P.S.R. ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

(Accredited by NAAC and listed under 12B of UGC Act, 1956)

Sevalpatti (P.O), Sivakasi – 626140.

Department of
Computer Science and Engineering

CURRICULUM
AND
SYLLABI

UG Regulations – 2019

B.E., Computer Science and Engineering

(Full–Time)

(Candidates admitted from 2019–2020 onwards)

DEPARTMENT VISION & MISSION

Vision

- To impart holistic education in Computer Science and Engineering to cater the needs in academia, industry and society.

Mission

- Offering under graduate and post graduate programmes by providing effective and balanced curriculum and equip themselves to gear up to the ethical challenges awaiting them.

- To confer continuous activities in technical and research that will enable the students to face the real time challenges in the field of Computer Science and Engineering.

- To provide training for the students in a socially responsible manner with inculcating integrity and human values.

Programme Educational Objectives (PEO's)

- Lead a professional career by acquiring the basic knowledge in the field of specialization and allied Engineering.

- Assess the real life problems and deal with them confidently relevance to the society.

- Engage in lifelong learning by pursuing higher studies and participating in professional organizations.

- Exhibit interpersonal skills and able to work as a team for success.

PROGRAMME SPECIFIC OUTCOMES (PSO's)

1. Design, implement, test, and evaluate a computer system, component, or algorithm to meet desired needs and to solve a computational problem.
2. The ability to understand, analyse and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics and networking for efficient design of computer-based systems of varying complexity.
3. The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product.
4. Ability to use knowledge in various domains to identify research gaps and hence to provide solutions, new ideas and innovations.

PROGRAMME OUTCOMES (PO's)

Engineering Graduates will be able to:

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

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

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

4. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

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

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

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

9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

P.S.R. ENGINEERING COLLEGE, SIVAKASI – 626140.

(An Autonomous Institution, Affiliated to Anna University, Chennai)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Consolidated Curriculum Structure
(UG Regulations 2019)

Programme: B.E. – COMPUTER SCIENCE AND ENGINEERING

Sem-ester	Theory Courses					Theory Cum Practical Courses		Institution Non-Credit Courses	Practical Courses		Special Courses	Value Added / Mandatory Courses	Total Credits
1	191HS11 Communicative English (2)	191HS12 Calculus and Linear Algebra(4)	191HS13 Engineering Physics (2)	191HS14 Engineering Chemistry (2)	191EEF1 Basic Electrical and Electronics Engineering (3)	191MEF1 Engineering Graphics (3)	-	-	191HS17 Physics and Chemistry Laboratory–I (1)	191EEF7 Basic Electrical and Electronics Laboratory (1)	-	-	18
2	191HS21 Technical English (2)	191HS22 Differential Equations and Numerical Methods (4)	191HS23 Physics of Materials (2)	191HS24 Environmental Science(2)	191CSF1 Programming for Problem Solving (3)	191MEF7 Mechanical Workshop (3)	-	-	191HS27 Physics and Chemistry Laboratory – II (1)	191CSF7 C Programming Laboratory (1)	-	-	18
3	191HS31 Transforms and Discrete Mathematics (3)	191BS31 Biology for Engineers (3)	191CS31 Data Structures (3)	191CS32 Programming in Python (3)	191CS33 Design and Analysis of Algorithms (4)	191EC35 Digital Electronics and Micro-processors (4)	-	191HS37 Communication Skills – I (0)	191CS37 Data Structures & Algorithms Laboratory (1)	191CS38 Python Laboratory (1)	-	Value Added Course –I	22
4	191HS42 Probability and Statistics (3) (2L+2T)	191CS41 Computer Organization and Architecture (3)	191CS42 Database Management Systems (3)	191CS43 Object Oriented Programming (3)	-	191CS44 Operating Systems (4)	191CS45 Software Engineering (4)	191HS47 Communication Skills – II (0)	191CS47 Database Management Systems Laboratory (1)	191CS48 Java Laboratory (1)	-	191MC0* Mandatory Course – I	22

Sem-ester	Theory Courses					Theory Cum Practical Courses		Institution Non-Credit Courses	Practical Courses		Special Courses	Value Added / Mandatory Courses	Total Credits
5	191CS51 Theory of Computation (3) (2L+2T)	191CS52 Artificial Intelligence and Machine Learning (3)	191CS53 Mobile Application Development (3)	191CSE* Elective – I (3)	-	191CS54 Computer Networks (4)	191CS55 Web Technology (4)	191HS57 Business English (0)	191CS57 Machine Learning Practices Laboratory (1)	191CS58 Mobile Application Development Laboratory (1)	-	Value Added Course – II	22
6	191CS61 Cloud Computing (3)	191CS62 Deep Learning (3)	191BAE* Mgmt. Elective (3)	191CSE* Elective – II (3)	191OE** Open Elective – I (3)	191CS63 Internet of Things (4)	-	191HS67 Career English (0)	191CS67 Cloud Laboratory (1)	191CS68 Deep Learning Laboratory (1)	191CS69 Mini Project (1)	191MC0* Mandatory Course – II	22
7	191CS71 Big Data Analytics (3)	191CS72 Image and Video Analytics (3)	-	191CSE* Elective – III (3)	191OE** Open Elective – II (3)	191CS73 Block Chain Technologies (4)	191CS74 Ethical Hacking and Network Defense (4)	-	191CS77 Big Data Analytics Laboratory (1)	191CS78 Video Analytics Laboratory (1)	191CS79 Project – I (2)	Value Added Course – III	24
8	-	-	191CSE* Elective – IV (3)	191CSE* Elective – V (3)	-	-	-	-	-	-	191CS89 Project – II (6)	-	12
												TOTAL CREDITS	160

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P.S.R. ENGINEERING COLLEGE, SIVAKASI – 626140.
UG REGUALTION – 2019
CHOICE BASED CREDIT SYSTEM
B.E. COMPUTER SCIENCE AND ENGINEERING
CURRICULUM [I – VIII SEMESTERS – FULL-TIME]
(candidates admitted from 2019-2020 onwards)

Total Credits: 160

S. No.	Course Code	Course Title	Category	L–T–P	Credit
		SEMESTER I			
Theory					
1	191HS11	Communicative English	HSMC	2–0–0	2
2	191HS12	Calculus and Linear Algebra	BSC	3–1–0	4
3	191HS13	Engineering Physics	BSC	2–0–0	2
4	191HS14	Engineering Chemistry	BSC	2–0–0	2
5	191EEF1	Basic Electrical and Electronics Engineering	ESC	3–0–0	3
6	191MEF1	Engineering Graphics	ESC	1–0–4	3
Practical					
7	191HS17	Physics and Chemistry Laboratory –I	BSC	0–0–2	1
8	191EEF7	Basic Electrical and Electronics Laboratory	ESC	0–0–2	1
				No. of Credits:	**18**

S. No.	Course Code	Course Title	Category	L–T–P	Credit
		SEMESTER II			
Theory					
1	191HS21	Technical English	HSMC	2–0–0	2
2	191HS22	Differential Equations and Numerical Methods	BSC	3–1–0	4
3	191HS23	Physics of Materials	BSC	2–0–0	2
4	191HS24	Environmental Science	BSC	2–0–0	2
5	191CSF1	Programming for Problem Solving	ESC	3–0–0	3
6	191MEF7	Mechanical Workshop	ESC	1–0–4	3
Practical					
7	191HS27	Physics and Chemistry Laboratory – II	BSC	0–0–2	1
8	191CSF7	C Programming Laboratory	ESC	0–0–2	1
				No. of Credits:	**18**

S. No.	Course Code	Course Title	Category	L–T–P	Credit
		SEMESTER III			
Theory					
1	191HS31	Transforms and Discrete Mathematics	BSC	2–2–0	3
2	191BS31	Biology for Engineers	BSC	3–0–0	3
3	191CS31	Data Structures	PC	3–0–0	3
4	191CS32	Programming in Python	PC	3–0–0	3
5	191CS33	Design and Analysis of Algorithms	PC	3–1–0	4
6	191EC35	Digital Electronics and Microprocessors	ESC	3–0–2	4
Practical					
7	191HS37	Communication Skills – I	HSMC	0–0–2	0
8	191CS37	Data Structures and Algorithms Laboratory	PC	0–0–2	1
9	191CS38	Python Laboratory	PC	0–0–2	1
				No. of Credits:	**22**

S. No.	Course Code	Course Title	Category	L–T–P	Credit
SEMESTER IV					
Theory					
1	191HS42	Probability and Statistics	BSC	2–2–0	3
2	191CS41	Computer Organization and Architecture	PC	3–0–0	3
3	191CS42	Database Management Systems	PC	3–0–0	3
4	191CS43	Object Oriented Programming	PC	3–0–0	3
5	191CS44	Operating Systems	PC	3–0–2	4
6	191CS45	Software Engineering	PC	3–0–2	4
7	*191MC0**	*Mandatory Course – I*	MC	2–0–0	0
Practical					
8	191HS47	Communication Skills – II	HSMC	0–0–2	0
9	191CS47	Database Management Systems Laboratory	PC	0–0–2	1
10	191CS48	Java Laboratory	PC	0–0–2	1
			No. of Credits:		**22**

S. No.	Course Code	Course Title	Category	L–T–P	Credit
SEMESTER V					
Theory					
1	191CS51	Theory of Computation	PC	2–2–0	3
2	191CS52	Artificial Intelligence and Machine Learning	PC	3–0–0	3
3	191CS53	Mobile Application Development	PC	3–0–0	3
4	191CS54	Computer Networks	PC	3–0–2	4
5	191CS55	Web Technology	PC	3–0–2	4
6	*191CSE**	*Program Elective – I*	PE	3–0–0	3
Practical					
7	191HS57	Business English	HSMC	0–0–2	0
8	191CS57	Machine Learning Practices Laboratory	PC	0–0–2	1
9	191CS58	Mobile Application Development Laboratory	PC	0–0–2	1
			No. of Credits:		**22**

S. No.	Course Code	Course Title	Category	L–T–P	Credit
SEMESTER VI					
Theory					
1	191CS61	Cloud Computing	PC	3–0–0	3
2	191CS62	Deep Learning	PC	3–0–0	3
3	191CS63	Internet of Things	PC	3–0–2	4
4	*191BAE**	*Management Elective*	HS	3–0–0	3
5	*191CSE**	*Program Elective – II*	PE	3–0–0	3
6	*191OE**	*Open Elective – I*	OE	3–0–0	3
7	*191MC0**	*Mandatory Course – II*	MC	2–0–0	0
Practical					
7	191HS67	Career English	HSMC	0–0–2	0
8	191CS67	Cloud Laboratory	PC	0–0–2	1
9	191CS68	Deep Learning Laboratory	PC	0–0–2	1
10	191CS69	Mini Project	PROJ	0–0–2	1
			No. of Credits:		**22**

S. No.	Course Code	Course Title	Category	L–T–P	Credit
SEMESTER VII					
Theory					
1	191CS71	Big Data Analytics	PC	3–0–0	3
2	191CS72	Image and Video Analytics	PC	3–0–0	3
3	191CS73	Block Chain Technologies	PC	3–0–2	4
4	191CS74	Ethical Hacking and Network Defense	PC	3–0–2	4
5	*191CSE**	*Program Elective – III*	PE	3–0–0	3
6	*191OE**	*Open Elective – II*	OE	3–0–0	3
Practical					
7	191CS77	Big Data Analytics Laboratory	PC	0–0–2	1
8	191CS78	Video Analytics Laboratory	PC	0–0–2	1
9	191CS79	Project – I	PROJ	0–0–4	2
			No. of Credits:		**24**

S. No.	Course Code	Course Title	Category	L–T–P	Credit
SEMESTER VIII					
Theory					
1	*191CSE**	*Program Elective – IV*	PE	3–0–0	3
2	*191CSE**	*Program Elective – V*	PE	3–0–0	3
Practical					
3	191CS89	Project – II	PROJ	0–0–12	6
			No. of Credits:		**12**
			Total No. of Credits:		**160**

S. No.	Categories	R2019 Credits	AICTE Weightage
1	HSMC – Humanities and Social Science including Management Courses.	07	12
2	BSC – Basic Science	27	25
3	ESC – Engineering Sciences	18	24
4	PC – Program Core	78	48
5	PE – Program Elective	15	18
6	OE – Open Elective	6	18
7	MC – Mandatory Course	0	0
8	PROJ – Project	9	15
	TOTAL	**160**	**160**

LIST OF PROGRAM ELECTIVES

S. No.	Course Code	Course Title	Category	L–T–P	Credit
1.	191CSEA	Ad Hoc and Sensor Networks	PE	3–0–0	3
2.	191CSEB	Advanced JAVA Programming	PE	3–0–0	3
3.	191CSEC	C# and .Net Programming	PE	3–0–0	3
4.	191CSED	Cyber Crime and Cyber Forensics	PE	3–0–0	3
5.	191CSEE	Data Science and Analytics	PE	3–0–0	3
6.	191CSEF	Distributed Computing	PE	3–0–0	3
7.	191CSEG	Embedded and Real Time Systems	PE	3–0–0	3
8.	191CSEH	Information Retrieval	PE	3–0–0	3
9.	191CSEI	Internet of Everything	PE	3–0–0	3
10.	191CSEJ	iOS Application Development	PE	3–0–0	3
11.	191CSEK	Medical Image Processing	PE	3–0–0	3
12.	191CSEL	Mobile and Edge Computing	PE	3–0–0	3
13.	191CSEM	Modeling and Simulation	PE	3–0–0	3
14.	191CSEN	Natural Language Processing	PE	3–0–0	3
15.	191CSEO	Neural Networks	PE	3–0–0	3
16.	191CSEP	Search Engine Optimization Marketing	PE	3–0–0	3
17.	191CSEQ	Social Web Mining	PE	3–0–0	3
18.	191CSER	Soft Computing Algorithms	PE	3–0–0	3
19.	191CSES	System Software	PE	3–0–0	3
20.	191EC72	Digital Image Processing	PE	3–0–0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF CSE

S. No.	Course Code	Course Title	Category	L–T–P	Credit
1	191OE1A	Green Computing	OE	3–0–0	3
2	191OE1B	Java Scripts	OE	3–0–0	3
3	191OE1C	Python Foundations	OE	3–0–0	3
4	191OE1D	Web Development using PHP	OE	3–0–0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF ECE

S. No.	Course Code	Course Title	Category	L–T–P	Credit
1	191OE2A	Agriculture Electronics	OE	3–0–0	3
2	191OE2B	Consumer Electronics	OE	3–0–0	3
3	191OE2C	Medical Electronics	OE	3–0–0	3
4	191OE2D	Multimedia Compression and Communication	OE	3–0–0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF EEE

