Dr. Mahalingam College of Engineering and Technology

(An Autonomous Institution)

Pollachi - 642 003

Curriculum and Syllabi

B.Tech. Artificial Intelligence and Data Science

Semesters I to IV

REGULATIONS 2019

DR MAHALINGAM MCET COLLEGE OF ENGINEERING AND TECHNOLOGY

Enlightening Technical Minds

Department of Artificial Intelligence and Data Science

Vision:

To build quality engineers with diversified knowledge to compete globally with innovations in thedomain of Artificial Intelligence and Data Science

Mission:

- To impart technical content in latest technologies through industry collaborativeCurriculum

- To produce young engineers with expert knowledge to hoist industry's growth

- To foster ethical engineers for resolving community issues through automation solutions

- To motivate engineers to employ ethical conduct of research for societal benefits

Programme: B.Tech. Artificial Intelligence and Data Science

Programme Educational Objectives (PEOs) - Regulations 2019

B.Tech. Artificial Intelligence and Data Science graduates will:

PEO1. Domain Knowledge: Possess diversified knowledge and expertise in the domain of ArtificialIntelligence and Data Science

PEO2. Problem solving skills and Ethics: Apply computing skills to identify the challenges and todevelop creative ethical solutions

PEO3. Lifelong Learning and development: Involve in lifelong learning, research anddevelopment to fulfill social needs using latest technology

Programme Outcomes (POs) - Regulations 2019

On successful completion of B.Tech. Artificial Intelligence and Data Science, graduating students/graduates will be able to:

PO1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, concepts of Artificial Intelligence and data science to solve complex engineering problems

PO2. Problem Analysis: Identify, review literature, formulate and analyze complex engineering problems using first principles of mathematics and engineering sciences

PO3. Design and Development of Solutions: Design and develop AI based solutions for complex engineering problems with societal and environmental awareness

PO4. Complex problem Investigation: Investigate complex problems by employing skills pertaining to knowledge acquisition, knowledge representation and knowledge engineering to arrive at valid conclusions

PO5. Modern Tool Usage: Evaluate and use Data analysis tools and AI based techniques for effective decision making in business and engineering domains

PO6. Societal contribution: Follow professional engineering practice by applying contextualknowledge to assess societal and legal issues

PO7. Environment and Sustainability: Understand and provide professional engineering solutions taking into consideration environmental and economic sustainability

PO8. Ethics: Follow ethical principles and norms in engineering practice

PO9. Individual and Team work: Function effectively as an individual, team member or leader indiversified environments

PO10. Communication: Communicate and present the actionable insights of data using reportsthrough various modes for all professional activities

PO11. Project Management and Finance: Apply Engineering knowledge and management principles for effective project management in multi-disciplinary environments

PO12. Life-long Learning: Engage in independent life-long learning and skill development forprofessional and social well being

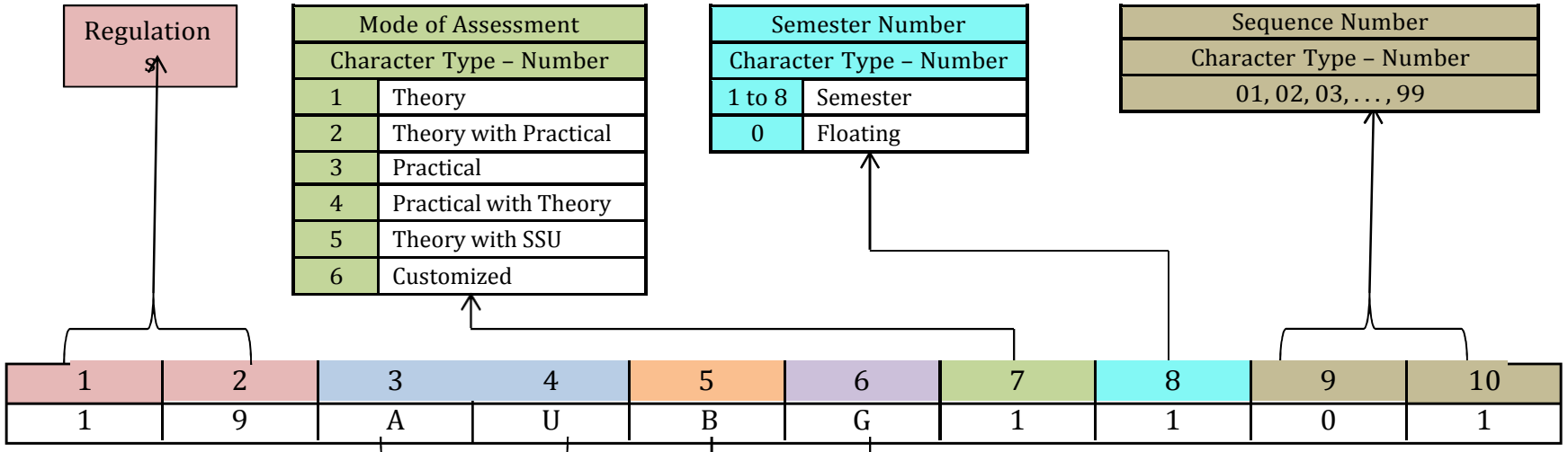
Programme Specific Outcomes (PSOs) - Regulations 2019

PSO1. Software Automation: Develop customized automation solutions for Engineering andbusiness problems using intelligent techniques.

PSO2. Data Engineering: Predict significant information and visualize large scale data using latesttechnologies.

Dr. Mahalingam College of Technology, Pollachi

2019 Regulations - Course Code Generation Procedure for UG Courses(v1)



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

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

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

Programme: B.Tech Artificial Intelligence and Data Science 2019 Regulations
Curriculum for Semesters I to IV

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

Semester I

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1102	Linear Algebra and Infinite Series	3	1	0	4	100	CS,IT & AD
19ENHG2101	Communication Skills – I	2	0	2	3	100	All
19EESC2101	Introduction to Electrical and Electronics Engineering	3	0	2	4	100	CS, IT & AD
19ADSN2101	Introduction to C Programming	3	0	2	4	100	-
19CSSC4001	IT Practices Lab	1	0	4	3	100	CS , IT & AD
19PSHG6001	Wellness for students	0	0	2	1	100	All
	Total	**12**	**1**	**12**	**19**	**600**	

Semester II

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1202	Calculus and Transforms	3	1	0	4	100	CS,IT & AD
19ENHG2201	Communication Skills – II	2	0	2	3	100	All
19PHBC2002	Physics for Information Sciences	3	0	2	4	100	CS,IT & AD
19ECSC2201	Digital System Design	2	0	2	3	100	CS,IT & AD
19ADSN2201	Object Oriented Programming with Java	3	0	3	4.5	100	-
19MESC4001	Engineering Drawing	1	0	3	2.5	100	AU,CS,EC,EI, IT, ME, AD
19CHMG6201	Environmental Sciences	1	0	0	-	100	All
	Total	**15**	**1**	**12**	**21**	**700**	

