Hours

Describe the workflow of a machine learning project - Outline the workflow of a data science project. Demonstrate how to use data in AI projects - Guide on choosing an AI project - Explore collaboration within an AI team - Explain data processing and visualization techniques - Introduce technical tools for AI teams - Highlight the use of Python in AI-related projects.

Unit III Integrating AI into Business - Case Studies 9 Hours

Conduct case studies on a smart speaker and a self-driving car - Discuss the roles within an AI team through examples - Identify common pitfalls in AI projects - Survey major application areas of AI.

Unit IV AI and Society - Impact and Ethical Considerations 9 Hours

Present a realistic view of AI's impact on society - Address issues of discrimination and bias in AI. Discuss adversarial attacks on AI systems - Explore adverse uses of AI technology - Analyze

the impact of AI on developing economies - Evaluate the relationship between AI and employment.

Unit V AI Applications in Specific Domains - Real-world Examples 9 Hours

Apply AI concepts to case studies in a specific domain - Explore real-world examples showcasing AI applications - Discuss challenges and solutions encountered in domain-specific AI projects - Present healthcare as a domain with predictive diagnostics - Showcase finance as a domain with fraud detection using AI.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain fundamental concepts of AI and its applications in various fields.	Understand
CO2: Design and develop AI applications by selecting suitable tools and techniques.	Apply
CO3: Integrate AI in everyday life to solve practical problems.	Apply
CO4: Assess and select appropriate AI tools for processing and visualizing data.	Apply
CO5: Implement AI in real-world scenarios across different domains such as healthcare and finance.	Apply

Text Book(s):

T1. M.C. Trivedi,"A Classical Approach to Artificial Intelligence", Khanna Book Publishing, 2019.

T2. Stuart Russel, "Artificial Intelligence: A modern approach", Pearson Education, 2010.

Reference Book(s):

R1. Rich and Knight,"Artificial Intelligence", The McGraw Hill, 2017.

R2. Nils and Nilson, "Artificial Intelligence: A new synthesis", Elsevier, 1997.

R3. A Luger, "Artificial Intelligence", Pearson Education, 2002.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview

2.https://www.udemy.com/course/artificial-intelligence-az/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Course Code: 19AMOC1007		Course Title: NEURAL NETWORKS AND DEEP LEARNING	
Course Category: Open Elective		Course Level: Practice	
L: T: P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended :

1. Introduce the basics of deep neural networks.
2. Teach the basics of associative memory and unsupervised learning networks
3. Make students to apply CNN architectures of deep neural networks
4. Make students to analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.

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-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.

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 – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression

Unit IV DEEP FEEDFORWARD NETWORKS 9 Hours

History of Deep Learning- 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. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the basic concepts and terminologies of neural networks and their applications.	Understand
CO2: Demonstrate training algorithms for pattern association and associative memory networks.	Apply
CO3: Construct CNN architectures for tasks such as image generation, compression, and computer vision.	Apply
CO4: Examine the key computations in deep learning and use them to build and train neural networks for specific tasks.	Apply
CO5: Design recurrent neural networks for applications in natural language processing and image generation.	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

Course Articulation Matrix

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

High-3; Medium-2; Low-1