S. No.	Course Code	Course Title	Category	L–T–P	Credit
1.	191OE4A	Domestic and Industrial Electrical Installation	OE	3–0–0	3
2.	191OE4B	Electrical Materials	OE	3–0–0	3
3.	191OE4C	Energy Auditing and Conservation	OE	3–0–0	3
4.	191OE4D	Energy Storage Systems	OE	3–0–0	3
5.	191OE4E	Renewable and Sustainable Energy	OE	3-0-0	3
6.	191OE4F	Vehicular Electric Power System	OE	3-0-0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF BIO-TECHNOLOGY

S. No.	Course Code	Course Title	Category	L–T–P	Credit
1.	191OE5A	Biomaterials	OE	3–0–0	3
2.	191OE5B	Biosensors	OE	3–0–0	3
3.	191OE5C	Bioweapons and Security	OE	3–0–0	3
4.	191OE5D	Food and Nutrition Technology	OE	3–0–0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF MECHANICAL ENGINEERING

S. No.	Course Code	Course Title	Category	L–T–P	Credit
1.	191OE6A	Maintenance Engineering	OE	3–0–0	3
2.	191OE6B	Non-Destructive Testing and Materials	OE	3–0–0	3
3.	191OE6C	Operations Research and Management	OE	3–0–0	3
4.	191OE6D	Renewable Sources of Energy	OE	3–0–0	3
5.	191OE6E	Robotics	OE	3–0–0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF CIVIL ENGINEERING

S. No.	Course Code	Course Title	Category	L–T–P	Credit
1.	191OE7A	Air and Noise Pollution Control	OE	3–0–0	3
2.	191OE7B	Energy Science and Engineering	OE	3–0–0	3
3.	191OE7C	Environment and Ecology	OE	3–0–0	3
4.	191OE7D	Fundamentals of Fire Safety	OE	3–0–0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF BIOMEDICAL ENGINEERING

S. No.	Course Code	Course Title	Category	L–T–P	Credit
1.	191OE8A	Brain Computer Interface and its Applications	OE	3–0–0	3
2.	191OE8B	Internet of Things in Medicine	OE	3–0–0	3
3.	191OE8C	Speech Processing	OE	3–0–0	3
4.	191OE8D	Telehealth Technology	OE	3–0–0	3

MANAGEMENT ELECTIVES OFFERED BY DEPARTMENT OF MBA

S. No.	Course Code	Course Title	Category	L-T-P	C
1.	191BAEA	Engineering Economics and Accounting	HS	3–0–0	3
2.	191BAEB	Entrepreneurship	HS	3–0–0	3
3.	191BAEC	Essentials of Management	HS	3–0–0	3
4.	191BAED	Intellectual Property Rights	HS	3–0–0	3
5.	191BAEE	Professional Ethics in Engineering	HS	3–0–0	3
6.	191BAEF	Women Studies and Women Empowerment	HS	3–0–0	3

MANDATORY COURSES

S. No.	Course Code	Course Title	Category	L–T–P	Credit
1.	191MC01	Design Thinking	MC	2–0–0	0
2.	191MC02	Essence of Indian Traditional Knowledge	MC	2–0–0	0
3.	191MC03	Indian Constitution	MC	2–0–0	0
4.	191MC04	Universal Human Values	MC	2–0–0	0
5.	191MC05	Yoga	MC	2-0-0	0

VALUE ADDED COURSES

The value added courses on recent trends are offered in Semester III, V and VII for theknowledge enrichment of the students.

191HS11	COMMUNICATIVE ENGLISH	L T P C 2 0 0 2

Programme: B.E. Computer Science and Engineering **Sem:** 1 **Category:** HSMC

Prerequisites: Nil

Aim: To acquire basic Language Skills in order to communicate with English Language Speakers.

Course Outcomes: The Students will be able to

CO1: Develop the basic reading and writing skills.

CO2: Listen actively and grasp the contents of the speech.

CO3: Develop their speaking skills and speak fluently in real contexts.

CO4: Develop vocabulary of a general kind by developing their reading skills.

CO5: Use the grammar effectively to exhibit their speaking and writing skill.

CO6: Speak in English with clarity.

SHARING INFORMATION RELATEDTO ONESELF, FAMILY AND FRIENDS. 9

Reading – Short comprehension passages, Practice in skimming and scanning. **Writing –** Sentence structures, Developing Hints. **Listening–** Short texts, Short formal and informal conversations. **Speaking** – Introducing oneself, Exchanging personal information. **Language Development** – WH questions, Asking and answering YES or NO questions, Parts of Speech. **Vocabulary Development –** Prefixes & Suffixes, Subject verb Agreement.

GENERAL READING AND FREE WRITING 9

Reading – **Comprehension** – Pre-reading & Post-reading. Comprehension questions (Multiple choice questions, Short questions, Open-ended questions), Short narratives and Descriptions from Newspapers including Dialogues. **Writing –** Paragraph writing, Use of Phrases and Clauses in sentences, Listening Telephonic conversations. **Speaking** – Sharing information of a personal kind, Greetings.

Language Development – Noun Pronoun agreement. **Vocabulary Development** – The Concept of Word Formation. (Norman Lewis' *Word Power Made Easy*)

GRAMMAR AND LANGUAGE DEVELOPMENT 9

Reading – Short texts & Longer passages (Cloze reading). **Writing** – Importance of proper punctuation, Jumbled sentences. **Listening –** Listening to longer texts and filling up the table, Product description, Narratives from different sources. **Speaking –** Asking about routine actions and Expressing opinions.

Language Development – Degrees of Comparison, Pronouns. **Vocabulary Development –** Misplaced modifiers, Relative clauses.

READING AND LANGUAGE DEVELOPMENT. 9

Reading- Comprehension. **Reading** longer texts- reading different types of texts. **Writing**- letter Writing, informal or personal letters-Achieving Coherence. **Listening**- listening to dialogues or conversations and completing exercises based on them. **Speaking**- Speaking about oneself- Speaking about one's friend. **Language Development**- Articles. **Vocabulary Development** – Root words from foreign languages and their use in English.

EXTENDED WRITING 9

Reading- Longer texts- close reading. **Writing**- Organizing principles of paragraphs in documents. **Listening** – Listening to talks, conversations. **Speaking** – Participating in conversations, short group conversations. **Language Development** - Cliches, Tenses. **Vocabulary Development** - Prepositions.

Total Periods: 45

Text Books:

1. Board of Editors. "Fluency in English: A course book for Engineering and Technology". Orient Blackswan, Hyderabad: 2016.

2. Kumar, Sanjay and PushpLata, "Communication Skills: A Workbook", New Delhi: OUP, 2018

References:

1. www.oxfordonlineenglish.com
2. www.ielts.up.com
3. www.ted.com
4. www.testpreppractice.com
5. www.beccambridgeenglish.org

Extensive Reading

1. Shiv Khera, *You Can Win*, Macmillan Books, New Delhi, 2003.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1												2				
CO2								1								2
CO3										3				1		
CO4								1								
CO5									2						3	
CO6										2						

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191HS12	**CALCULUS AND LINEAR ALGEBRA**	**3**	**1**	**0**	**4**

Programme: B.E. Computer Science and Engineering   **Sem:** 1 **Category:** BSC

Prerequisites: Matrices, Differentiation and Integration.

Aim: The course is aimed at developing the basic mathematical skills of engineering students.

Course Outcomes: The Students will be able to.

CO1: Find the inverse and the positive powers of a square matrix.

CO2: Apply the concept of orthogonal reduction to diagonalise the given matrix

CO3: Determine the evolute of curves, Beta and Gamma Functions.

CO4: Apply Lagrangian multiplier method to find maxima and minima of an unconstrained problem.

CO5: Apply the concepts of Differentiation and Integration in Vectors

CO6: Predict an analytic function, when its real or imaginary part is known.

MATRICES   **12**

Characteristic equation - Eigen Values and Eigen vectors of a real matrix - Properties of Eigen values - Cayley-Hamilton Theorem (without proof) and its application - Orthogonal Transformation of a Symmetric matrix to diagonal form - Quadratic form - Orthogonal reduction to canonical form.

CALCULUS   **12**

Radius of Curvature - Cartesian and Parametric Coordinates - Circle of Curvature - Involutes and evolutes –Beta and Gamma functions and their properties.

MULTIVARIABLE CALCULUS   **12**

Partial Derivatives - Total Derivative - differentiation of Implicit function – Jacobian - Taylor's Expansion - Maxima/Minima for function of two variables - Method of Lagrange's multipliers.

VECTOR CALCULUS   **12**

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepiped.

COMPLEX VARIABLE – DIFFERENTIATION   **12**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy– Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function(without proof) – Harmonic conjugate – Construction of analytic functions – Conformal mapping : $w = z + c$, cz, $1/z$, and bilinear transformation.

Total Periods: 60

Text Books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43/e, 2014.
2. G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", 9/e, Pearson, Reprint, 2002

References:

1. Veerarajan.T.*,* "Engineering Mathematics for first year", 4/e Tata Mc-Graw – Hill, Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 9/e, 2006.
2. G.B. Thomas and R.L. Finney, "Calculus and Analytic Geometry", Pearson, 9/e, 2002.
3. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.
4. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 36/e, 2010.
5. J. W. Brown, R. V. Churchill, "Complex Variables and Applications", Mc-Graw-Hill, 7/e, 2004.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3		1								3		2	1	
CO2	2	3		3								2				1
CO3	3	3										2	2			
CO4	1	1													2	
CO5	3	2		2										2		
CO6	2	2		1								3	2			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191HS13	ENGINEERING PHYSICS	L	T	P	C
		2	0	0	2

Programme: B.E. Computer Science and Engineering   **Sem:** 1   **Category:** BSC

Prerequisites: School Level Physics

Aim: To endow the students with the fundamentals of Physics and apply new ideas in the field of Engineering and Technology.

Course Outcomes: The Students will be able to

CO1: Understand the theory and various crystal structures.

CO2: Know about the basic configuration of a Laser, types of lasers and the industrial applications of Laser.

CO3: Understand principle behind fiber optic communication and the electronic devices involved in the transmission and reception of data.

CO4: Know about basics of properties of matter and its applications.

CO5: Gain knowledge about basic equations of Quantum mechanics and its applications.

CO6: Understand the basic concepts of acoustics and ultrsonics.

SOLID STATE PHYSICS   **9**

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Crystal Defects-point, Line and surface defects - burger vector.

WAVE OPTICS   **9**

LASERS: Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einsteins A and B coefficients – Derivation- Types of lasers – CO_2, Nd-YAG - Industrial Applications - Lasers in welding, cutting and Soldering

FIBER OPTICS: Optical Fiber-Classification- Principle and propagation of light in optical fibres- Numerical aperture and Acceptance angle-Fibre optical communication system- Sensors (Active and passive) –Displacement and Temperature Sensors.

PROPERTIES OF MATTER   9

Elasticity–Stress - strain diagram and its uses -factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple- torsion pendulum: theory and experiment -bending of beams -bending moment –cantilever: theory and experiment–uniform and non-uniform bending: theory and experiment – I shaped girders - stress due to bending in beams.

QUANTUM PHYSICS   **9**

Black body radiation – Planck's theory -Photoelectric effect - Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box.

ACOUSTICS AND ULTRASONICS   **9**

ACOUSTICS: Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - Sabine's formula - absorption coefficient and its determination – factors affecting acoustics of buildings: focusing, interference, echo, Echelon effect, resonance - noise and their remedies

Ultrasonics: Ultrasonics - production – magnetostriction and piezoelectric methods - acoustic grating - industrial applications - NDT.

         Total Periods: 45

Text Books:

1. Gaur R. K., Gupta S. C., "Engineering Physics" Dhanpat Rai Publications, New Delhi (2016).

2. Avadhanulu M. N., Kshirsagar, P. G., "A Text book of Engineering Physics", S.Chand & Co., Ltd., New Delhi, 2017.

References:

1. Serway and Jewett., "Physics for Scientists and Engineers with Modern Physics",Thomson Brooks/Cole,6/e, Indian reprint (2016)

2. AritherBeiser, "Concepts of Modern Physics", Tata McGraw Hill, NewDelhi (2015).

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2						3				2	1		3
CO2	2	3	1		2	1			1			2	1		1	1
CO3	2	1	2		1	1	2			1			2	1		3
CO4	2	3	1	1	3								1		2	1
CO5	1	1		2										2		1
CO6	1	2	3	1	1	2	3						2		1	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	T	P	C
191HS14	**ENGINEERING CHEMISTRY**	2	0	0	2

Programme: B.E. Computer Science and Engineering   **Sem:** 1   **Category:** BSC

Prerequisites: Basic Science

Aim: To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

Course Outcomes: The Students will be able to.

CO1: Demonstrate the essential concept of water and their properties and applications

CO2: The treatment of water for potable and industrial purposes.

CO3: Understand the operating principles and the reaction involved in electrochemistry.

CO4: Know the principles and application of spectroscopy.

CO5: Learn the basic ingredients required for paint formulation.

CO6: Know the preparation techniques of consumer products.

WATER TECHNOLOGY   **9**

Hardness -Types and Estimation by EDTA method- alkalinity –types of alkalinity and determination- Domestic water treatment –disinfection methods – Boiler feed water– internal conditioning– external conditioning – desalination and reverse osmosis.

ELECTROCHEMISTRY   **9**

Electrochemical cells – reversible and irreversible cells – EMF –measurement of emf – Single electrode potential – Nernst equation– reference electrodes –Standard Hydrogen electrode –Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series

SPECTROSCOPIC TECHNIQUES AND APPLICATIONS   **9**

Introduction of UV-Visible and IR spectroscopy and selection rules- principles and instrumentation of UV-Visible (electronic) spectroscopy – IR (vibrational) spectroscopy - its applications. Fluorescence spectroscopy and its applications in medicine-colorimetry– estimation of iron by colorimetry .

INORGANIC & ORGANIC COATINGS   **9**

Paint–Definition–Components of Paints and their functions–Varnish–Definition–Preparation of Oil Varnish–Differences between Paint and Varnish–Special Paints–Luminescent Paints, Fire Retardant Paints- Aluminium Paints - Distemper.corrosion control– electroplating (Au) and electroless (Ni) plating.

PREPARATION OF CONSUMER PRODUCTS   **9**

Washing Powder- Cleaning powder - phenoyls (white, Black &coloured)- Shampoo- liquid blue- inks - blue –red - green inks – Soap - bathing & detergent – oils - Face powder and bleaching powder.

     Total Periods: 45

Text Books:

1. P. Kannan, A. Ravikrishnan, "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009.
2. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., 2002.

References:

1. S.S. Dara, S.S. Umare, "Engineering Chemistry", S. Chand & Co. Ltd., New Delhi 2010.
2. B.K.Sharma, "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
3. B.Sivasankar, "Engineering chemistry" Tata McGraw Hill Pub., 2006.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2		1	1	1	1				2	2	2	1		1
CO2	2	2	1	2	1	2	1				1	1		1		2
CO3	2	1	1	2	2							2		1		
CO4	2	2	1		1						2	1			2	
CO5	2	2	1		1	1						2				2
CO6	2	2	1	1	2	1			1	1	1	1			2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EEF1	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** 1 **Category:** ESC

Prerequisites: Algebra, calculus and electrostatics

Aim: To provide comprehensive idea about AC and DC circuit analysis, working principles and applications of basic machines in electrical engineering and protection schemes in power system.