Semester III

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABN1302	Probability and Statistics for Data Science	3	1	0	4	100	-
19ADCN1301	Data Structures and Algorithm Analysis – I	3	0	0	3	100	CS, AD
19ADCN1302	Computer Architecture	3	0	0	3	100	CS, AD
19ADCN1303	Data Mining	3	0	0	3	100	-
19ADCN2301	Database Systems	3	0	2	4	100	CS, AD
19ADCN3301	Data Structures and Algorithm Analysis Laboratory	0	0	3	1.5	100	CS, AD
19ADCN4301	Python Programming for Data Engineers Laboratory	1	0	3	2.5	100	-
19PSHG6002	Universal Human Values 2 : Understanding Harmony	2	1	0	3	100	All
XXXXXXXXXX	One Credit Course	0	0	2	1	100	
	Total	**18**	**2**	**10**	**25**	**900**	

Semester IV

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABN1401	Discrete Mathematics for Artificial Intelligence	3	1	0	4	100	-
19ADCN1401	Data Structures and Algorithm Analysis – II	3	1	0	4	100	CS, AD
19ADCN1402	Artificial Intelligence -I	3	0	0	3	100	-
19ADCN1403	Operating System Principles	3	0	0	3	100	-
19ADCN1404	Object Oriented Software Development	3	0	0	3	100	-
19ADCN3401	Intelligent systems - I Laboratory	0	0	4	2	100	-
19ADPN6401	Mini Project	0	0	4	2	100	-
XXXXXXXXXX	One Credit Course	0	0	2	1	100	-
	Total	**15**	**2**	**10**	**22**	**800**	

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

*Refer to clause: 4.8 in UG academic regulations 2019

Tentative Curriculum for Semesters V to VIII

Semester V

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Big Data Analytics	3	0	0	3	100	-
	Artificial Intelligence –II	3	0	0	3	100	-
	Computer Networks	3	0	2	4	100	-
	Professional Elective – I	3	0	2	4	100	-
	Professional Elective – II	3	0	0	3	100	-
	Open Elective – I	3	0	0	3	100	-
	Big Data Analytics Laboratory	0	0	4	2	100	-
	Machine learning techniques Laboratory	0	0	4	2	100	-
	Employability Skills 1: Teamness and Interpersonal Skills	0	0	2	1	100	All
	Total	**18**	**0**	**14**	**25**	**900**	

Semester VI

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Exploratory Data Analysis	3	0	2	4	100	-
	Deep Learning	3	0	2	4	100	-
	Professional Elective – III	3	0	2	4	100	-
	Professional Elective – IV	3	0	0	3	100	-
	Open Elective – II	3	0	0	3	100	-
	Cloud Computing Laboratory	1	0	4	3	100	-
	Innovative and Creative Project	0	0	4	2	100	-
	Employability Skills 2: Campus to Corporate	0	0	2	1	100	All
	Total	**16**	**0**	**16**	**24**	**800**	

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

*Refer to clause: 4.8 in UG academic regulations 2019

Semester VII

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Data Visualization Techniques	3	1	0	4	100	-
	Information security	3	0	0	3	100	-
	Professional Elective – V	3	0	2	4	100	-
	Professional Elective – VI	3	0	2	4	100	-
	Open Elective – III	3	0	0	3	100	-
	Business Intelligence and Analytics Laboratory	0	0	4	2	100	-
	Information Security Laboratory	0	0	4	2	100	
Total		**15**	**1**	**12**	**22**	**700**	-

Semester VIII

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

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

*Refer to clause: 4.8 in UG academic regulations 2019

Total Credits: 172

Tentative Professional Electives for semester V to VII

Course Code	Course Title	Hours / Week			Credits	Marks	Common to Programmes
		L	T	P			
	User Interface Design	3	0	2	4	100	-
	Graphics and Visualization	3	0	2	4	100	-
	Information Retrieval Techniques	3	0	2	4	100	-
	Formal languages and Automata theory	3	0	2	4	100	-
	Computational science	3	0	2	4	100	-
	Text and Web Mining	3	0	2	4	100	-
	Natural Language Processing	3	0	2	4	100	-
	Soft Computing	3	0	2	4	100	-
	Social Network Analytics	3	0	2	4	100	-
	Cryptographic Techniques	3	0	2	4	100	-
	Web Technologies	3	0	2	4	100	-
	Software Quality Assurance and Testing	3	0	2	4	100	-
	Health Care Analytics	3	0	2	4	100	-
	Fundamentals of Virtualization	3	0	2	4	100	-
	Graph Analytics and Algorithm	3	0	2	4	100	-
	Computer Vision	3	0	2	4	100	-
	Augmented reality for AI	3	0	2	4	100	-
	Business Analytics Management	3	0	2	4	100	-
	Predictive Modeling and Analysis	3	0	2	4	100	-
	Embedded Systems in IoT	3	0	2	4	100	-
	Intelligent Robot Technology	3	0	0	3	100	-
	Sequence learning	3	0	0	3	100	-
	Optimization Techniques	3	0	0	3	100	-
	Reinforcement learning	3	0	0	3	100	-
	Large Scale Analytics	3	0	0	3	100	-
	Recommendation systems	3	0	0	3	100	-
	Ethics in Artificial Intelligence	3	0	0	3	100	-
	Cognitive Science and Analysis	3	0	0	3	100	-
	Foundation Skills in Integrated Product Development	3	0	0	3	100	-

Open Electives
(Offered to other programme)

Course Code	Course Title	Hours / week			Credits	Marks
		L	T	P		
	Data Mining	3	0	0	3	100
	Data analytics and Machine Learning	3	0	0	3	100
	Data Science for Engineers	3	0	0	3	100
	Exploratory Data Analysis	3	0	0	3	100
	Business Intelligence and Analytics	3	0	0	3	100
	Ethics in Data Science	3	0	0	3	100

Regulations 2019

Detailed Syllabi for Semesters I to IV

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

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

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment Pattern

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

Non-letter Grades

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

Semester – I

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

Pre-requisites

- NIL

Course Objectives

The course is intended to:

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

Unit I Matrices 9+3 Hours

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

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

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

Unit III Orthogonality and Inner Product Space 9+3 Hours

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

Unit IV Eigen Values and Eigen Vectors 9+3 Hours

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

Unit V Sequences and Series 9+3 Hours

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

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

Text Book(s):

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

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

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

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	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

Assessment Pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials/ Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code:19ENHG2101	Course Title: Communication Skills – I (common to all 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

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

Unit III Reading 15 Hours

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

Unit IV Writing 15 Hours

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	Understand
CO4: Write texts bearing direct meanings for different contexts maintaining an appropriate style	Apply

Text Book(s):

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

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

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment Pattern

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

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

Pre-requisites

- Nil

Course Objectives

The course is intended to:

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

Unit I Fundamentals of DC Circuits 9 Hours

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

Unit II AC Fundamentals 9 Hours

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

Unit III Electrical Machines 9 Hours

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

Unit IV Semiconductor Devices **9 Hours**

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

Unit V Display Devices and Transducers **9 Hours**

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

List of Experiments **30 Hours**

[A] Electrical & Electronics :

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

[B] Civil & Mechanical:

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

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

Text Book(s):

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

Reference Book(s):

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

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

R3. Smarajit Ghosh, “Fundamental of Electrical and Electronics Engineering”, 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	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	2	3	2	-	-	-	-
CO2	2	1	-	-	-	-	-	2	3	2	-	-	-	-
CO3	2	1	-	-	-	-	-	2	3	2	-	-	-	-
CO4	2	1	-	-	-	-	-	1	-	1	-	-	-	-
CO5	2	1	-	-	-	-	-	1	-	1	-	-	-	-
CO6	3	2	1	1	-	-	-	2	3	2	-	-	-	-

High-3; Medium-2; Low-1

Assessment Pattern

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

Course Code: 19ADSN2101	Course Title: Introduction to C Programming		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Build solutions using problem solving techniques and appropriate programming constructs
2. Develop programs using control Structures and arrays
3. Write Programs using Functions and Strings
4. Implement programs using pointers and structures
5. Write programs using files, preprocessor directives and graphics functions

Unit I Introduction 9 Hours

General Problem solving strategy – Program development cycle - Problem Solving Techniques : Algorithm, Pseudocode and Flow Chart - Introduction – C Character set - Identifiers – keywords - Data types – Variables and constants –Structure of C Program- Operators and Expressions-Type Conversion-Formatting input and output statements.

Unit II Control Structures and Arrays 9 Hours

Statements: Selection statement-Jumping statement-Iterative statements-Arrays-One dimensional Array-Two-dimensional Array-Applications: Linear search, Binary search, Matrix Operations.

Unit III Functions and Strings 9 Hours

Functions: Declaration & Definition – Return statement – Types of functions –call by value – call by reference –Recursion. Strings: Declaration and Initialization of string –String library Functions-Storage classes.

Unit IV Pointers and Structures 9 Hours

Pointers: Features of Pointers-Declaration of pointer-Operations on Pointers-void pointer-Dynamic memory allocation-Structures: Declaration & Initialization of Structures – Structure within Structure – Array of Structures.

Unit V Files and Preprocessor Directives 9 Hours

Introduction to Files – Streams - File Types – File operations – Command line arguments – Preprocessor Directives: Macros, File Inclusion- Graphics: Initialization -Graphics functions.

List of Exercises 30 Hours

1. Write programs using Operators and Expressions
2. Develop programs using control structures and Arrays
3. Implement programs using Functions and Strings
4. Write programs using Pointers and Structures
5. Implement programs using Files and Preprocessor directives
6. Develop programs using Graphics functions

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Build solutions using problem solving techniques and appropriate programming constructs for a given scenario	Understand
CO2: Develop programs using control Structures and arrays for a given application	Apply
CO3: Write Programs using Functions and Strings for a given scenario	Apply
CO4: Implement programs using pointers and structures for real time applications	Apply
CO5: Write programs using files, preprocessor directives and graphics functions for a given application	Apply

Text Book(s):

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

Reference Book(s):

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

R2. Yashavant P.Kanetkar, “Let Us C”, 16th Edition, BPB Publications, 2017.

R3. Brian W. Kernighan , Dennis Ritchie, “The C Programming Language”,2nd Edition, Pearson Education, 2015.

Web References:

1. NPTEL Course Introduction to Programming in C: https://onlinecourses.nptel.ac.in/noc19_cs42
2. Learn C: https://www.learn-c.org/
3. C Programming Tutorials: https://www.cprogramming.com/
4. C Programming Exercises: https://codeforwin.org/

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Assessment pattern

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

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

Pre-requisites

- Nil

Course Objectives

The course is intended to:

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

Unit I Introduction **7 Hours**

Internet and World Wide Web – Web Browser – Web Server – Web Page – URIs and URLs – Client Side Scripting – Server Side Scripting

Study of Open Source Tools: Open Element, MIT App Inventor, any other Open source Tool

Unit II HTML **8 Hours**

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

List of Experiments **60 Hours**

Web Applications

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

Mobile Applications

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

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

Reference(s):

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

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

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Assessment Pattern

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

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

Pre-requisites

- NIL

Course Objectives

The course is intended to:

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

Unit I Goal Setting

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

Unit II Time Management - Tools and Techniques

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

Unit III Practices for Physical Wellness

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

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

Unit IV Practices for Mental Wellness

Meditation: Mind and its functions - mind wave frequency – Simple basic meditation – WCSC meditation and introspection tables. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.

Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas

Unit V Putting into Practice

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

Course Outcomes	**Cognitive/ Affective**
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. Reading material, workbook and journal prepared by PS team of the college.

Reference Book(s):

R1. Stephen R Covey, “First things first”, Simon & Schuster UK, Aug 1997.

R2. Sean Covey, “Seven habits of highly effective teenagers”, Simon & Schuster UK, 2004.

R3. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar, “Value education for harmonious life (Manavalakalai Yoga)”, Vethathiri Publications, Erode, I Edition (2010).

R4. Dr. R. Nagarathna, Dr.H.R. Nagendra, “Integrated approach of yoga therapy for positive health”, Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Edition.

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

Assessment Pattern

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

Semester - II

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

Pre-requisites

- NIL

Course Objectives

The course is intended to:

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

Unit I Differential Calculus 9+3 Hours

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

Unit II Multivariable Calculus 9+3 Hours

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

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

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

Unit IV Fourier Series 9+3 Hours

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

Unit V Z Transforms 9+3 Hours

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

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

Text Book(s):

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

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

Reference Book(s):

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

R2. Srimanta Pal &Subodh C. Bhunia. “Engineering Mathematics”, 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

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

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

Pre-requisites

- Communication Skills – I

Course Objectives

The course is intended to:

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

Unit I Listening **15 Hours**

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

Unit II Speaking **15 Hours**

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

Unit III Reading **15 Hours**

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

Unit IV Writing **15 Hours**

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

List of Tasks

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

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

Text Book(s):

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

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

Reference Book(s):

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

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

Web References:

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

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Assessment Pattern

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

Course Code: 19PHBC2002	Course Title: Physics for Information Sciences (common to CS, IT& AD)		
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

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

Assessment Pattern

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

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

Pre-requisites

- Introduction to Electrical and Electronics Engineering

Course Objectives

The course is intended to:

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

Unit I Digital Fundamentals 6 Hours

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

Unit II Combinational Circuits 6 Hours

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

Unit III Synchronous Sequential Circuits 6 Hours

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

Unit IV Asynchronous Sequential Circuits 6 Hours

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

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

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

List of Experiments **30 Hours**

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

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

Text Book(s):

T1. Anil K. Maini, “Digital Electronics Principles, Devices and Applications”, John Wiley & Sons, 2007.