Course Outcomes: The Students will be able to

CO1: Analyze DC circuits using basic laws.

CO2: Analyze AC circuits using basic laws.

CO3: Understand the operation of DC machines and its applications.

CO4: Demonstrate about AC machines and its applications.

CO5: Know the construction, working and characteristics of the semiconductor devices.

CO6: Design basic combinational and sequential logic circuits.

ELECTRICAL CIRCUITS 12

Ohm's Law – Kirchhoff's Laws –Reduction of series and parallel circuits-Mesh and Nodal Analysis of DC circuits – Introduction to AC Circuits - RMS Value, Average value, Form factor and peak factor phasor representation – Single Phase AC series circuits with R, RL, RC - Power and Power factor. Introduction to three phase circuits- Star and delta connected balanced load.

DC MACHINES & TRANSFORMER 8

DC Generators - construction, principle of operation, Types, EMF equations and applications. DC Motors - operation, Types, Speed and torque equation – speed control of DC shunt motors. Single Phase Transformer - Constructional details and operation, Types, EMF equation, transformation ratio.

AC MACHINES 8

Single phase induction motor - construction, operation and applications, Three phase induction motor – Types, Construction and operation, Torque equation, slip torque characteristics, Synchronous generators - construction and operation, EMF equation - Synchronous motors – principle of operation.

SEMICONDUCTOR DEVICES 9

Introduction to semiconductors-PN Junction Diode – characteristics, breakdown effect and applications - Half wave and Full wave rectifiers, Zener Diode - characteristics and voltage regulator. Bipolar Junction Transistor – operation of NPN and PNP, characteristics of CB, CE, CC configurations.

DIGITAL ELECTRONICS 8

Number System – Binary, octal, hexadecimal, Logic Gates, Half and Full Adders – Flip-Flops –RS, JK, T and D - Counters – synchronous up counter, synchronous down counter, asynchronous up counter, asynchronous down counter, shift registers – shift right and shift left register.

Total Periods: 45

Text Books:

1. Muthusubramanian R, Salivahanan S, "Basic Electrical, Electronics and Computer Engineering", McGraw Hill, New Delhi, 2009.
2. B L Theraja, AK Theraja,'A Text book of Electrical Technology: Volume 2 AC and DC Machines', S.Chand, 23/e, 2006.
3. R.S. Sedha, "A Textbook of Applied Electronics" S. Chand & Co., 2008.

References:

1. V N Mittle, Arvind Mittle "Basic Electrical Engineering", McGraw Hill, New Delhi, 2005.
2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford University press (2012).
3. V K Mehta, Rohitmehta "Principles of Electronics", S.Chand& Co., Ltd, (2015).

4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill,(2014).
5. NPTEL Video Lecture Notes on "Basic Electronics" by Prof. M.B Patil, IIT Bombay.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1							3		3	3	2	3
CO2	3	2									2		3	2	1	3
CO3	3	3		1							2		3	2		3
CO4	3	2									2		3	3	2	3
CO5	3	2		1							3		3	3		3
CO6	3	3	3	2							3		3	2		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191MEF1	**ENGINEERING GRAPHICS**	**1**	**0**	**4**	**3**

Programme: B.E. Computer Science and Engineering   **Sem:** 1   **Category:** ESC

Prerequisites: Nil

Aim: To develop graphic skills in students.

Course Outcomes: The Students will be able to.

CO1: Follow the conventions used in engineering graphics.

CO2: Practice plane curves and free hand sketching.

CO3: Draw the projections of points, lines and plane.

CO4: Draw the projections of simple solids and their sectional views.

CO5: Describe the applications of development of surfaces.

CO6: Practice isometric and perspective projections.

Concepts and conventions (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions(1) and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

PLANE CURVES   **12**

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

PROJECTION OF POINTS, LINES AND PLANE SURFACES   **12**

Projection of Points in all four quadrants - Projection of straight lines located in the first quadrant – inclined to both planes – Determination of true lengths and true inclinations – Projection of regular polygonal and circular lamina inclined to both reference planes.

PROJECTION OF SOLIDS   **12**

Projection of simple solids like Prisms, Pyramids, Cylinder and Cone when the axis is inclined to one reference plane.

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES   **12**

Sectioning of above solids in simple vertical position by cutting planes inclined to HP and perpendicular to VP – Obtaining true shape of section; Development of lateral surfaces of truncated solids – Prisms, Pyramids, Cylinder and Cone

ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS   **12**

Principles of isometric projection – isometric scale – isometric projections of truncated Prisms, Pyramids, Cylinder and Cone; Conversion of Isometric Views to Orthographic Views and Vice-versa.

    Total Periods: 60

Text Books:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2016)

References:

1. Venugopal K. and Prabhu Raja V., **"Engineering Graphics",** New Age International (P) Ltd., 2016.
2. Shah M.B. and Rana B.C., **"Engineering Drawing",** Pearson Education (2009).
3. John K.C., "Engineering Graphics for degree", PHI Learning Pvt. Ltd., New Delhi, (2015).
4. Kumar M.S., "Engineering Graphics**",** D.D. Publications, (2015)

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		3		2					3			1			1
CO2	3		2		2					3			1			1
CO3	3		2		2					3			1			1
CO4	3		3		2					3		1	1			1
CO5	3		3		2					3			1			1
CO6	2		2		2					3		1	1			1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191HS17	PHYSICS AND CHEMISTRY LABORATORY – I	L	T	P	C
		0	0	2	1

Programme: B.E. Computer Science and Engineering   **Sem:** 1   **Category:** BSC

Pre/Co-requisites: 191HS13 – Engineering Physics & 191HS14 – Engineering Chemistry

Aim: To introduce the basic Physics concepts through experiments and
To impart the basic analysis in Chemistry.

Course Outcomes: The Students will be able to.

CO1: Understand the laser light propagation in optical fiber and the rigidity modulus of the materials.

CO2: Understand the velocity of sound in liquid and propagation light in the medium.

CO3: Know about the stress analysis and thermal conductivity of the material.

CO4: Gain knowledge of water quality parameter of potable water.

CO5: Determine the unknown concentrations of chemicals.

CO6: Apply the instrumental technique for calculating the amount of unknown substance.

LIST OF EXPERIMENTS – PHYSICS PART (A minimum of five experiments shall be offered)

1. a. Determination of Particle Size using Diode LASER.

   b. Determination of wavelength of the LASER source.

   c. Determination of Acceptance angle and Numerical aperture of an optical fibre.

2. Torsional pendulum – Determination of rigidity modulus.

3. Determination of Velocity of sound and compressibility of liquid - Ultrasonic Interferometer.

4. Determination of Dispersive power of a prism using Spectrometer.

5. Determination of Young's modulus of the material - Non uniform bending.

6. Determination of thermal conductivity of a bad conductor - Lee's Disc method.

LIST OF EXPERIMENTS – CHEMISTRY PART (A minimum of five experiments shall be offered)

1. Estimation of Total Hardness of their home town Water by EDTA method.

2. Estimation of Alkalinity of Water sample.

3. Estimation of Chloride ion in water sample by Argentometric method.

4. Estimation of Ferrous Ion by Potentiometric Titrations.

5. Conductometric Titration of strong acid Vs strong base.

Total Periods 45

References:

1. A.I. Vogel, "Text book of Quantitative Inorganic Analysis", ELBS, London(2006).

2. A. Ravikrishnan, "Practical Engineering Chemistry", Sri Krishna Publications, Chennai (2002).

3. Engineering Physics Laboratory Manual & Engineering Chemistry Laboratory Manual.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1							3		3	3	2	3
CO2	3	2									2		3	2	1	3
CO3	3	3		1							2		3	2		3
CO4	3	2									2		3	3	2	3
CO5	3	2		1							3		3	3		3
CO6	3	3	3	2							3		3	2		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

			L	T	P	C
191EEF7	**BASIC ELECTRICAL AND ELECTRONICS LABORATORY**		0	0	2	1

Programme   B.E. Computer Science and Engineering   **Sem: 1**   **Category:**   **ESC**

Pre/Co-requisites: 191EEF1 – Basic Electrical and Electronics Engineering

Aim: To expose the students to basic laws, characteristics of diodes and operation of D.C. machines and transformers and give them experimental skill.

Course Outcomes: The Students will be able to

CO1:   Apply the circuit theory concepts and analyze the outcome.

CO2:   Examine the characteristics of diodes.

CO3:   Analyze characteristics of transistor.

CO4:   Explain the operation of rectifiers.

CO5:   Obtain various characteristics of DC Machines.

CO6:   Obtain various characteristics of AC Machines.

LIST OF EXPERIMENTS

1. Verification of Ohms law
2. Verification of Kirchhoff's voltage and current laws
3. V – I characteristics of P-N Junction Diode and Zener Diode
4. Input and Output characteristics of CE configuration of NPN transistor
5. Half wave Rectifier
6. Full wave Rectifier
7. Speed Control of D.C. Shunt Motor
8. Load Test on Single phase transformer
9. Load Test on three phase squirrel cage induction motor
10. Open Circuit characteristic of an Alternator

Total Periods: 45

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	1				3		3		3	2	2	2
CO2	3	2		2	1				3		2		3	2		2
CO3	3	2		2	1				3		2		3	2		3
CO4	3	3	2	2	1				3		2		3	2		3
CO5	3	2		2	1				3		3		3	2	1	2
CO6	3	2		2	1				3		3		3	2	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191HS21	TECHNICAL ENGLISH	L	T	P	C
		2	0	0	2

Programme: B.E. Computer Science and Engineering **Sem:** 2 **Category:** HSMC

Prerequisite: 191HS11 – Communicative English

Aim: To develop the students' intellectual, personal & Professional abilities.

Course Outcomes: The Students will be able to

CO1: Remember words and its meanings for the specific purpose.

CO2: Understand the basic nuances of language.

CO3: Apply written communication methodologies at workplace.

CO4: Develop Listening skill to respond and to gather information.

CO5: Interpret the text using comprehending skill.

CO6: Involve in professional correspondences confidently.

INTRODUCTION TO TECHNICAL ENGLISH 9

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises. **Speaking** – Asking for and giving directions. **Reading** – reading short technical texts, Newspapers. **Writing** - Purpose statements, Extended definitions, Writing Instructions & Recommendations, Checklists. **Vocabulary Development** - Technical Vocabulary. **Language Development** – Subject Verb Agreement.

READING AND STUDY SKILLS 9

Listening - Listening to longer technical talks and completing exercises based on them. **Speaking** – Describing a process. **Reading** – Reading longer technical texts, News papers identifying various transitions in a text- paragraphing. **Writing** - Techniques for writing Precisely. **Vocabulary Development** -vocabulary used in formal letters/emails and reports. **Language Development** - Personal & Impersonal Passive voice, Numerical adjectives.

TECHNICAL WRITING AND GRAMMAR 9

Listening - Listening to classroom lectures on Engineering / Technology. **Speaking** – Introduction to Technical presentations. **Reading** – Reading longer texts both general and Technical, practice in rapid reading. **Writing**- Describing a process, Use of sequence words, Causes and Effects **Vocabulary Development** - Sequence words, Nominal compounds, Misspelled words. **Language Development** - Embedded sentences.

REPORT WRITING 9

Listening- Listening to documentaries and Making notes. **Speaking** – Mechanics of presentations. **Reading** – Reading for detailed comprehension. **Writing** - Job application, cover letter, Resume preparation. **Vocabulary Development** - Finding suitable synonyms, Paraphrasing. **Language Development** – Clauses, If conditionals.

GROUP DISCUSSION AND JOB APPLICATIONS 9

Listening - TED/Ink talks. **Speaking** – Participating in a Group discussion. **Reading** – Reading and Understanding Technical articles. **Writing** – Writing reports, Minutes of Meeting, Introduction and Conclusion. **Vocabulary Development** - Verbal analogies**. Language Development** - Reported speech.

Total Periods: 45

Text Books:

1. SudharshanaN.P. and C.Savitha. English for Technical Communication. New Delhi: Oxford University Press, 2017.

References:

1. www.bbc.co.uk/learning_english

2. www.cambridgeenglish.org
3. www.englishenglish101.com
4. www.islcollective.com

Extensive Reading

1. Abdul Kalam, "*The Wings of Fire*". Hyderabad: UP, 1999. Print.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1																
CO2															2	
CO3								1		2			3			
CO4																
CO5				2												
CO6											2			1		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191HS22	DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS	L T P C
		3 1 0 4

Programme: B.E. Computer Science and Engineering   **Sem:** 2   **Category:**   BSC

Prerequisites: 191HS12 – Calculus and Linear Algebra

Aim: To analyze the engineering problems using the techniques and the mathematical skills acquired by studying ODE and PDE uses numerical methods.

Course Outcomes: The Students will be able to

CO1: Use suitable method to solve higher order Differential Equations.

CO2: Use suitable method to solve higher order PDE.

CO3: Interpolate discrete data by means of continuous function.

CO4: Discover Numerical integration using Trapezoidal and Simpson's $1/3^{rd}$ rules.

CO5: Find the solution for the IVPs in ODE using single step and Multistep methods.

CO6: Find the solution of BVPs in PDE using finite difference methods.

ORDINARY DIFFERENTIAL EQUATIONS   **12**

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

PARTIALDIFFERENTIALEQUATIONS   **12**

Formationofpartialdifferentialequations–Lagrange'slinearequation–Solutionsof standard typesoffirstorderpartialdifferentialequations (without reducing the standard type) –Linear homogenouspartialdifferentialequationsofsecondandhigherorder withconstantcoefficients.

SOLUTION OF EQUATION & INTERPOLATION, NUMERICAL DIFFERENTIATION   **12**

Solutions of Polynomial and transcendental equations – Newton Raphson method - Interpolation using Newton's forward and backward difference formulae - Interpolation with unequal intervals- Newton's divided difference and Lagrange's formulae - Numerical differentiation using Newton's forward and backward difference formula - Numerical Integration – Trapezoidal rule and Simpson's $1/3^{rd}$ rule..

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS   **12**

Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method – Milne's predictor – corrector methods for solving first order equations – Finite difference methods for solving second order equation.

BOUNDARY VALUE PROBLEMS OF PARTIAL DIFFERENTIAL EQUATIONS   **12**

Finite differences solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

                                         Total Periods: **60**

Text Books:

1. B.S. Grewal, 'Higher Engineering Mathematics', Khanna Publishers, 36/e, Delhi, 2005.

2. Grewal B.S. and Grewal J. S., "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi, (2004).

References:

1. Greenberg. *M.D*. "Advanced Engineering Mathematics, Pearson Education Inc., 2/e, (First Indian reprint), 2002.

2. Venkataraman. M.K., "Engineering Mathematics", Volume I and II", The National Publishing Company,Revised enlarged 4/e, Chennai, 2004.