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

Reference Book(s):

R1. Morris Mano, Michael ciletti, “Digital Degin”, 5th Edition, Pearson Publication, New Delhi, 2014.

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

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

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

Web References:

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

Course Articulation Matrix

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

Assessment Pattern

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

Course Code: 19ADSN2201	Course Title: Object Oriented Programming with Java		
Course Category: Engineering Science		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 3	Credits:4.5	Total Contact Hours:90	Max. Marks:100

Pre-requisites

- Introduction to C Programming

Course Objectives

The course is intended to:

1. Develop simple java programs using classes, objects and static methods
2. Utilize the principles of inheritance, interfaces and packages
3. Apply the error handling techniques and multithreading concepts
4. Develop java programs using Collection frameworks and built in classes
5. Design java applications using Streams and Java Swing

Unit I Introduction 9 Hours

Object Oriented Programming Concepts – Java Features – Data Types –Variables – Constants – Operators – Java Virtual Machine – Classes & Methods – Constructors – Constructors overloading – Static Members – Garbage Collection – Command Line Arguments –Arrays – String Class.

Unit II Inheritance, Interfaces and Packages 9 Hours

Class Inheritance: Types – Method Overriding – Super Keyword – Final Variables and Methods – Final Classes – Method Overloading – Abstract Classes and Methods – Interfaces – Packages – Importing Packages – Visibility Control.

Unit III Exception Handling and Thread 9 Hours

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

Unit IV Java Collections and Built in Classes 9 Hours

Collection Interfaces – Set, List, Queue, Collections Classes – ArrayList, LinkedList, HashSet - Accessing a Collection via an Iterator –Map interfaces – Utility Classes: String Buffer – StringTokenizer - Math.

Unit V Streams and GUI Programming **9 Hours**

Streams - Byte Streams - Character Streams – Reading and Writing Files- SWING Basics - Layout Managers -Swing Components: JLabel - JTextField - JButton – JcheckBox – JTextArea – JRadioButton - Event Handling.

List of Exercises **45 Hours**

1. Write programs using constructors and static members
2. Write programs using Inheritance, and Interfaces
3. Write programs using Method overriding and Packages
4. Write programs using Exception Handling and Thread
5. Write programs using Java Collections and String Tokenizer
6. Write programs using Streams and Swing components

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Develop simple java programs using classes, objects and static methods for solving real time problems	Understand
CO2: Utilize the principles of inheritance, interfaces and packages for achieving the code reusability	Apply
CO3: Apply the error handling techniques and multithreading concepts to solve the business problems	Apply
CO4: Develop java programs using Collection frameworks and built in classes for efficient programming	Apply
CO5: Design java applications using Streams and Java Swing for the real word scenarios	Apply

Text Book(s):

T1. Schildt. Herbert., “Java - The complete Reference”, 11th Edition, McGraw Hill Education, 2019.

Reference Book(s):

R1. Deitel and Deitel, “Java How to Program”, Prentice Hall, 11th Edition, 2017.

R2. Allen B. Downey, Chris Mayfield, “Think Java: How to Think Like a Computer Scientist”, O'Reilly,2016.

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs84/preview
2. https://www.w3schools.com/java/
3. https://www.tutorialspoint.com/java/index.htm
4. http://www.javamex.com

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Assessment pattern

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

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

Pre-requisites

- NIL

Course Objectives

The course is intended to:

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

Unit I Orthographic Projection **12 Hours**

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

Unit II Projection of Solids **12 Hours**

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

Unit III Projection of Sectioned Solids **12 Hours**

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

Unit IV Development of Surfaces **12 Hours**

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

Unit V Isometric Projection **12 Hours**

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

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

Text Book(s):

T1. Cencil Jensen, Jay D.Helsel and Dennis R. Short, " Engineering Drawing and Design", 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,

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" Tata McGraw India, New Delhi, 3rd Edition, 2008.

Publications of Bureau of Indian Standards

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

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

Assessment pattern

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

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

Pre-requisites

- NIL

Course Objectives

The course is intended to:

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

Unit I Natural Resources 2 Hours

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

Unit II Environmental Pollution and Disaster Management 2 Hours

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

Unit III Environmental Ethics and Legislations 2 Hours

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

Unit IV Environmental Issues and Public Awarness 2 Hours

Public awareness - Environment and human health

Unit V Environmental Activities 7 Hours

(a)* Awareness Activities*:

i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste

ii) Slogan making event

iii) Poster making event

(b) Actual Activities:

i) Plantation

ii) Cleanliness drive

iii) Drive for segregation of waste

iv) To know about the different varieties of plants

v) Shutting down the fans and ACs of the campus for an hour or so

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

Text Book(s):

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

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

Reference Book(s):

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

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment Pattern

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

Non-letter Grades

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

Semester III

Course Code: 19MABN1302	Course Title: Probability and Statistics for Data Science		
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 and solve practical problems using standard distributions
2. Calculate the correlation and regression for two variables
3. Test the samples based on hypothesis
4. Analyze the samples based on variance
5. Acquire the knowledge of control charts

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- Binomial- Poisson- Uniform –Exponential- Normal Distributions and their properties.

Unit II Two Dimensional Random Variables 9+3 Hours

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression using least square method – Transformation of random variables.

Unit III Testing of Hypotheses 9+3 Hours

Sampling Distributions- Estimation of parameters-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 IV 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.

Unit V Statistical Quality Control **9+3 Hours**

Control charts for measurements(X and R Charts)-Control charts for attributes (p,c and np charts –Tolerance limits-Acceptance sampling.

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

Text Book(s):

T1. Veerajan T, "Probability, Statistics and Random process", 3rd Edition, Tata McGraw-Hill, New Delhi, 2017.

T2. Dr.J.Ravichandran, "Probability and Statistics for Engineers", 1stEdition, Wiley India Pvt. Ltd., 2010.

Reference Book(s):

R1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition Pearson Education, Asia, 2013.

R2. M.R. Spiegel, J. Schiller and R.A. Srinivasan, "Schaum's Outlines Probability and Statistics", 4th Edition Tata McGraw Hill edition, 2012.

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

R4. M.R. Spiegel , L.J.Stephens," Schaum's Outlines Theory and Problems of Statistics", 3rd edition, Mcgraw Hill International edition, 1999.

Web References:

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

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

Assessment Pattern:

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

Course Code: 19ADCN1301	Course Title: Data Structures and Algorithm Analysis – I		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Introduction to C Programming

Course Objectives

The course is intended to:

1. Describe the importance of data structures and asymptotic notations
2. Perform various operations on List data structure
3. Perform various operations on Stack and Queue data structures
4. Apply suitable methods for efficient data access through hashing and determine the complexity of algorithms
5. Compare the efficiency of brute force & divide and conquer techniques

Unit I Basic Concepts of Algorithms 8 Hours

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

Unit II List 9 Hours

List – Array implementation – Linked List implementation:Singly, Doubly, Circular Linked list – Operations: Insert, Delete and Search- Applications of List.