3. Kreyszig, E., Advanced Engineering Mathematics, John Wiley Sons, 8/e, 2001.

4. Chapra S.C., Canale R.P., "Numerical Methods for Engineers", Tata Mc-Graw Hill, New Delhi, (2007).

5. Gerald C.F., and Wheatley P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi, (2006).

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1		1								3		2	1	
CO2	2	2		2												1
CO3	2	1		2								1	2			
CO4	1	2		3								2			2	
CO5	2	3												2		
CO6	3	3			3				1			2	2			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191HS23	PHYSICS OF MATERIALS	L T P C
		2 0 0 2

Programme: B.E. Computer Science and Engineering   **Sem:** 2   **Category:**   BSC

Prerequisites: 191HS13 – Engineering Physics

Aim: To endow the students with the fundamentals of physics, materials and apply new ideas in the field of Engineering and Technology.

Course Outcomes: The Students will be able to

CO1: Understand the theory and processing of conducting, superconducting materials.

CO2: Acquire knowledge of classification of semi conducting materials.

CO3: Gain knowledge about the types of magnetic materials and their applications.

CO4: Enhance the knowledge about dielectric materials and their applications.

CO5: Understanding on the functioning of optical materials for optoelectronics.

CO6: Know about the basics of quantum structures and their applications in spintronics

ELECTRICAL PROPERTIES OF MATERIALS   **9**

Conductors: classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory –Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

Super Conductors: properties - Types of super conductors - Applications of superconductors – SQUID, cryotron, magnetic levitation.

SEMICONDUCTOR PHYSICS   **9**

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – Extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration– Hall effect – Determination of Hall coefficient – Applications.

MAGNETIC AND DIELECTRIC MATERIALS   **9**

Magnetic Materials: Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications.

Dielectric Materials: Polarization - electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation –dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

OPTICAL PROPERTIES OF MATERIALS   **9**

Classification of optical materials–carrier generation and recombination processes-Absorption -emission and scattering of light in metals, insulators and Semiconductors (concepts only)- photocurrent in a P-N diode–solar cell–photo detectors-LED-optical storage techniques.

NANOELECTRONIC DEVICES   **9**

Introduction-electron density in bulk material–Size dependence of Fermi energy–quantum confinement–quantum structures-Density of states in quantum well, quantum wire and quantum dot structures – Zener-Bloch oscillations–resonant tunneling – Carbon nanotubes: Properties and applications.

       Total Periods: 45

Text Books:

1. William D. Callister, Jr., "Material Science and Engineering", John Wiley & Sons Inc., 7/e, New Delhi (2017).
2. Ragavan, V., "Material science and Engineering", Prentice Hall of India (2004).
3. Kasap, S.O. "Principles of Electronic Materials and Devices", McGraw -Hill Education, 2016.
4. Umesh K Mishra, Jasprit Singh, "Semiconductor Device Physics and Design", Springer,2014.

References:

1. Koch C., "Nanostructured materials: processing, properties and applications", William Andrew pub.

2011.
2. Charles P. Poole and Frank J.Ownen., "Introduction to Nanotechnology", Wiley India 2016.
3. Charles Kittel., "Introduction to solid state Physics", John Wiley & Sons, 7/e, Singapore 2012.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1			3			1			1	3	1		
CO2	3	2	2	1		1						1	2	1	1	
CO3	1		2	1		2	1		1				1	2		
CO4	2	2	1	1		2		1					2	2		
CO5	3	1	3	2	2								2	1	1	
CO6	3	3	3	2	3	2				1			3		1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191HS24	ENVIRONMENTAL SCIENCE	L	T	P	C
		2	0	0	2

Programme: B.E. Computer Science and Engineering   **Sem:** 2 **Category:**   BSC

Prerequisites: 191HS14 – Engineering Chemistry

Aim: To impart the social groups and individuals to acquire knowledge of pollution and environmental degradation.

Course Outcomes: The Students will be able to

CO1: Understand the basic concepts of environment and energy resources.

CO2: Get knowledge about the ecosystem.

CO3: Identify and analyze causes, effects and control measures of various types of pollution.

CO4: Get the knowledge about types of disaster and mitigation measures.

CO5: Understand the impact of social issues and climate change

CO6: Understand to create the green environment.

ENVIRONMENT AND ENERGY RESOURCES 9

Environment- definition, scope and importance – Need for public awareness – Forest resources-deforestation–Energy resources: Growing energy needs, renewable (solar energy and wind energy) and non-renewable energy sources-Nuclear energy – fission and fusion reactions and light water nuclear reactor for power generation (block diagram only), Petroleum processing and fractions.

ECOSYSTEM 9

Ecosystem: Concept of an ecosystem – Structure and function of an ecosystem: Producers, consumers and decomposers, Energy flow in the ecosystem-Nitrogen cycle, Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the Forest ecosystem and Aquatic ecosystems (lake and rivers).

ENVIRONMENTAL POLLUTION 9

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution –Disaster management: floods-landslides.

SOCIAL ISSUES AND EARTH'S CLIMATE SYSTEM 9

Population-variation among nation-Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting– climate change, global warming, acid rain, Ozone layer depletion.

GREEN CHEMISTRY 9

Introduction to green chemistry- 12 principles of green chemistry-toxicology and green chemistry- energy and green chemistry-education in green chemistry. Reuse and recycling technologies-material selection for green design-recycled water technology.

Total Periods: 45

Text Books:

1. Ravikrishnan, "Environmental Science and Engineering, Sri Krishna Hitech Publishing Company Private Limited, 2010.

2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

References:

1. Anubha Kaushik, C.P. Kaushik, "Environmental Science and Engineering", New Age International Publishers, 2016.

2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill Publishing Company Ltd, New Delhi, ISBN: 0070601690, 2006.

3. Raman Sivakumar, "Introduction to Environmental Science and Engineering"*,* Tata McGraw Hill Education Private Limited, New Del2010.

4. P.Meenakshi, "Elements of Environmental Science and Engineering", PHI learning (P) Ltd., India.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2		1	1	1	1				2	3	2	1		1
CO2	2	2	1		1	2	1				1	2		1		2
CO3	2	1	1	2	2			1				2		1		
CO4	2	2	1		1						2	2			2	
CO5	2	2	1		1	1						2				2
CO6	2	2	1		2	1			1	1	1	2			2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSF1	**PROGRAMMING FOR PROBLEM SOLVING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Programme: B.E./B.Tech. Common to all Branches   **Sem:** 2   **Category:**   ESC
Prerequisites: Nil

Aim: To provide an awareness to Computing and Programming.
Course Outcomes: The Students will be able to
CO1: Understand the basic terminologies of computer and various problem-solving techniques.
CO2: Recall the fundamentals needed for constructing a C program.
CO3: Outline the various types of arrays and functions for string handling.
CO4: Summarize the essence of functions and pointers in a C program.
CO5: Illustrate the requirements of structures and unions.
CO6: Make use of different functions for manipulating files.

INTRODUCTION   **9**
Generation and Classification of Computers- Basic Organization of a Computer - Number System - Binary - Decimal - Conversion - Problems. Software - Types, Development Steps. Algorithm - Pseudo code - Flow Chart. Problem formulation - Problem Solving.

C PROGRAMMING BASICS   **9**
Introduction to Unix Operating System - Introduction to ' C' programming - fundamentals - structure of a 'C' program - compilation and linking processes - Constants, Variables - Data Types - Expressions using operators in 'C' - Managing Input and Output operations - Decision Making and Branching - Looping statements - solving simple scientific and statistical problems.

ARRAYS AND STRINGS   **9**
Arrays - Initialization - Declaration - One dimensional and Two dimensional arrays. String- String operations - String Arrays. Simple programs –Bubble Sort – Linear Search -Matrix Operations.

FUNCTIONS AND POINTERS   **9**
Function - Definition of function - Declaration of function - Pass by value - Pass by reference - Recursion - Pointers - Definition - Initialization - Pointers arithmetic - Pointers and arrays- Example Problems.

STRUCTURES AND FILES   **9**
Introduction - need for structure data type - structure definition - Structure declaration - Structure within a structure - Union - Programs using structures and Unions - File Manipulation - Storage classes - Pre-processor directives.

Total Periods   45

Text Books:
1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2017.
2. Balagurusamy E, "Programming in ANSI C", Tata McGraw-Hill Education, 2016
3. Reema Thareja, "Computer Fundamentals and Programming in C", Oxford University Press, 2/e, 2016.

References:
1. Byron S Gottfried, "Programming with C", Schaum's Outlines, 3/e, McGraw-Hill, 2017.
2. Dromey R.G., "How to Solve it by Computer", Pearson Education, 4th Reprint, 2007.
3. Kernighan B.W, Ritchie,D.M, "The C Programming language", Pearson Education, 2/e, 2006.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	2						3	2		3	3	3		
CO2	3	3	3						2	1		3	3	3	3	2
CO3		3	2						2			2	3	2		
CO4		3	3						3			3	3			3
CO5	2	3	2						1			2		2		
CO6		2	3						2			3	2			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	T	P	C
191MEF7	**MECHANICAL WORKSHOP**	1	0	4	3

Programme: B.E. Computer Science and Engineering   **Sem:** 2   **Category:**   ESC
Prerequisites: Nil

Aim: To Provide exposure to the students with hands on experience on various basic Engineering Practices.

Course Outcomes: The Students will be able to
CO1: Make the square fitting, vee& step fitting.
CO2: Produce simple wooden joints using wood working tools.
CO3: Fabricate tray and funnel in sheet metal.
CO4: Create simple lap, butt and tee joints using arc welding equipments
CO5: Identify the various pipe joints.
CO6: Make the pipe connections.

FITTING OPERATIONS & POWER TOOLS   **12**
Preparation of square fitting, vee& step – fitting models

CARPENTRY   **12**
Study of the joints in roofs, doors, windows and furniture; Hands-on-exercise: Dismantling & Assembling of various wooden furniture; Preparation of T Joint, dove tail joint.

SHEET METAL FORMING   **12**
Preparation of tray and funnel.

WELDING   **12**
Preparation of arc welding of butt joints and lap joints.

PLUMBING   **12**
Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings; Hands-on-exercise - basic pipe connections – Mixed pipe material connection – Connections with different joining components.

                                                    Total Periods: 60

LIST OF EQUIPMENTS (For a batch of 30 students)
1. Fitting vice (fitted to work bench) - 15Nos
2. Fitting Tools – 15 set
3. Carpentry vice (fitted to work bench) - 15 Nos.
4. Models of industrial trusses, door joints, furniture joints - 5 Nos.
5. Standard woodworking tools - 15 Sets
6. Hand Shear – 01
7. Standard tools and calipers for sheet metal work – 05
8. Arc welding transformer with cables and holders - 5Nos.
9. Welding booth - 5 Nos
10. Welding accessories like welding shield, chipping hammer, Wire brush, etc., - 5Sets
11. Assorted components for plumbing consisting of metallic pipes, Plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings - 15 Sets.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	3	3				3							2
CO2	2	2	3	3	3				3							2
CO3	2	2	3	3	3				3							1
CO4	2	2	3	3												1
CO5	2	2	3	3												1
CO6	2	2	3	3	3				3							1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191HS27	**PHYSICS AND CHEMISTRY LABORATORY – II**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Programme: B.E. / B.Tech. (Common to all branches)   **Sem:** 2   **Category:** BSC

Prerequisites: 191HS17 – Physics and Chemistry Laboratory – I

Aim: To introduce the basic Physics concepts through experiments and to impart knowledge on the application of chemistry in engineering branches.

Course Outcomes: The Students will be able to.

CO1: Learn the interference of light and young's modulus of the materials.

CO2: Understand the properties of flow of the liquid.

CO3: Know the band gap of material and resistance of the given coil.

CO4: Determine the quantity of unknown solution by instrumental technique.

CO5: Determine the concentration of an identified analyze by volumetric analysis

CO6: Analyze the characteristics of water.

LIST OF EXPERIMENTS – PHYSICS PART (A minimum of five experiments shall be offered)

1. Determination of thickness of thin wire – Air wedge method
2. Determination of Young's modulus of the material – Uniform bending
3. Determination of viscosity of liquid – Poiseuille's method.
4. Determination of wavelength of mercury spectrum- Spectrometer Grating.
5. Determination of Band Gap of a semiconductor material.
6. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.

LIST OF EXPERIMENTS – CHEMISTRY PART (A minimum of five experiments shall be offered)

1. Esimation of HCl by pH metry
2. Estimation of Copper in brass by EDTA method.
3. Estimation of iodine in iodized salt with thiosulfate
4. Determination of percentage of calcium in limestone by EDTA method
5. Determination of DO in water (Winkler's method)

Total Periods: 45

References:

1. Text book of Quantitative Inorganic Analysis, A.I.Vogel, ELBS,London, (2006).
2. "Practical A. Ravi Krishnan Engineering Chemistry", Sri Krishna Publications, Chennai (2002).
3. Engineering Physics Laboratory Manual
4. Engineering Chemistry Laboratory Manual

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	2	1	1	1		1					1				
CO2	2		1	1	1		1					1				
CO3	2	2		1	1		1					1				
CO4	2	2	1		2		1									
CO5	3	2	2		2							2				
CO6	3	2	2	2			2					2				

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	T	P	C
191CSF7	**C PROGRAMMING LABORATORY**	0	0	2	1

Programme: B.E./B.Tech. Common to all Branches   **Sem:** 2   **Category:** ESC

Pre/Co-requisites: 191CSF1 – Programming for Problem Solving

Aim To provide practical knowledge in developing C Programming.

Course Outcomes: The Students will be able to

CO1: Construct flowcharts using Raptor

CO2: Build simple C programs using decision making and looping statements.

CO3: Perform various operations on matrix using arrays and functions.

CO4: Experiment with user defined functions and pre-defined functions.

CO5: Implement simple programs using structures and unions.

CO6: Develop programs using file handling statements.

LIST OF EXPERIMENTS:

1. Draw a flowchart for various algorithms using Raptor
2. C Programming using Simple statements and expressions.
3. Scientific problem solving using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using String functions.
6. Programs with user defined functions - Includes Parameter Passing.
7. Program using Recursive Function and conversion from given program to flow chart.
8. Programs using pointers
9. Program using structures and unions.
10. Program using files.

Total Periods 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2						2				3	1	1	
CO2	3	2	2						2				3	2	2	
CO3	3	2	3						2				3	3	2	
CO4	2	3	2						2				3	2	2	2
CO5	3		2						2				3	2	1	
CO6	2		2										2	2	1	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191HS31	**TRANSFORMS AND DISCRETE MATHEMATICS**	**L**	**T**	**P**	**C**
		2	**2**	**0**	**3**

Programme: B.E. Computer Science and Engineering   **Sem:** 3   **Category:** BSC

Prerequisites: 191HS22 – Calculus and Linear Algebra

Aim: To introduce basic mathematical ideas such as reasoning techniques, basic counting techniques and their applications.