Unit III Stack and Queue 9 Hours

Stack – Implementation – Applications: Balancing Symbols, Infix to Postfix conversion, Evaluation of Postfix expression and function calls – Queue – Implementation –Circular Queue- Deque – Applications.

Unit IV Hashing and Mathematical Analysis of Algorithms 10 Hours

Hashing – Separate chaining – Open addressing – Double hashing – Rehashing. Mathematical analysis of non-recursive algorithms: Matrix Multiplication – Mathematical analysis of recursive algorithms: Factorial problem, Towers of Hanoi – Empirical analysis of algorithms.

Unit V Simple Algorithmic Design Techniques 9 Hours

Brute force approach: Exhaustive Search – String matching:Naive approach, Linear search Bubble sort – Divide and Conquer technique: Binary search, Merge sort, Quick sort.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the importance of data structures and the notations used in algorithm analysis	Understand
CO2: Perform operations on List data structures for various applications	Apply
CO3: Perform operations on Stack and Queue data structures for various applications	Apply
CO4: Apply suitable methods for efficient data access through hashing and determine the complexity of algorithms using mathematical analysis	Apply
CO5: Compare the efficiency of brute force & divide and conquer techniques for problem solving	Apply

Text Book(s):

T1. Mark A. Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2011.

T2. AnanyLevitin, "Introduction to the Design & Analysis of Algorithms", 3rd Edition, Pearson Education, 2011.

Reference Book(s):

R1. SartajSahni, "Data Structures, Algorithms and Applications in C++", 2nd Edition, Universities Press, 2005.

R2. Michael T. Goodrich, Roberto Tamassia, David M. Mount, "Data Structures and Algorithms in C++", 2nd Edition, John Wiley & Sons, 2010.

R3. Cormen.T.H.,Leiserson.C.E., Rivest. R.L. and Stein.C., "Introduction to Algorithms", PHI Pvt. Ltd., 2001.

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
3. The Animation of Recursion URL: http://www.animatedrecursion.com/

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	1	1	1	1	-	1	-	1	1	1	2	-
CO3	3	2	1	1	1	1	-	1	-	1	1	1	2	-
CO4	3	2	1	1	1	1	1	1	-	1	1	1	2	1
CO5	3	2	1	1	1	1	1	1	-	1	1	1	2	1

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ADCN1302	Course Title: Computer Architecture		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Describe the memory organization and various addressing modes
2. Explain the various components of the processing unit and bus organization
3. Design cache memory organization
4. Use various pipeline techniques
5. Describe the various Parallel Processing architectures

Unit I Memory Organization and Addressing 9 Hours

Evolution of Microprocessor – Basic Processor Architecture – Operational concepts – Performance – Memory location – Memory Operations – Instructions and sequencing – Addressing modes – CISC Vs RISC – DMA.

Unit II Input / Output and Basic Processing Unit 9 Hours

Accessing I/O devices – Interrupts – Buses – Instruction Execution – Hardware Components – Instruction Fetch and Execution Steps – Control Signals – Hardwired Control, CISC Style Processors: Micro programmed Control.

Unit III Cache Memory Design 9 Hours

Characteristics of Memory Systems – Cache Memory Principles – Elements of Cache Design – Mapping Function – Example of Mapping Techniques – Replacement Algorithms – Performance Consideration.

Unit IV Pipelining 9 Hours

Pipelining Concept – Pipeline Organization and issues- Data Dependencies – Memory Delays – Branch Delays – Resource Limitations – Performance Evaluation – Superscalar operation- Pipelining in CISC Processors

Unit V Parallelism 9 Hours

Instruction Level Parallelism – Parallel Processing Challenges – Flynn‟s Classification – Hardware multithreading – Multicore Processors: GPU, Multiprocessor Network Topologies – Case Study: ARM, Intel 32/64.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Describe the memory organization and various addressing modes with example	Understand
CO2: Explain the various components of the processing unit and bus organization for instruction execution	Understand
CO3: Design cache memory organization using various mapping techniques	Apply
CO4: Use various pipeline techniques to improve the performance of processors	Apply
CO5: Describe the various Parallel Processing architectures to implement parallelism	Understand

Text Book(s):

T1. Carl Hamacher, Zvonok Vranesic, Safwat Zaky, NaraigManjikian "Computer Organization and Embedded Systems", 6th Edition, McGraw Hill, 2012. (Unit 1,2,3,4)

T2. David A. Patterson and John L. Hennessey, "Computer Organization and Design: The Hardware/Software Interface", 5th Edition, Morgan Kauffman / Elsevier, 2014.(Unit 5)

Reference Book(s):

R1. William Stallings, "Computer Organization and Architecture: Designing for Performance", 10th Edition, Pearson Education, 2016.

R2. S.S.S.P.Rao, "Basics of Computer Organisation and Architecture: Problems and Solutions", Alpha Science International Ltd, 2014.

R3. John L. Hennessey and David A. Patterson, "Computer Architecture: A Quantitative Approach", Morgan Kauffman / Elsevier, 5th Edition, 2012

Web Reference(s):

1. Computer Architecture – Coursera URL: https://www.coursera.org/lecture/comparch/course-introduction-Ouq7L
2. Computer System Architecture-MIT Open Courseware Notes URL: https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-823-computer-system-architecture-fall-2005/index.htm
3. Computer Architecture: NPTEL Course URL: http://www.nptel.ac.in/courses/106102062/

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	2	1	-	-	-	-	-	1	-	1	-	1	-	-
CO3	3	2	1	1	-	-	1	1	-	1	-	1	2	-
CO4	3	2	1	1	-	-	1	1	-	1	-	1	2	-
CO5	2	1	-	-	-	-	-	1	-	1	-	1	-	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ADCN1303	Course Title: Data Mining		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Distinguish the types of data to be pre-processed for the given dataset
2. Describe the basic principles, concepts and applications of data warehousing
3. Categorize the kinds of patterns that are discovered by association rule mining
4. Classify data for the given dataset.
5. Analyze the data mining trends and applications.

Unit I Introduction 10 Hours

Introduction to Data Mining: Kinds of Data – Kinds of Patterns – Technologies - Applications – Issues - Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity - Preprocessing: Data Quality - Major Tasks in Data Preprocessing - Data Reduction – Data Transformation and Data Discretization - Data Cleaning and Data Integration.

Unit II Data Warehousing 8 Hours

Data Warehousing and Online Analytical Processing: Data Warehouse basic concepts - Data Warehouse Modeling - Data Cube and OLAP - Data Warehouse Design and Usage - Data Warehouse Implementation - Data Generalization by Attribute-Oriented Induction.

Unit III Association 9 Hours

Mining Frequent Patterns - Associations and Correlations: Basic Concepts and Methods: Frequent Item set Mining Methods, Pattern Evaluation Methods, Frequent Pattern and Association Mining: A Road Map, Multidimensional Space, Constraint-Based Frequent Pattern Mining, Applications of frequent pattern Mining.

Unit IV Classification and Clustering 10 Hours

Classification: Basic Concepts - Decision Tree Induction – Bayes Classification Methods – Rule Based Classification – K-Nearest-Neighbor Classifier - Model Evaluation and Selection – Techniques to Improve Classification Accuracy. Cluster Analysis: Basic Concepts and Methods- Cluster Analysis - Partitioning Methods - Hierarchical Methods - Density-Based Methods - Grid-Based Methods.

UNIT V Data Mining Trends 8 Hours

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

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Distinguish the types of data to be pre-processed for the given dataset using the preprocessing technique.	Apply
CO2: Describe the basic principles, concepts and applications of data warehousing in real world scenario.	Apply
CO3: Categorize the kinds of patterns that are discovered by association rule mining for transaction database	Analyze
CO4: Classify data for the given dataset using real world applications	Apply
CO5: Analyze the data mining trends and applications for societal problems	Analyze

Text Book(s):

T1. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", 3rd Edition, Elsevier, 2012.

Reference Book(s):

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

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

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

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

Web References:

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ADCN2301	Course Title: Database Systems		
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 functions and architecture of database management system
2. Design relational databases using ER model and normalization concepts
3. Construct SQL queries using DDL, DML and DCL commands
4. Develop applications using database connectivitythrough advanced SQL concepts
5. Explain the concurrency control and recovery mechanisms

Unit I Foundations of DBMS 7 Hours

File System – Database System – File System Vs. DBMS – Roles in DBMS Environment – Data Models and Conceptual Modeling – Functions of DBMS – Components of DBMS – Multi user DBMS Architecture.

Unit II Relational Model, ER Model and Normalization 10 Hours

Relational Model: Terminology, Integrity Constraints – Relational Algebra – ER Modeling: Concepts, Relationship Types, Attributes, Structural Constraints – Normalization: Data Redundancy and Update Anomalies, Functional Dependencies,1NF, 2NF, 3NF, BCNF.

Unit III SQL Fundamentals 10 Hours

SQL: Overview of Query Language, Data Types, Data Definition, Views, Access Control – Data Manipulation – Joins – Nested Queries.

Unit IV Advanced SQL and Query Processing 9 Hours

Advanced SQL: Functions and procedures, Cursors, Triggers – Accessing SQL from a Programming Language – Query Processing: Decomposition, Heuristical Approach to Query Optimization, Cost Estimation for Relational Algebra Operations.

Unit V Transaction and Concurrency Control 9 Hours

Transaction: Properties – Concurrency Control: Locking methods, Deadlock, Timestamp Ordering, Multi-version Timestamp Ordering, Optimistic Techniques – Database Recovery: Transaction and Recovery, Recovery facilities, Recovery Techniques.

List of Exercises **30 Hours**

1. Design a database using ER diagrams
2. Create and modify the tables using DDL commands and manipulate the data using DML commands
3. Implement Joins and nested queries
4. Implement Functions and procedures
5. Create Cursors and Triggers
6. Access database through programming language

The suggested applications are (not limited to)

1. Library management system
2. Hotel Management system
3. Student management system
4. Ticket reservation system
5. Hospital management system
6. Employee management system

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the functions and architecture of database management system using its components	Understand
CO2: Design relational databases using ER model and normalization concepts for real world scenarios	Apply
CO3: Construct SQL queries using DDL, DML and DCL commands for effective retrieval of data from database	Apply
CO4: Develop applications using database connectivity through advanced SQL Concepts for solving real world problems	Apply
CO5: Explain the concurrency control and recovery mechanisms to manage multiple transactions in real time application	Understand

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", 7thEdition, McGraw-Hill,2019.

Reference Book(s):

R1. RamezElmasri,Shamkant B. Navathe, “Fundamentals of Database Systems”, 7th Edition, Pearson Education,2017.

R2. C.J. Date, A. Kannan and S. Swamynathan- “An Introduction to Database Systems”, 8th Edition, Pearson Education, 2006.

Web References:

1. Text book handouts: http://www.inf.unibz.it/~nutt/IDBs1011/idbs-slides.html
2. NPTEL lecture videos and notes: https://nptel.ac.in/courses/106106093/
3. SQL practice exercises with solutions: https://www.w3resource.com/sql-exercises/

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	-
CO3	3	2	2	2	2	1	1	2	3	2	1	1	3	2
CO4	3	2	2	2	2	1	1	2	3	2	1	1	3	2
CO5	2	1	-	-	-	1	-	1	-	1	-	1	-	-

High-3; Medium-2;Low-1

Assessment Pattern

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

Course Code: 19ADCN3301	Course Title:Data Structures and Algorithm Analysis 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

- Introduction to C Programming

Course Objectives

The course is intended to:

1. Implement list data structures using array and linked list
2. Implement stack data structure for various applications
3. Implement queue data structure and hashing techniques
4. Compare the efficiency of Brute-Force and Divide & Conquer approaches

List of Exercises

1. Implementation of List using array representation
2. Implementation of List using linked list representation
3. Implementation of Doubly linked list
4. Implementation of Stack application: Balancing parenthesis
5. Implementation of Stack application: Evaluation of postfix expression
6. Implementation of Circular Queue using array representation
7. Implementation of Hashing
8. Implementation of String Matching algorithm
9. Implementation of Searching techniques
10. Implementation of Sorting techniques: Bubble and Merge sort

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Implement list data structures and perform various operations using array and linked list representation.	Apply
CO2: Implement stack data structure for various applications using array representation	Apply
CO3: Implement circular queue using array and hashing techniques for efficient data handling in various scenarios	Apply
CO4: Compare the efficiency of Brute-Force and Divide & Conquer approaches for solving problems.	Apply

Text Book(s):

T1. Mark A. Weiss., "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2011.

T2. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", Pearson Education,

Reference Book(s):

R1. Sartaj Sahni, "Data Structures, Algorithms and Applications in C++", 2nd Edition, Universities

R2. Michael T. Goodrich, Roberto Tamassia, David M. Mount, "Data Structures and Algorithms in C++", 2nd Edition, John Wiley & Sons, 2010.

R3. Cormen.T.H.,Leiserson.C.E., Rivest. R.L. and Stein.C., "Introduction to Algorithms", PHI Pvt. Ltd., 2001.