Course Outcomes: The Students will be able to.

CO1: Apply Laplace transform to solve first and second order differential equations with elementary function.

CO2: Explain the Fourier transform and with their properties.

CO3: Determine Z-inverse transform using convolution theorem and partial fraction method.

CO4: Apply mathematical induction and prove a relation.

CO5: Invent Eulerian and Hamiltonian paths to find shortest paths.

CO6: Make use of graph theoretic models to solve basic problems in networks.

LAPLACE TRANSFORMS   **9**

Laplace transform — Properties of Laplace Transforms – Laplace Transform of periodic functions – Inverse Laplace transforms by partial fraction method and Convolution theorem (excluding proof) – Solving ODE using Laplace transformation techniques.

FOURIER TRANSFORMS   **9**

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms– Properties–Transforms of simple functions–Convolution theorem –Parseval's identity.

Z-TRANSFORMS   **9**

Z-transforms–Elementaryproperties–InverseZ-transform–Convolutiontheorem– Formation of difference equations – Solution of difference equations using Z-transform.

INTRODUCTION TO COUNTING   **9**

Decision problems on Propositional logic – Basic counting techniques – inclusion & exclusion-Pigeonhole principle – Permutations and combinations – Recurrence relations – Solving Linear recurrence relations and generating functions.

INTRODUCTION TO GRAPHS   **9**

Graphs and their basic properties– Graph terminology and special types of graphs - Representing graphs and graph isomorphism – Euler and Hamilton paths.

                 Total Periods: 45

Text Books:

1. B.S. Grewal, 'Higher Engineering Mathematics', 36/e, Khanna Publishers, Delhi, 2005.
2. Grewal B.S. and Grewal J. S., "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi, (2004).

References:

1. Greenberg. *M.D.* "Advanced Engineering Mathematics, Pearson Education Inc., 2/e, (First Indian reprint), 2002.
2. Venkataraman. M.K., "Engineering Mathematics Volume I and II", The National Publishing Company, Chennai, Revised enlarged 4/e, 2004.
3. Trembly J. P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub., New Delhi, 30th Re-print (2007).
4. Dr.P.Kandasamy, Dr.K.Thilagavathy, Dr.K.Gunavathy, "Transforms and Partial Differential Equation", S.Chand & Company Ltd. Ram Nagar, New Delhi.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1		1								3		2	1	
CO2	3	2		3												1
CO3	3	1		2								2	3			
CO4	2	3		2								3			2	
CO5	2	2												2		
CO6	1	2			2				2			3	3			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191BS31	**BIOLOGY FOR ENGINEERS**	**L T P C**
		3 0 0 3

Programme: B.E./ B.Tech. (Common to all Branches). **Sem:** 3 **Category:** BSC

Prerequisites: Nil

Aim: To understand basic and fundamental engineering knowledge from biology.

Course Outcomes: The Students will be able to.

CO1: Understand various biochemical interactions and the structure and function of various biological molecules.

CO2: Explain basic concepts of thermodynamics and energy transactions.

CO3: Discuss different aspects of molecular computing.

CO4: Demonstrate an understanding of Mendelian laws of inheritance.

CO5: Describe cellular architecture and utilize these concepts to design an engineering system.

CO6: Understand fundamental concepts in sensory physiology analogy with communication systems.

INTRODUCTION   **9**

Biological analogy in engineering science, Biological elements-Carbohydrate, protein, amino acids, lipids and nucleic acids structure and function. Primary, secondary, tertiary and quaternary structure of protein. Protein as enzymes, transporter, receptors and structural elements.

METABOLISM AND ENGINEERING   **9**

Engineering aspects in thermodynamics of energy transactions, exothermic and endothermic versus endergonic and exergonic reactions. ATP as an energy source, glycolysis, Krebs cycle and photosynthesis. Energy yielding and energy consuming reactions. Enzymes classification, mechanism of enzyme action, enzyme kinetics and kinetic parameters.

GENETICS AND TRANSFORMATION TECHNOLOGY   **9**

Molecular basis of information transfer. DNA as a genetic material. Concept of genetic code. Mendal's laws, concept of segregation and independent assortment. Concept of allele, Gene mapping, Gene interaction, Epistasis, concepts of recessiveness and dominance and their relativeness to programming. Cell multiplication. Phenotype and genotype. Single gene disorders in humans and human genetics.

CLASSIFICATION AND SYSTEM ENGINEERING   **9**

Structure, function and relativeness to engineering of prokaryotes and eukaryotes. Habitats- aquatic or terrestrial. Molecular taxonomy-three major kingdoms. Microbial species and strains. Identification and classification of microorganisms. Industrial application of microorganisms. Sterilization and media compositions. Growth kinetics.

SENSOR BIOLOGY AND COMMUNICATION SYSTEMS   **9**

Sensory system, circulatory system and excretory system and their relativeness to communication engineering. Hormonal regulation. General defense mechanism in human. Major human disorder and diseases.

                                                                                          Total Periods: 45

Text Books:

1. Arthur T. Johnson, CRC Press, New York 2011.
2. ThyagaRajan. S., Selvamurugan. N., Rajesh.M.P., Nazeer. R.A., Richard W. Thilagaraj, Barathi. S., Jaganthan. M.K., "*Biology for Engineers*", Tata McGraw-Hill, New Delhi, 2012.

References:

1. Rajiv Singal, Gaurav Agarwal, RituBir, Biology for Engineers, CBS Publisher, 2019.
2. Charles Molnar and Jane Gair, Concepts of Biology-1st Canadian Edition, Open Stax Publication, 2013.
3. Raven Johnson, Biology, 11/e, Mc Graw Hill Publication, 2017.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2											1			
CO2	2												1			
CO3			1												2	
CO4						2								2		
CO5					1		2								2	
CO6										2						1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS31	DATA STRUCTURES	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem: 3 Category: PC**

Prerequisites: 191CSF1 – Programming for Problem Solving

Aim: To make the student easier to study how the operations on data structure and various algorithms are performed.

Course Outcomes: The Students will be able to

CO1: Outline the concepts of object oriented programming language.

CO2: Rephrase basic data structures such as linked lists, stacks and queues.

CO3: Apply algorithms for solving problems in sorting and searching.

CO4: Summarize the pros and cons of hashing techniques.

CO5: Explain the implementations and applications of advanced non-linear data structures.

CO6: Illustrate the representation and various algorithms of graphs.

BASIC CONCEPTS OF OBJECT ORIENTED PROGRAMMING   9

Introduction, Classes and objects, Operators overloading and type conversions. Inheritance, Constructors and destructors, Virtual functions and polymorphism, Exception handling.

LINEAR DATA STRUCTURES   9

Abstract Data Types (ADTs) - List ADT - array-based implementation - linked list implementation - singly linked lists - circularly linked lists - doubly-linked lists - applications of lists - Polynomial Manipulation - All operation. Stack ADT - Evaluating arithmetic expressions - other applications - Queue ADT - circular queue implementation - Double ended Queues - applications of queues.

SORTING, SEARCHING AND HASH TECHNIQUES   9

Sorting algorithms: Insertion sort - Selection sort - Bubble Sort - Shell sort - Quick sort - Merge sort - Radix sort. Searching: Linear search - Binary Search. Hashing: Hash Functions - Separate Chaining - Open Addressing - Rehashing - Extendible Hashing.

ADVANCED NON-LINEAR DATA STRUCTURES   9

AVL trees - Red-Black trees - Splay trees - B-Trees - Binomial Heaps - Fibonacci Heaps - Disjoint Sets - Amortized Analysis - accounting method - potential method - aggregate analysis - Applications of Non-Linear Data Structures.

GRAPHS   9

Representation of Graphs - Breadth-first search - Depth-first search - Topological sort - Minimum Spanning Trees - Kruskal and Prim algorithm - Shortest path algorithm - Dijkstra's algorithm - Bellman-Ford algorithm - Floyd - Warshall algorithm.

Total Periods: 45

Text Book:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education, 4/e, 2014.
2. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill Company Ltd., 7/e, 2017.

References:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill, 3/e, 2002.
2. ReemaThareja, "Data Structures Using C", Oxford University Press, 2/e, 2011.
3. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4. Michael T Goodrich, Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", Wiley Publishers, 7/e, 2004.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1										2				
CO2	1	2	2	1	1							2	2	2		
CO3	2	2	2	2	3							2		2		
CO4	2	3	2	2	2								3	3	2	
CO5	2	3	3	3	3							2		3	2	
CO6	2	3	3	3	3							2	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191CS32	**PROGRAMMING IN PYTHON**	**3**	**0**	**0**	**3**

Programme: B.E. Computer Science and Engineering **Sem:** **3** **Category:** **PC**

Prerequisites: 191CSF1 – Programming for Problem Solving

Aim: To review the ideas of computer science, programming, and problem-solving ability in python.

Course Outcomes: The Students will be able to

CO1: Recall fundamental knowledge in python programming.

CO2: Summarize strings and functions in python programs.

CO3: Demonstrate lists, tuples, and dictionaries in python.

CO4: Identify the methods for handling files and exceptions in Python.

CO5: Show the implementation of object oriented programming in Python.

CO6: Outline the importance of various graphics methods in data visualization.

BASICS IN PYTHON 9

Python Overview - Comments - Identifiers - Keywords - Variables - Data types - Operators - Statement and Expressions - String Operations - Boolean Expressions - Control Statements - Iterations - Input from Keyboard.

STRINGS AND FUNCTIONS 9

Built-in Functions - Composition of Functions - User defined functions - Parameters and Arguments - Function calls - The return statement - Python recursive function - Anonymous Functions. Strings - String Traversal - Escape Characters - String formatting operator

LISTS AND DICTIONARIES 9

Lists-Traversing a List - Built-in list operators, methods-Tuples-Values - Operations - Functions - Dictionaries - Values - Update - Properties Operations

FILE MANAGEMENT AND OOPS CONCEPT 9

Files, Exceptions, Class, Objects in python - Built-in Class attributes - Inheritance - Method Overriding - Data Encapsulation - Data hiding.

GRAPHICS AND DATA SCIENCE 9

Graphics – Turtle - Canvas - Frame - Widgets - Creating Database - Tables - Data Frames from Excel - Data Visualization - Histogram - Creating pie chart – Line graph

Total Periods: 45

Text Books:

1. E.Balagurusamy, "Introduction to Computing and Problem Solving Using Python", McGraw-Hill Education (India) Private Ltd., 2016.
2. Allen B. Downey, ``Think Python: How to Think like a Computer Scientist'', 2/e, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/).

References:

1. Dr.R.Nageswara Rao, "Core Python Programming", Dream tech Press, 2/e, 2018.
2. John V.Guttag, "Introduction to Computation and Programming using Python", MIT Press, 2/e, 2016.
3. John Paul Mueller, "Beginning Programming with python For DUMMLES",John Wiley & Sons; 1/e, 2014.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		3	1									3			
CO2	3	3		1											2	
CO3	3		2	3								3			3	3
CO4	2	3		2										3		
CO5	3	2		3												3
CO6	2			2	2								2			3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS33	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	1	0	4

Programme: B.E. Computer Science and Engineering **Sem: 3 Category: PC**

Pre/Co-requisites: 191CS31 – Data Structures

Aim: To learn about algorithm analysis for the run time complexities and the space requirements. and acquire knowledge of algorithms for implementing various computing system.

Course Outcomes: The Students will be able to

CO1: Recall the fundamental knowledge of various algorithms.
CO2: Develop solution using algorithmic strategies for a given problem.
CO3: Relate current techniques in algorithmic principles for modeling and developing software systems.
CO4: Apply graph-based algorithms to solve engineering problems.
CO5: Construct polynomial reductions for problems using the intractable complexity classes.
CO6: Select the different algorithm design techniques for a given problem.

BASIC ALGORITHMIC ANALYSIS **12**

Asymptotic analysis of upper and average complexity bounds; Identifying differences among best, average, and worst case behaviors; Big O, little o, omega, and theta notation; Standard complexity classes; Empirical measurements of performance; Time and space tradeoffs in algorithms; Using recurrence relations to analyze recursive algorithms.

ALGORITHMIC STRATEGIES **12**

Brute-force algorithms; Greedy algorithms; Divide-and-conquer; Backtracking; Branch-and-bound; Heuristics; Pattern matching and string/text algorithms; Numerical approximation algorithms.

FUNDAMENTAL COMPUTING **12**

Simple numerical algorithms, Sorting and Searching Algorithm: binary search algorithms; Quick Sort Hashing: Hash tables, including collision-avoidance strategies.

GRAPHS **12**

Representations of graphs (adjacency list, adjacency matrix, Sparse Matrix); Topological Sorting; Shortest-path algorithms (Single source shortest path; Dijkstra's and Floyd's algorithms); Minimum spanning tree (Prim's and Kruskal's algorithms).

COPING WITH THE LIMITATIONS OF ALGORITHM POWER **12**

Lower -Bound Arguments -P, NP NP-Complete and NP Hard Problems, Branch and Bound –LIFO Search and FIFO search, Hamiltonian Circuit Problem, –Knapsack Problem –Travelling Salesman Problem.

Total Periods: 60

Text Book:
1. S.Sridhar, "Design and Analysis of Algorithms", Oxford University Press 2014,ISBN-13: 978-0-19-809369-5

References:
1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3/e, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Edu, 2009.
4. Steven S. Skiena, "The Algorithm Design Manual", 2/e, Springer, 2008.
5. http://nptel.ac.in/

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2										2	3			
CO2	2	3		2										3		
CO3	2	3	3		3							2			3	
CO4	2	3		2	3											2
CO5	2	2	3	2	2							2	3			3
CO6	2	3		2	2								3	2		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC35	DIGITAL ELECTRONICS AND MICROPROCESSORS	L	T	P	C
		3	0	2	4

Programme: B.E. Computer Science and Engineering **Sem:** 3 **Category:** HS

Prerequisites: 191EEF1 – Basic Electrical and Electronics Engineering

Aim: Tofocus on the study of Electronic Circuits and Microprocessor and Microcontroller.

Course Outcomes: The Students will be able to

CO1: Apply various laws of Boolean algebra and expressions.
CO2: Design digital circuits using basic gates and flip-flops.
CO3: Describe the functional blocks of the 8085 and 8086 microprocessors.
CO4: Describe the architecture, Instruction formats and features of i3 and i5 microprocessors.
CO5: Utilize the Peripheral Interface devices and Microprocessors.
CO6: Familiarize with the Communication and Interrupt handling devices.

BOOLEAN ALGEBRA 9

Basic logic circuits: Logic gates (AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR and their truth tables), Universal Gates, Laws of Boolean algebra, De-Morgan's theorem, Min term, Max term, POS, SOP, K-Map, Simplification by Boolean theorems, don't care condition

COMBINATIONAL LOGIC, FLIP FLOP AND TIMING CIRCUIT 9

The Half adder, the full adder, subtractor circuit. Multiplexer de-multiplexer, decoder, BCD to seven segment Decoder, encoders.

Flip flop and Timing Circuit Set-reset laches, D-flip-flop, R-S flip-flop, J-K Flip-flop, Master slave Flip flop, edge triggered flip-flop, T flip-flop.

8085 AND 8086 MICROPROCESSOR 9

Introduction to 8085 Architecture, Timing Diagram, Addressing Modes, Instruction Formats, Instruction Set. Introduction to 8086 Architecture, Features, Signals, I/O & Memory Interfacing, Addressing Modes, Instruction Formats, Instruction Set, Assembler Directives, Interrupts, Minimum Mode & Maximum Mode Operation, Assembly Language Programming.

CORE i3 & i5 MICROPROCESSOR 9

Introduction to Core i3 Architecture, Instruction Formats, Features of Core i3,Advantages of core i3, Introduction to Core i5 Architecture, Instruction Formats, Features of Core i5,Advantages of core i5.

PERIPHERAL DEVICES 9

Parallel Peripheral Interface (8255), A/D & D/AInterface, Timer / Counter (8253), Keyboard and Display Controller (8279), USART (8251), Interrupt Controller (8259), DMA Controller (8237).

Total Periods: 45

COMPONENT LAB – LIST OF EXPERIMENTS:
1. Design and implementation of 4-bit binary adder / subtractor & parity generator / checker using basic gates and MSI devices.
2. Design and implementation of magnitude comparator.
3. Design and implementation of application using multiplexers/ De-multiplexers.
4. Design and implementation of Shift registers.
5. Design and implementation of Synchronous and Asynchronous counters.

Text Book:
1. Morris Mano, "Digital Design", Pearson Education,6/e, 2018.
2. Ramesh S Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085" Penram International Publishing 6/e, 2013.
3. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson education, 2/e, 2011.

References:
1. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware, TMH,2012.
2. Floyd, Jain, "Digital Fundamentals", Pearsons Publications, 2005.
3. Charles H. Roth, Larry L. Kinney, Raghunandan G. H., "Fundamentals of Logic Design",Cengage Learning India Pvt. Ltd.; 1/e, 2019
4. https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/ia-introduction-basics-paper.pdf

5. http://ijirt.org
6. http://nptel.ac.in/

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2							2			2	3			
CO2	2	3							2					3		
CO3	2	3	3		3			2	2			2			3	
CO4	2	3			3			2	2							2
CO5	2	2	3		2			2				2	3			3
CO6	2	3		1	2								3	2		3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191HS37	COMMUNICATION SKILLS – I	L	T	P	C
		0	0	2	MC

Programme: B.E./ B.Tech. (Common to all Branches) **Sem:** 3 **Category:** HSMC

Prerequisite: 191HS21 – Technical English

Aim: To create an Environment to improve learner's communication skill using Professional English module.

Course Outcomes: The Students will be able to

CO1: Impart basics of Language relating to Business Communication
CO2: Impart basics of Grammar relating to Business Communication
CO3: Imbibe the spirit of accurate and appropriate Basic Communication
CO4: Familiarize with the Professional Communication Module
CO5: Improve their ability to understand Technical Communication
CO6: Improve their Technical writing skills.

A. Language & Grammar   **2**
1 Use of Verb, Article, Adjectives, Adverbs, Preposition, Conjunction, Comparative Superlative,
2 Noun –Antecedent & Precedent
3 Spelling &Punctuation
4 Concord
5 Use of Active & Passive voice
6 Use of Conditional Sentence & Reported speech

B. Reading   **4**
1. Reading technical reports for Gist
2. Reading Technical Article, Graphs, Charts, Adverts, Notices & Proposals for Structure and detail

C. Writing   **3**
1. Writing E-mails for giving Instruction/ Summarizing/Persuading/Giving assurance/asking a comment
2. Writing an Introduction to Report/Proposal/Technical Description
3. Writing Instructions & Recommendations for User manuals/Equipments/devices/New Inventions

D. Listening   **3**
1. Listening to Technical News for Gist
2. Listening to Technical Interviews for gathering information
3. Listening to a Presentation for inferring meaning

E. Speaking   **6**
1 Self-Introduction
2 Have your say- Recent gadgets/Technical Innovations/ Scientific Inventions

                                            TOTAL   18 PERIODS

TEXT BOOKS
1. Technical Writing: Process and Product, Gerson, Pearson Education India, 2007, ISBN: 8131709280, 9788131709283
2. Business Benchmark Pre-Intermediate to Intermediate: Student's Book BEC Preliminary Edition, Norman Whitby, PB + 2 Audio CDs,ISBN: 9780521759397

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1						2				3		2				3
CO2										3						3
CO3								2	1	3		1				3
CO4	1								1	3				2	2	3
CO5	1					3			1	1	2	2				
CO6						3	1		1	1		2				

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS37	DATA STRUCTURES AND ALGORITHMS LABORATORY	L	T	P	C
		0	0	2	1

Programme: B.E. Computer Science and Engineering   **Sem:** 3   **Category:** PC

Prerequisite: 191CSF7 – C Programming Laboratory

Aim: To develop C++ programming skills in design and implementation of data structures andtheir applications.

Course Outcomes: The Students will be able to

CO1: Recall the importance and basic usability of structure and ADT in different applications.

CO2: Compare the different algorithms based on their time complexity.

CO3: Explain the linked implementation, and its uses both in linear and non-linear data structure.

CO4: Illustrate the various data structure such as stacks, queues, trees, graphs, etc. to solve various computing problems.

CO5: Apply the various kinds of searching and sorting techniques.

CO6: Develop a suitable data structure and algorithm to solve a real worldproblem.

LIST OF EXPERIMENTS:

Implementation in the following topics:

1. Representation of records using Structures in C - Creation of Linked List - Manipulation of records in a Linked List.
2. Operations on a Stack and Queue
    a. Infixto postfix
    b. Simpleexpression evaluation using stacks
    c. Linked Stack Implementation
    d. Linked Queue Implementation.
3. Applications of Stack and Queue.
4. Implementation of Sorting algorithm.
5. Implementation of Linear search and Binary Search.
6. Implementation of Hashing Techniques.
7. Implementation of Binary Search Tree.
8. Implementation of Tree traversal Techniques.
9. Implementation of Minimum Spanning Trees.
10. Implementation of Shortest Path Algorithms.

Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.   (or)

Server with C compiler supporting 30 terminals or more.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1												2
CO2		2	2	3						1			1		1	
CO3	2	2			2					1			2			
CO4	2	2	2	2	3					2			2	3		2
CO5	2	3	3	3	3					3			3	2	3	3
CO6		3	3	3	3					3			3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

| 191CS38 | **PYTHON LABORATORY** | **L T P C** |
| | | **0 0 2 1** |

Programme: B.E. Computer Science and Engineering   **Sem: 3 Category: PC**

Prerequisite: 191CSF7 – C Programming Laboratory

Aim: To give students a basic knowledge in developing simple programs in Python.

Course Outcomes: The Students will be able to

CO1: Recall the basic operators and control statements inpython.

CO2: Experiment with various built in functions and user definedfunctions

CO3: Create executablecode

CO4: Develop different Decision Making statements and functions

CO5: Design simple GUI Applications in Python

CO6: Build applications with database operations.

List of Experiments:

Write the programs for the following topics using python:

1. Operators and Control Statements
2. Built-In and User defined functions
3. String functions
4. Collections (Lists, Tuples, Dictionaries).
5. Inheritance
6. Working with Databases
7. Data Frames from Excel
8. GUI programming using Turtle, Canvas & frames
9. Button Widget
10. Histogram

Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		3	2					2		3	2		3	
CO2	2			2	3					3			3			3
CO3	2	3			2							2		2		3
CO4			3	2								2	3			
CO5	3	3		2						2			2		3	3
CO6	2			3	2					3		3	2	3		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191HS42	PROBABILITY AND STATISTICS	L T P C
		2 2 0 3

Programme: B.E. Computer Science and Engineering   **Sem:** 4   **Category:** BSC

Prerequisite: 191HS31 – Transforms and Discrete Mathematics

Aim: To analyze the engineering problems using the techniques and the mathematical skills acquired by studying ODE and PDE uses numerical methods.

Course Outcomes: The Students will be able to

CO1: Categorize the discrete and continuous random variables.
CO2: Analyze the binomial, Poisson, geometric, uniform, exponential and normal distribution.
CO3: Understand the Two-dimensional Random Variables.
CO4: Analyze the differences between means& standard deviations.
CO5: Test the independence of attributes for small samples.
CO6: Classify the tests for single variance and equality of variances.

PROBABILITY AND RANDOM VARIABLES 9

Probability spaces – Conditional probability – Bayes rule - Discrete and continuous random variables – Moments - Moment generating functionsand their properties.

DISCRETE AND CONTINOUS PROBABILITY DISTRIBUTION 9

Binomial, Poisson, Geometric, Uniform, Exponential, Gamma andnormal distributions – Function of Random Variable.

TWO DIMENSIONAL RANDOM VARIBLES 9

Joint distributions - Marginal and conditional distributions – Covariance – Correlation andRegression - Transformation of random variables - Central limit theorem (for 2-Drandomvariables).

STATISTICS 9

Curve fitting by the method of least squares – fitting of Straight lines , Second degree parabolas and more general curves – Test of significance – Large sample test for single proportion , difference of proportions, single mean, difference of means and difference of standard deviations.

TESTING OF HYPOTHESIS 9

Sampling distributions – Testing of hypothesis for mean, variance, proportions anddifferences using Normal, t, Chi-square and F distributions - Tests for independence ofattributes and Goodness of fit.

Total Periods: 45

Text Books:
1. B.S. Grewal, 'Higher Engineering Mathematics', Khanna Publishers, Delhi, 36/e, 2005.
2. Grewal B.S. and Grewal J. S., "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi, (2004).

References:
1. Greenberg. M.D. "Advanced Engineering Mathematics", Pearson Education Inc. (First Indian reprint), 2/e, 2002.
2. Venkataraman. M.K., "Engineering Mathematics Volume I and II", The National Publishing Company, Chennai, Revised enlarged, 4/e, 2004.
3. Kreyszig, E., Advanced Engineering Mathematics, John Wiley Sons, 8/e, 2001.
4. Chapra S.C. and Canale R.P., "Numerical Methods for Engineers", Tata Mc-Graw Hill, New Delhi, (2007).
5. Gerald C.F., and Wheatley P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi, (2006).

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	3			2							3	2		2
CO2	2	2	2			3							2			2
CO3	3		2			2							1	2		3
CO4	2	2												3		1
CO5		3	1			2								3		2
CO6	1					3							3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	T	P	C
191CS41	**COMPUTER ORGANIZATION AND ARCHITECTURE**	3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem:** 4   **Category:** PC

Prerequisite: 191EC35 – Digital Electronics and Microprocessors

Aim: To understand the organization of a computer, hardware-software interface, and to discuss the basic structure of a digital computer.

Course Outcomes: The Students will be able to

CO1: Outline the fundamental organization of a computer system.

CO2: Summarize the concepts of register transfer logic and arithmetic operations.

CO3: Explain the fundamentals concepts of pipeline processing.

CO4: Compare the performance of various memory systems and standard I/O interfaces.

CO5: Interpret the performance issues of multiprocessors and thread level parallelism.

CO6: Discuss the concepts of multithreading and multi-core Architectures with case studies.

BASIC STRUCTURE OF COMPUTERS   **9**

Functional units -Basic operational concepts - Bus structures - Performance and metrics – InstructionSet Architecture - Addressing modes - RISC - CISC. Fixed point and floating point operations -Execution of a complete instruction - Multiple bus organization - Hardwired control - Micro programmed control - Nano programming.

PIPELINING   **9**

Pipelining Basic concepts - Hazards - Types - Influence on instruction sets - Data path and control considerations - Performance considerations - Exception handling - Instruction level parallelism - Parallel processing challenges - Flynn's classification.

MEMORY AND I/O SYSTEMS   **9**

Basic concepts - Semiconductor RAM - ROM - Speed - Size and cost - Cache Memories – Improvingcache performance - Virtual memory - Memory management requirements - Associative memories -Performance Considerations - Accessing I/O devices - Programmed Input/output - Interrupts – DirectMemory Access - Buses - Interface circuits - Standard I/O Interfaces (PCI, SCSI, USB).

MULTIPROCESSORS AND THREAD LEVEL PARALLELISM   **9**

Symmetric and Distributed shared memory architectures -Shared Memory Programming with OpenMP-Distributed Memory Programming with MPI -Performance issues - Models of memory consistency.

MULTI-CORE ARCHITECTURES   **9**

Introduction to Multithreading- Software and hardware multithreading - SMT and CMP architectures - Design issues - Case studies - Intel Core i7 - Heterogeneous multi-core processors - case study: IBM Cell Processor.

      Total Periods: 45

Text Book:

1. Carl Hamacher, Zvonko Vranesic and SafwatZaky, "Computer Organization", McGraw-Hill Inc., 6/e, 2012.

2. John L. Hennessey and David A. Patterson, "Computer architecture – A quantitative approach", Morgan Kaufmann / Elsevier Publishers, 5/e, 2011.

References:

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software interface", 3/e, Elsevier, 2005.

2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Pearson Education, 6/e, 2003.

3. John P.Hayes, "Computer Architecture and Organization", Tata McGraw Hill, 3/e, 1998.
4. V.P. Heuring, H.F. Jordan, "Computer Systems Design and Architecture", Pearson Education, 2/e, 2004.
5. David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture: A Hardware/SoftwareApproach", Morgan Kaufmann /Elsevier Publishers, 1999.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			2								3	3		3
CO2	3			2								2	2		1	
CO3	3	2												2		
CO4	3												3	1	2	2
CO5	3				2									2		1
CO6	3		2									2	3		3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191CS42	**DATABASE MANAGEMENT SYSTEMS**	**3**	**0**	**0**	**3**

Programme: B.E. Computer Science and Engineering   **Sem:**   4   **Category:**   **PC**
Prerequisite:
Aim: To provide a strong foundation in database technology and current trends in this field.
Course Outcomes: The Students will be able to.
 CO1:   Identify the basic concepts of database systems.
 CO2:   Outline the basics of SQL and methods to enhance queries.
 CO3:   Apply the normalization rules for optimizing the database.
 CO4:   Illustrate the transactions using T-SQL.
 CO5:   Summarize the various recovery mechanisms for concurrency control.
 CO6:   Describe the various advanced Database technologies and tools.