Web References:

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
3. The Animation of Recursion URL: http://www.animatedrecursion.com/

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Assessment pattern

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

Course Code: 19ADCN4301	Course Title: Python Programming for Data Engineers Laboratory		
Course Category: Professional Core		Course Level: Practice	
L: T: P (Hours/Week) 1: 0: 3	Credits: 2.5	Total Contact Hours: 60	Max Marks:100

Pre-requisites

- Object Oriented Programming with Java

Course Objectives

The course is intended to:

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

Unit I Introduction to Python and Data Structures 7 Hours

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

Unit II OOPS Concepts and GUI Programming in Python 8 Hours

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

List of Exercises 45 Hours

1. Implement data types, operators and expressions
2. Implementation of branching statements, looping constructs & functions
3. Implementation of list, tuple and dictionary
4. Implementation of file handling techniques
5. Implementation of class and objects with exception handling
6. Implementation of polymorphism
7. Implementation of Inheritance
8. Implementation of pickle and shelve objects
9. Implement Database Connectivity with SQL Server
10. Design a GUI programming with Tkinter for given application

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Develop Python programs using variables and statements for simple business logic	Apply
CO2: Utilize suitable data structures for a given problem and its constraints	Apply
CO3: Create classes and objects for provided business requirement	Apply
CO4: Create a GUI based application with data persistence using databases	Apply

Reference (s):

R1. 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.

R2. Mark Lutz, "Powerful Object Oriented Programming Python", 4th Edition, O"Reilly, 2012

Web References:

1. https://docs.python.org/3/tutorial/
2. https://www.pyschools.com/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

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

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

Pre-requisites

- Induction Program (UHV 1)

Course Objectives

The course is intended to:

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

Unit I Introduction to Value Education 6+3 Hours

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

Unit II Harmony in Human Being 6+3 Hours

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

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

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

Unit IV Harmony in the Nature 6+3 Hours

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

Unit V Harmony on Professional Ethics 6+3 Hours

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

Course Outcomes	**Affective Level**
At the end of this course, students will be able to:	
CO1. Reflect on values, aspiration, relationships and hence identify strengths and weaknesses.	Responding
CO2. Appraise physical, mental and social 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. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference Book(s):

R1.Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
R2.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
R3. The story of stuff, Annie Leonard, Free Press, New York 2010.

Web References:

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment Pattern

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

Semester IV

Course Code:19MABN1401		Course Title: Discrete Mathematics for Artificial Intelligence	
Course Category: Basic Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max. Marks:100

Pre-requisites

- Linear Algebra and Infinite Series

Course Objectives

The course is intended to:

1. Use the concepts of propositional logic to test the validity of arguments.
2. Use the concepts of sets, relations and functions in programming.
3. Use combinatorics in counting problems.
4. Use the concepts of groups to study the algebraic structures.
5. Use the fundamental concepts in graph theory in practical problems.

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 Combinatorics 9+3 Hours

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

Unit IV Algebraic Structures 9+3 Hours

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

Unit V Graphs 9+3 Hours

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

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: Apply the concepts of graph theory to solve practical problems	Apply

Text Book(s):

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

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

Reference Book(s):

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

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

Web References:

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

Course Articulation Matrix

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

Assessment pattern

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

Course Code: 19ADCN1401	Course Title: Data Structures and Algorithm Analysis – II		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max. Marks:100

Pre-requisites

- Data Structures and Algorithm Analysis – I

Course Objectives

The course is intended to:

1. Perform various operations on Binary trees and Heaps
2. Implement operations on Search tree structures
3. Perform various operations on Graphs and Sets
4. Apply Greedy strategy & Dynamic Programming techniques
5. Compare the working of Backtracking & Branch and Bound techniques

Unit I Trees Structures 9+3 Hours

Tree – Preliminaries – Binary trees – Tree traversal – Applications: Expression tree, Decision tree, Game tree – Binary Heap – Heap sort.

Unit II Search Tree Structures 9+3 Hours

Binary search tree – B-Trees – k-d tree – Tries.

Unit III Graph 9+3 Hours

Graph – Definitions – Representations – Topological sort – Breadth first traversal – Depth first traversal – Biconnectivity – Euler circuits – Sets – Representation – Operations.

Unit IV Greedy Method and Dynamic Programming 9+3 Hours

Greedy technique: Dijikstra's algorithm, Prim's and Kruskal's algorithm, Huffman Tree – Dynamic Programming: Binomial Coefficient, Floyd's and Warshall's algorithm, Multistage Graph.

Unit V Backtracking & Branch and Bound 9+3 Hours

Limitations of Algorithm Power: P,NP and NP Complete problems - Backtracking: n-Queens problem, Hamiltonian Circuit, Subset-sum problem - Branch and Bound: Assignment problem, Knapsack problem, Travelling salesman problem.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Perform various operations on Binary trees and Heaps for real world applications	Apply
CO2: Implement operations on Search tree structures for efficient storage and retrieval of data	Apply
CO3: Perform various operations on Graphs and Sets by using suitable storage organizations	Apply
CO4: Apply Greedy strategy & Dynamic Programming techniques for solving optimization problems	Apply
CO5: Compare the working of Backtracking & Branch and Bound techniques and choose the suitable technique for problem solving	Apply

Text Book(s):

T1. Mark A. Weiss., "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2011.

T2. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", 3rd Edition, Pearson Education, 2011.

Reference Book(s):

R1. Ellis Horowitz, Sartaj Sahni, Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications, 2010.

R2. Adam Drozdek, "Data Structures and Algorithms in C++", 4th Edition, Cengage Learning, 2013.

R3. Cormen.T.H.,Leiserson.C.E., Rivest R.L and Stein C, "Introduction to Algorithms", PHIPvt Ltd, 2001.

Web Reference(s):

1. SWAYAM Course Design and Analysis of Algorithms: https://swayam.gov.in/nd1_noc19_cs47/preview
2. Animation Videos: http://www.animatedrecursion.com/
3. Course Material: THE P VERSUS NP PROBLEM https://www.claymath.org/sites/default/files/pvsnp.pdf

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

High-3; Medium-2;Low-1

Assessment Pattern:

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ADCN1402	Course Title: Artificial Intelligence - I		
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

- Data Structures and Algorithms

Course Objectives

The course is intended to:

1. Describe agent types and behaviour.
2. Compare the efficiency of various searching techniques.
3. Apply real time searching to the given problem
4. Apply Inference rules to the given Knowledge Base
5. Choose the appropriate planning technique.

Unit I Introduction to Artificial Intelligence 9 Hours

Introduction – Definitions - Foundations - History – State of Art – Intelligent Agents: Agents and Environments – The concept of Rationality - Nature of Environments - Structure of Agents - Problem Solving agents

Unit II Solving Problems by Searching 9 Hours

Searching for Solutions – Uninformed Search Strategies : Breadth First, Uniform Cost, Depth First, Depth Limited, Iterative Deepening, Bidirectional Search – Comparison of Uninformed Search Strategies - Informed Search strategies : Greedy BFS, A* search – Optimality of A* - Memory Bounded Heuristic Search – Heuristic Functions

Unit III Real Time Searching 9 Hours

Local search algorithms and Optimization Problems – Local Search in Continuous Spaces - Online search agents - Adversarial search – Optimal decision in games - Alpha – Beta Pruning – Imperfect Real Time Decisions - Constraint Satisfaction Problem – Inference in CSPs - Backtracking search for CSP.

Unit IV Knowledge and Reasoning 9 Hours

Logical Agents – Knowledge Based Agents - Propositional Logic – Theorem Proving - Resolution - Forward and Backward chaining – Agents Based on Propositional Logic - First Order Logic - Syntax and Semantics of FOL - Using First Order Logic - Knowledge Engineering in FOL - Inference in FOL - Unification and Lifting - Forward and Backward chaining – Resolution.

Unit V Planning 9 Hours

Classical Planning - Planning as State space search - Planning and acting in Real world and Non deterministic domains - Hierarchical planning – Multi-agent planning.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Describe the types and behavior of problem solving agents	Apply
CO2: Compare the efficiency of various searching techniques in solving a problem	Apply
CO3: Apply real time searching technique to solve the given problem	Apply
CO4: Apply Inference rules to the given Knowledge Base for theorem proving	Apply
CO5: Choose the appropriate planning technique to solve the given problem	Apply

Text Book(s):

T1. Stuart J. Russell, Peter Norvig, "Artificial Inteligence – A modern Approach", 3rd Edition, Pearson Education Inc., 2021.

Reference Book(s):

R1. Saroj Kaushik, " Artificial Intelligence", Cengage Learning, 2019.

R2. Lavika Goel, "Artificial Intelligence – Concepts and Applications", Wiley, 2021.

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

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

Course Code: 19ADCN1403	Course Title: Operating System Principles		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. 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 System: Disk Structure, Disk Attachment, Disk Scheduling – 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

Design Principles – Kernel Modules – Process Management – Scheduling – Memory Management – File Systems – Input and Output – Inter-process Communication – Network Structure – Security.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Describe the components of operating systems and its services based on system calls	Understand
CO 2: Solve process scheduling and synchronization problems using algorithms	Apply
CO 3: Compare different memory management techniques using allocation schemes	Apply
CO 4: Develop solutions for free space management using file systems and disk scheduling concepts.	Apply
CO 5: 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”, 10th Edition, 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 Education, 2018.

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

Assessment Pattern

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

Course Code: 19ADCN1404	Course Title: Object Oriented Software Development		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre– requisites

- Fundamentals of Programming

Course Objectives

The course is intended to:

1. Impart the knowledge on Software Life cycle models.
2. Derive the requirements for a Software system.
3. Analyze classes with appropriate relationships.
4. Design classes, interfaces and subsystems.
5. Develop functional object oriented software.

Unit I Software Process 9 Hours

Software Process Structure – Software Development Process Models – Agile Development – Understanding Requirements.

Unit II Requirements Modeling 8 Hours

Unified Modeling Language – Architecture – Unified Process – Requirements Workflow – Defining Requirements – Use Case Modeling – Actor and Use Case Generalization – Use Case Relationships.

Unit III Analysis Modeling 10 Hours

Analysis Workflow – Classes and Objects – Finding Analysis Classes – Relationships – Inheritance and Polymorphism – Analysis Packages – Use Case Realization – Activity Diagrams.

Unit IV Design Modeling 9 Hours

Design Workflow – Design Classes – Refining Analysis Relationships – Interface and Subsystems – Design Realization – Basic and Advanced State Charts.

Unit V Implementation, Testing & Deployment 9 Hours

Implementation Workflow – Components – Software Testing Strategies – Testing Conventional Applications – Testing Object Oriented Applications – Deployment.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Impart the knowledge on Software Life cycle models for Software development process	Understand
CO 2: Derive the requirements for a Software system through Requirement Engineering process	Apply
CO 3: Analyze classes with appropriate relationships in problem statement using activity diagrams	Apply
CO 4: Design classes, interface and subsystems by using Interaction and State diagrams	Apply
CO 5: Develop functional object oriented software, test it with necessary deployment techniques	Apply

Text Books:

T1. Roger. S. Pressman and Bruce R. Maxim, "Software Engineering – A Practitioner's Approach", 8th Edition, McGraw Hill, 2015.

T2. Jim Arlow, Ila Neustadt, "UML2 and The Unified Process: Practical Object Oriented Analysis and Design", Pearson Education, 2015.

Reference Books:

R1. Craig Larman, "Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development", 3rd Edition, Addison Wesley Professional, 2015.

R2. Ian Sommerville, "Software Engineering", 9th edition, Pearson Education Asia, 2011.

Web References:

1. Roger S.Pressman online learning Center URL:http://www.mhhe.com/engcs/compsci /pressman/
2. NPTEL Course on Object Oriented Analysis and Design URL:http:/nptel.ac.in/courses/106105153/

Course Articulation Matrix

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

High– 3; Medium– 2; Low– 1

Assessment Pattern

	Assessment Component	**CO. No.**	**Marks**	**Total**
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19ADCN3401	Course Title: Intelligent systems - I 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

- Object Oriented Programming with Java

Course Objectives

The course is intended to:

1. Identify the types of data to be pre-processed
2. Generate association rules and cluster the data
3. Analyze the type of search technique
4. Develop AI application

List of Exercises

1. Identification of characteristic of data and perform data pre-processing techniques for any given dataset.
2. Perform data Classification using Decision Tree on the given data set
3. Identification of frequent item set and generation of association rules using Apriori algorithm
4. Cluster the given data set using K-Means clustering algorithm
5. Visualize and analyze the results for the given dataset using different types of charts.
6. Implementation of Breadth First and Depth First searching techniques
7. Implementing state space search algorithms
   - Hill climbing algorithms
   - A* algorithm
8. Demonstrate the Min-Max algorithm
9. Knowledge representation and inference using first order logic
10. Develop Simple AI applications

Suggested list (not limited to)

Chat bot creation, Smart assistants, Natural language processing tools,
Travel booking agent etc..,

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1 :Identify the types of data to be pre-processed for the given dataset	Apply
CO2: Generate association rules and cluster the data for the given data set	Apply
CO3: Analyze the type of search technique over the given scenario.	Analyze
CO4: Develop AI application to interact with environment	Apply

Reference (s):

R1. Stuart J. Russell, Peter Norvig, "Artificial Intelligence – A modern Approach", Third Edition, Pearson Education Inc., 2021.

R2. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", 3rd Edition, Elsevier, 2014.

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

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

Course Code: 19ADPN6401	Course Title: Mini Project		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 0: 0: 4	Credits:2	Total Contact Hours:60	Max Marks:100

Course Objectives

The course is intended to:

1. Identify solution to simple engineering problems.

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

Course Articulation Matrix

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

Assessment pattern

Continuous Assessment	Assessment component	CO. No.	Marks	Total Marks
	Review 1	1,2,3,4	25	75
	Review 2	1,2,3,4	25	
	Review 3	1,2,3,4	25	
End Semester Examination	Viva voce	1,2,3,4	25	25
Total				100