INTRODUCTION   **9**
Purpose of Database System - Views of data - Data Models - Architecture -Entity - Relationship (E-R) model - Extended E-R Features - Design of E-R database schema - Structure of Relational data model - Fundamentals of relational algebra operations

STRUCTURED QUERY LANGUAGE   **9**
SQL: Basic structure - Query Processing Overview -Set operations - Aggregate functions - Null Values - Nested sub queries -Data Base Languages- Keys - Embedded SQL -Dynamic SQL. Domain Constraints - Assertions - Triggers - Views.

DATABASE DESIGN   **9**
Functional Dependencies – Normalization-First, Second, Third Normal Forms, - Boyce/Code Normal Form - Multi-valued Dependencies and Fourth Normal Form - Join Dependencies and Fifth Normal Form.

TRANSACTIONS PROCESSING AND CONCURRENCY CONTROL   **9**
Transaction Concepts - ACID Properties - Transaction States - T-SQL (Transact-SQL) – Transaction implementation - Auto Rollback in SQL Transaction- SQL Transaction in IF ELSE statement-SQL Transaction in TRY CATCH-Concurrency Control Problems - Serializability - Recovery mechanisms.

ADVANCED DATABASES AND NoSQL   **9**
Data Mining and Data Ware Housing - Parallel and Distributed Databases –Web Database - Big Data Analytics – NoSQL- MongoDB - Basic Structure – Commands – Data Base Connectivity

Total Periods: 45

Text Books:
1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6/e, Tata McGraw Hill, 2016.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 6/e, Pearson, 2011.
3. Itzik Ben-Gan,"Microsoft SQL Server 2012 T-SQL Fundamentals", Microsoft Press 1/e, 2012.

References:
1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Pearson Education, 8/e, 2006.
2. Raghu Ramakrishnan, "Database Management Systems", McGrawHill, 4/e, 2010.
3. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2		1									1	2		
CO2	3		2									2		2	1	
CO3	3				2							2	1		2	
CO4	3	1	2											3	2	
CO5		1										2			2	
CO6	3		2		2							3	3	3		1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS43	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem:** 4   **Category:** PC
Prerequisite: 191CS32 – Programming in Python
Aim: To understand object oriented programming concepts, and apply them in problem solving.
Course Outcomes: The Students will be able to
  CO1: Outline the basic concepts of Object Oriented Programming.
  CO2: Recall the concepts and types of inheritance and the need of interfaces in Java.
  CO3: Remember the Basics of exception handling, multi-threaded programming and Files.
  CO4: Create Java program using generic classes and generic methods.
  CO5: Demonstrate user interfaces for java application and applets using GUI.
  CO6: Build real time applications with JDBC and RMI.

INTRODUCTION 9
OOP concepts**,** classes and objects, History of Java - data types - operators - control structures - methods – keywords - arrays –strings –Javadoc comments – Simple Java Programs

INHERITANCE AND INTERFACES 9
Inheritance - types of inheritance - polymorphism - dynamic binding, method overriding, abstract classes and methods. Interfaces - implementing interfaces - inner classes - uses of inner classes - packages - steps to creating and accessing a package.

EXCEPTIONSAND FILES 9
Exception handling - exception hierarchy - throwing and catching exceptions- built in exceptions, Multi-threaded programming –creating and executing threads - thread synchronization - Generic classes - Generic methods. File -The Byte Streams -The Character Streams – File operations

GUI PROGRAMMING 9
Applet Basics -Architecture -Applet Display Methods –Passing parameters to applets -Event Handling - Event Classes -Event ListenerInterfaces –Working with buttons, Windows, Graphics, Colors and Fonts – Using AWT Controls, Java swing- Layout Managers.Examples: handling a button click, handling mouse events, Adapter classes.

JDBC & RMI 9
Connecting to Database - JDBC Type 1 to 4 drives, connecting to a database, querying a database and processing the results, updating data with JDBC - Example program.RMI -Architecture –A simple client/server application using RMI

Total Periods: 45

Text Book:
1. Herbert Schildt, "Java – The Complete Reference", 11/e, TMH 2019.
References :
1. Balagursamy E, "Programming with Java", TMH, 6/e, 2019
2. Cay S. Horstmann, Gary Cornell, "Core Java: Volume I – Fundamentals", 8/e, Sun Microsystems Press, 2008.
3. P.J. Deitel, H.M. Deitel, "Java for Programmers", Pearson education (OR) "Java: How to Program", PHI 8/e.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1											2	1		
CO2	2	2	2		1							2	1	2		
CO3	2	1	1	1								1	2	1	1	
CO4	1	1										1	1			
CO5	2	2	1		1								2	2		
CO6	3	2		1	2							2	1	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191CS44	**OPERATING SYSTEMS**	**3**	**0**	**2**	**4**

Programme: B.E. Computer Science and Engineering **Sem: 4 Category: PC**

Pre/Co-requisites: 191CS41 – Computer Organization and Architecture

Aim: To introduce the basic principles and concepts of operating systems.

Course Outcomes: The Students will be able to

CO1: Explain the structure and functions of Operating system.

CO2: Utilize the techniques and algorithms for process management and synchronization.

CO3: Demonstrate various memory management schemes.

CO4: Summarize various Disk scheduling algorithms, Concepts of files and I/O components.

CO5: Survey the several features of Linux and Windows Operating Systems and its Services.

CO6: Inspect the variousProcess Scheduling algorithms and Page Replacement algorithms.

Operating System and Services **9**

Computer System Introduction-Operating system overview-structures and Operations-Types-System calls and System Programs-System Booting-Process-Concept-States-Scheduling Types-Inter Process Communication- Threads-Types and Models-Examples.

Process Management **9**

Process scheduling algorithms-examples-thread scheduling- examples-process synchronization- critical sections-hardware and software solutions-semaphores- classical problems in synchronization - producer consumer problem- readers writer problem- dining philosophers problem-deadlocks-detection and avoidance algorithms-deadlock prevention techniques.

Memory Management 9

Main memory and Types-Registers and Types-Cache memory and Types-Memory allocation- Paging and Segmentation-32 Bits and 64 Bits memory Systems-Virtual Memory-Demand Paging-Page Fault-Page Replacement-Allocating Kernel memory. Examples.

File and I/O Management 9

Mass Storage-Disk Structure and Scheduling-File-File System-Directory Structure-File Allocation Methods-Free Space Management-I/O System and Components-Services.

Case Studies and Tools 9

Linux Operating System and Services-Windows Server 2016 and Services – Memory and Process management for Intel i5 and i7 cores-Network and Security Features-VMWare Tool-Process and Memory Monitoring Tools.

Total Periods: 45

COMPONENT LAB – LIST OF EXPERIMENTS:
1. Implement Process Management System Calls
2. Implement Shared memory and IPC.
3. Implement Threading Applications.
4. Implement Synchronization Applications using Semaphores.
5. Process Scheduling Algorithms (FCFS, SJF, Round Robin and Priority).
6. Page Replacement Algorithms (FIFO and LRU)VMWare Tool

Text Book:
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "*Operating System Concepts*", John Wiley and Sons Inc., *9/e*, 2012.

References:
1. William Stallings, "*Operating Systems – Internals and Design Principles*", Prentice Hall, *7/e*, 2011.
2. Andrew S. Tanenbaum, "*Modern Operating Systems*", Addison Wesley, *2/e*, 2001.
3. Charles Crowley, "*Operating Systems: A Design-Oriented Approach*", Tata McGraw Hill, 1996.
4. D.M.Dhamdhere, "*Operating Systems: A Concept-Based Approach*", Tata McGraw Hill, *2/e*, 2007.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2										2	3		
CO2	3	2	2									2	3	2	2	
CO3	3	2										2	3	2		1
CO4	3	2			1							2	3	2		
CO5	3	2		1									2	3	2	1
CO6	3	2		2	2							2	3	2	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	L	**T**	**P**	**C**
191CS45 **SOFTWARE ENGINEERING**	**3**	**0**	**2**	**4**

Programme: B.E. Computer Science and Engineering   **Sem: 4   Category: PC**
Prerequisites: NIL

Aim: To develop high-end programming environments, tools and architectures.

Course Outcomes: The Students will be able to

CO1: Apply the Object oriented concepts & software engineering methodologies to develop the software projects.

CO2: Draw UML diagrams and interrelate the concepts to build the software projects.

CO3: Solve problems in software development activities from requirement specification to testing.

CO4: Choose and utilize suitable testing methods to test the software projects.

CO5: Expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.

CO6: Model different kinds of real world problems using Software Engineering concepts.

ANALYSIS 9

Software Engineering Concepts - Development Activities - Modeling concepts - UML Diagrams- Requirements Elicitation – Concepts- Analysis-concepts- Managing RAD.

DESIGN & IMPLEMENTATION 9

Decomposing the system - System Design Concepts - System Design Activities - Addressing Design Goals - Reusing Pattern Solutions - Concepts - Managing SSD-Mapping Models to Code - Overview

TESTING TECHNIQUES 9

Software testing terminology – Life cycle- Black box testing techniques – Boundary value analysis- Equivalence class testing – State table based testing – Decision table based testing – Cause effect graphing based testing- White box testing techniques, Need, Logic Coverage Criteria- Basis path testing- Graph matrices – Loop testing – Data flow testing – Mutation testing.

MANAGING THE TESTING PROCESS 9

Test organization - Structure of testing group - Test planning- Detailed test design and test specifications- Software metrics – Need of software measurement- Classification of software metrics – Entities to be measured- Testing metrics for monitoring and controlling.

TESTING SPECIALIZED SYSTEM & APPLICATION 9

Automation and testing tools - Need - Categorization of testing tools – Selection of testing tools- Testing object oriented software - Object oriented testing- Testing web based systems- Web technology evolution - Debugging.

Total Periods: 45

COMPONENT LAB – LIST OF EXPERIMENTS:
1. Passport Automation System.
2. Book Bank
3. Exam Registration
4. Stock Maintenance System
5. Online Course Reservation System

Text Book:
1. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, Pearson Education, 2011.
2. Naresh Chauhan, "Software Testing Principles and Practices" , Oxford University Press, 3/e, 2006.

References:
1. Craig Larman, "Applying UML and Patterns", Pearson Education, 3/e, 2005.
2. Stephen Schach, "Software Engineering", McGraw Hill, 7/e, 2007.
3. Ron Patton, "Software Testing", Sams Publishing, Pearson Education, 2/e, 2007.
4. Aditya P.Mathur, "Foundations of Software Testing – Fundamental Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1			3	2				2		2	2	3	3			2
CO2			2								3	2		3	2	
CO3		3		2			2			1			3			2
CO4	3							2						2		
CO5	3	2	2	2								2	3		3	2
CO6	2	3		1							2		3		3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191HS47	**COMMUNICATION SKILLS – II**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**MC**

Programme: B.E./ B.Tech. (Common to all Branches)   **Sem:** 4   **Category:** HSMC

Prerequisites: 191HS37 – Communication Skills – I

Aim: To create an Environment to experiment Professional English communication module with Intermediate resources.

Course Outcomes: The Students will be able to

CO1: Be competent in Presentation skill
CO2: Develop their accuracy in Written Communication
CO3: Improve their ability to understand Technical Presentations.
CO4: Improve their ability to understand Conversations
CO5: Give the exposure with Internal workplace Communication
CO6: Give the exposure with External workplace Communication

A. Reading   **4**
1. Reading Technical Articles, Reports, Proposals for gathering information
2. Reading Technical Journals, User manuals, annual reports for matching information

B. Writing   **6**
1. Writing E-mail to inform/respond/Insist/Convince/comment
2. Writing Technical Report (Format, Types, Abstract)
3. Writing Project Introduction/Website/Product
4. Writing User Manuals/Guidelines
5. Writing Product Reviews
6. Writing Useful Expressions for Persuading, Summarizing, gathering information

C. Listening   **2**
1. Listening to Telephonic conversation for filling the gaps
2. Listening to Group discussion to gather information
3. Listening to Interviews for writing short answers
4. Listening to Technical Presentation for evaluation

D. Speaking   **6**
1. Mini-Presentation on Technical Themes (Samples):
    a) Cloud computing   b) 4g   c) Mission to Mars
    d) Water Resource   e) Sixth Sense Technology
2. Group Discussion on Social and Technical issues

F. Speaking   **6**
3. Self-Introduction
4. Have your say- Recent gadgets/Technical Innovations/ Scientific Inventions

                TOTAL   **18 PERIODS**

TEXT BOOKS
1. Meenakshi Raman, SangeetaSharma, "Technical Communication: Principles and Practice", 2/e, ISBN: 0198065299, 9780198065296
2. Norman Whitby, "Business Benchmark Pre-Intermediate to Intermediate: Student's Book BEC Preliminary Edition", PB + 2 Audio CDs, ISBN: 9780521759397

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1										3	1					
CO2	1									3		3		1		
CO3									2	3	1				3	
CO4	1								2	3		3		1	3	
CO5								1	2	3						2
CO6								1	2	3						2

       1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS47	**DATABASE MANAGEMENT SYSTEMS LABORATORY**	L T P C
		0 0 2 1

Programme: B.E. Computer Science and Engineering   **Sem:**   **4**   **Category:**   **PC**

Prerequisites: 191CS38 – Python Laboratory

Aim: To study and implement DDL, DML commands & basics of PL/SQL functions, cursors, triggers etc.

Course Outcomes: The Students will be able to

CO1: Recall the structured query language (SQL) for database definition and databasemanipulation

CO2: Experiment with Join and Nested Queries to perform Various Database operations.

CO3: Demonstrate the PL/SQL blocks using Cursors and Triggers.

CO4: Illustrate the normalization forms using SQL queries

CO5: Solve the Transactions processing usingT-SQL

CO6: Analyze the various advanced technology of Databases and No-SQL.

LIST OF EXPERIMENTS:

MICROSOFT SQL SERVER

1. Practice of Database Languages using SQL Query
2. Set operators and Join queries and nested queries
3. PL/SQL–(Cursors, Stored procedures, stored function, Triggers, Package creation)
4. Front end Connectivity
5. Normalization (1NF, 2NF and 3NF)
6. Auto Rollback - IF ELSE statement-SQL Transaction in TRY CATCH using T-SQL.

MONGODB

1. NoSQL commands
2. Recursion
3. Java Database Connectivity

Mini project :

a) Inventory Control System.
b) Hospital Management System.
c) Railway Reservation System.
d) Personal Information System.
e) Web Based User Identification System.
f) Timetable Management System.
g) Hotel Management System
h) Education Management System
i) Airline Reservation System
j) Online Voting System
k) Goods and Service Tax(GST) Management System
l) Aadhaar Management System

                                                    Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops 30 Nos.

<p align="center">(or)</p>

Server supporting 30 terminals or more.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1		1							3	1			
CO2		2							1					2		
CO3	1							1			1		1		1	
CO4			1													
CO5					1							1				
CO6	1									1		3		2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS48	**JAVA LABORATORY**	**L** 0	**T** 0	**P** 2	**C** 1

Programme: B.E. Computer Science and Engineering **Sem:** 4 **Category:** PC

Prerequisites: 191CS38 – Python Laboratory

Aim: To introduce java compiler and eclipse platform or netbeans and to impart hand on experience with java programming.

Course Outcomes: The Students will be able to

CO1: Apply OOPs concepts to solve the problems using Java programs.

CO2: Demonstrate the Java features such as Inheritance, Polymorphism and exception handling.

CO3: Examine programming skills to implement multi-threaded concept.

CO4: Explain the use of GUI components (Console and GUI based).

CO5: Outline coding methods and able to implement event handling mechanisms.

CO6: Develop interactive applications, which communicate with database.

List of Experiments:

1. Write a java program to implement student details and calculate the total and average marks of any five students using object and classes.
2. Write a java program to create an abstract class and abstract method for the following:
   - Class: Bike   Method: Run
   - Class: Shapes Method: Draw
   - Class: Shapes Method: Area of the given shape
3. Demonstrate a program for method overloading. Consider the different types of transaction modes used for transferring money. (Credit card, Debit card, Net banking etc.).
4. Develop a java application for mobile recharge using Single inheritance. Consider Customer as base class for storing customer details and Account as derived class for storing account details. Perform the transaction process and recharge themobile.
5. Write a java program to implement inheritance to create class one to read all the inputs and class 2 to calculate the employee salary and class three to print the net pay and gross pay of the employee.
6. Develop a program for banking application with exception handling. Handle the exceptions in followingcases:
   - Account balance< 500
   - Withdrawal amount is greater than balanceamount
   - Transaction count exceeds5
   - One-day transaction exceeds the limit.
7. Write a multi-threaded Java program to print all numbers below 100,000 that are both prime   and Fibonacci number (some examples are 2, 3, 5, 13, etc.). Design a thread that generates prime numbers below 100,000 and writes them into a pipe.
8. Write a JAVA program to display analog clock using Applet.
9. Write a java program that handles all mouse events and shows the event name at the center of the window when mouse event is fired (Use Adapter classes).
10. Create a Student database and store the details of the students in a table. Perform the SELECT, INSERT, UPDATE and DELETE operations using JDBCconnectivity.

Total Periods: 60

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1								2	1	2		
CO2	1	1	1									2	1	1		
CO3	2	2	1	1								2	2	1		
CO4	1	1										2	1			
CO5	2	1	1		1							2	1	1		
CO6	2	2	1		1							2	2	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS51	THEORY OF COMPUTATION	L	T	P	C
		2	2	0	3

Programme: B.E. Computer Science and Engineering   **Sem: 5**   **Category:**   **PC**

Prerequisites: Nil

Aim: To understand all basic concepts in theoretical computer science

Course Outcomes: The Students will be able to

CO1: Recall basic concepts of formal languages of finite automata techniques

CO2: Design Finite Automata's for different Regular Expressions and Languages

CO3: Construct context free grammar for various languages

CO4: Design Turing machines to solve various computational problems

CO5: Outline the Characteristics of P, NP and NP Complete problems

CO6: Solve Computational problems regarding their computability and complexity.

FINITE AUTOMATA (FA):   **9**

Introduction, Deterministic Finite Automata (DFA) -Formal definition, simpler notations (state transition diagram, transition table), language of a DFA. Nondeterministic Finite Automata (NFA)- Definition of NFA, language of an NFA, Equivalence of Deterministic and Nondeterministic Finite Automata, Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epszlon transitions, Minimization of Deterministic Finite Automata.

REGULAR EXPRESSIONS (RE)   **9**

Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, applications of Regular Expressions, regular grammars and FA, Proving languages to be non-regular -Pumping lemma, applications, Closure properties of regular languages.

CONTEXT FREE GRAMMER (CFG)

Derivation Trees, Sentential Forms, Rightmost and Leftmost derivations of Strings. Ambiguity in CFG's, Minimization of CFG's, CNF, GNF, Pumping Lemma for CFL's,Definition of Push down automata with example

TURING MACHINES (TM)

Formal definition and behaviour, Languages of a TM, TM as accepters, and TM as a computer of integer functions, Types of TMs.

RECURSIVE AND RECURSIVELY ENUMERABLE LANGUAGES (REL)

Properties of recursive and recursively enumerable languages, Undecidable problems about TMs. Decidability, Post's correspondence problem (PCP), Complexity classes: Class P, Class NP, Complexity classes: Introduction to NP-Hardness and NP-Completeness.

     Total Periods: 45

Text Book:
1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman (2008), "Introduction to Automata Theory Languages and Computation", 3/e, Pearson Education, India.

References:
1. K. L. P Mishra, N. Chandra shekaran (2003), "Theory of Computer Science-Automata Languages and Computation", 2/e, Prentice Hall of India.
2. John.C. Martin, "Introduction to Languages and the Theory of Computation" McGraw-Hill Education, 01-May-2010.
3. Michael Sipser, "Introduction to the Theory of Computation" Cengage Learning, 2012.
4. Peter Linz, "An introduction to formal languages and automata", Jones & Bartlett Learning, 2001.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2								3	2	2		1
CO2	3	2		1	2							2	3	1		1
CO3	3	1	1	1								3	2	1		2
CO4	2	1		1								3	2	1		
CO5	2	2		1								2	2	2		1
CO6	3	2	1	1								3	2	2		1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS52	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Programme: B.E. Computer Science and Engineering   **Sem:** 5 **Category:** PC

Prerequisites: 191CS33 – Design and Analysis of Algorithms

Aim: To introduce basic artificial intelligence techniques and basic concepts of Machine Learning and techniques.

Course Outcomes: The Students will be able to

CO1: Compare the different types of problem solving agents
CO2: Perceive foundational concepts in machine learning
CO3: Construct algorithms for learning the linear and non-linear models
CO4: Discriminate the usage of various data clustering algorithms
CO5: Outline the learning algorithms for tree and rule-based models
CO6: Discuss the Genetic algorithms and reinforcement learning techniques

INTRODUCTION OF AI **9**

The foundations of AI - The History of AI- Intelligent agents- Agent based system Problem Solving: Searching for solution- Uninformed/Blind search - Informed/ Heuristic search - A* search. Knowledge Representation And Reasoning: Logics – First order logic, Inference in first order logic, Knowledge representation Planning: The planning problem - Planning with state space search - Partial order search - Planning with proportional logic - Planning and acting in the real world.

INTRODUCTION OF ML **9**

The Fundamentals of Machine Learning - The Machine Learning Landscape - Main Challenges of Machine Learning - End-to-End Machine Learning Project Working with Real Data - Discover and Visualize the Data to Gain Insights - Prepare the Data for Machine Learning Algorithms

CLASSIFICATION **9**

Classification - Training a Binary Classifier - Performance Measures - Multiclass Classification - Training Models - Linear Regression - Gradient Descent - Polynomial Regression - Regularized Linear Models

SUPPORT VECTOR MACHINES **9**

Support Vector Machines - Linear SVM Classification - Nonlinear SVM Classification - SVM Regression - Decision Trees - Training and Visualizing a Decision Tree - Making Predictions - The CART Training Algorithm - Regularization Hyper parameters

ENSEMBLE LEARNING AND RANDOM FORESTS 9

Voting Classifiers - Bagging and Pasting- Random Patches and Random Subspaces - Random Forests – Boosting - Dimensionality Reduction – PCA - Kernel PCA - Up and Running with Tensor Flow - Distributing TensorFlow Across Devices and Servers

Total Periods: 45

References:
1. Stuart Russel, Peter Norvig,"*Artificial Intelligence: A Modern Approach*", 3/e, Prentice hall,2009.
2. Aurélien Géron "*Hands-On Machine Learning with Scikit-Learn and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems*",1/e,2017.
3. EthemAlpaydin, "*Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)*", 3/e, MIT Press, 2014
4. Jason Bell, "*Machine learning – Hands on for Developers and Technical Professionals*", 1/e, Wiley, 2014
5. Peter Flach, "*Machine Learning: The Art and Science of Algorithms that Make Sense of Data*", 1/e, Cambridge University Press, 2012.
6. K. P. Murphy, "*Machine learning: A probabilistic perspective*", MIT Press, 2012.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2									2	1	1		
CO2	1	1	1	1								2	1	1		
CO3	2	2	1									2	1	2		
CO4	1	2	1									2	2	1		
CO5	1	1	2	1								2	2	2		
CO6	1	1	2	2								2	2	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS53	**MOBILE APPLICATION DEVELOPMENT**	**L T P C** **3 0 0 3**

Programme: B.E. Computer Science and Engineering   **Sem:** 5   **Category:**   **PC**
Prerequisites: 191CS42 – Object Oriented Programming
Aim: To provide students with the tools and knowledge necessary to create mobile applications that can run on mobile devices.

Course Outcomes: The Students will be able to

CO1: Classify the various Android Applications using layout and menus.
CO2: Demonstrate the audio, video and animation application.
CO3: Explain the fundamentals concepts of web database application.
CO4: Develop various types of sensors in Android.
CO5: Interpret applications to hand-held devices.
CO6: Design and Develop the mobile application (Mini Project).

ANDROID OVERVIEW 9
Overview of Android platform- Android SDK features - setting up the mobile app developmentenvironment along with an emulator- Android Application Development Architecture - creating an applications and activities -Application manifest

INTERFACE TOOLS 9
Creating user interface - Views - creating views - Layouts - Drawable resources - resolution and density independence - Menus - Intents - Adapters - Using Internet resources - Dialogs.

FILES AND DATABASES 9
Saving Simple Application Data - creating and saving preferences - preferences activity -saving activity state - loading files - file management tools-sending emails through application - Introducing Android databases -SQLite - Web Database- Firebase, MySQL-PHP

SMALL COMPUTING TECNOLOGY AND SENSORS 9
Audio, Video Using the Camera - Telephony And SMS - Bluetooth Networks - Managing network connectivity   - WI-FI - **Sensors**-Sensors and the Sensor Manager - Interpreting sensor values-Using the compass, Accelerometer and Orientation sensor.

ADVANCED TECHNOLOGY 9
Paranoid Android - Using Wake Locks - AIDL to Support IPC for Services -General API's- Payment-gateway, Android jetpack-Technology II-IOS-Introduction to Objective C-IOS features.

Total Periods: 45

Text Book:
1. Jeff Mc Wherter and Scott Gowell, " Professional Mobile Application Development" Wrox,2012
2. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson "Beginning ios 6 Development: Exploring the iOS SDK", Apress, 2013
3. Lauren Darcey, Shane Conder"Teach Yourself Android Application Development in 24 Hours", SAMS publication, 3/e, 2013

References:
1. Anubhav Pradhan, Anil V. Deshpande, "Composing Mobile Apps: Learn. Explore. Apply. Using Android", Wiley publication, 2014.
2. Barry Burd, "Android Application Development All in one for Dummies", John Wiley & Sons publication,2011.
3. http://developer.android.com/develop/index.htm
4. https://www.tutorialspoint.com/android
5. http://www.androidhive.info/
6. https://www.codeschool.com/learn/ios

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			2							3	3	3		3
CO2	3			2								3	2		1	
CO3	3	2										3		2		
CO4	3		2									3	3		3	3
CO5	3				2							3		2		1
CO6	3		2									3	3		3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191CS54	**COMPUTER NETWORKS**	**3**	**0**	**2**	4

Programme: B.E. Computer Science and Engineering   **Sem: 5   Category: PC**

Prerequisites: NIL

Aim: To understand the concepts of computer networks, protocols and data communication.

Course Outcomes: The Students will be able to
CO1:   Recall the fundamentals of a computer networks.
CO2:   Identify and understand various IEEE Standardsfor LAN.
CO3:   Illustrate multi-channel access Routing Protocols.
CO4:   Outline the elements and protocols of transport layer.
CO5:   Describe congestion in network layer with routing algorithms.
CO6:   Discuss various Application Layer Protocols.

Computer Networks Fundamentals   **9**
Building a network – Wired and Wireless Networks- Requirements – Layering and protocols – Internet Architecture – Network software – Performance- Link Layer Services – Framing – Error Detection – Flow control.

Internetworking and Media Access Control   **9**
Media Access Control – Protocol Formats-Ethernet (802.3) – Wireless LANs – 802.11 – Bluetooth – Switching and Bridging – Basic Internetworking-Protocols-IP, CIDR, ARP, RARP, DHCP and ICMP-RFC for IP and ARP.

Routing and Routing Protocols   **9**
Routing-RIP-OSPF-IGRP-EIGRP-Metrics-Switch Basics- Global Internet-Domains-BGP-IPv6-Multicast Communication—IP addresses – Address Classes-Subnetting- Supernetting- Examples–Multicast Routing –DVMRP-PIM. RFC-IPV6 and OSPF.

Transport Layer   **9**
Overview of Transport layer – TCP and UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements. RFC-TCP and UDP.

Application Layer and Case Studies   **9**
Electronic Mail-SMTP, POP3, IMAP, MIME– HTTP and HTTPS – Web Services – DNS – SNMP-Wireshark Packet Capturing Tool-Cisco Packet Tracer Tool-Open Source Network Tools-Manage Engine Tool.

Total Periods: 45

COMPONENT LAB – LIST OF EXPERIMENTS:
1. Implementation of CRC generator and checker algorithm in C/C++/Java.
2. Implementing client –server program using TCP/ UDP sockets
3. Implementation of Stop – and – Wait protocol in C / C++ / Java in a client – server environment using sockets.
4. Implementation of RFC-IP and TCP
5. Implementation of Sliding Window protocol in C / C++ / Java in a client –server environment using sockets
6. Implementation of RIP and OSPF routing algorithm in C / C++ / Java.
7. Construct a WAN using Cisco Packet Tracer Tool
8. **Monitor the network activities using Manage Engine Tool.**

Text Book:
1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann Publishers, 5/e, 2011.

References:
1. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Pearson Education, 5/e, 2009.
2. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.

3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011

4. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 4/e, 2011.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2										2	3	3		3
CO2	1		1	2								2	2		1	
CO3	2	2			1							2		2		
CO4	1	2	1		1							2	3	1	2	2
CO5	2				1							2		2		1
CO6	2		2	1								2	3		3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS55	**WEB TECHNOLOGY**	**L**	**T**	**P**	**C**
		3	**0**	**2**	**4**

Programme: B.E. Computer Science Engineering   **Sem: 5 Category: PC**

Aim: To provide web based interface for the applications to access the application from anywhere, anytime, anyone using HTML, CSS and DHTML including JavaScript, server side scripting with PHP and database connectivity using PHP and related technologies

Course Outcomes: The Students will be able to

CO1:   Recall the concepts of WWW including browser and HTTP protocol.
CO2:   Develop the user-friendly web pages using various HTML style tags.
CO3:   Build the dynamic web pages by implementing JavaScripts and objects.
CO4:   Design AJAX applications using XML.
CO5:   Outline the principles behind using MySQL as a backend DBMS with PHP
CO6:   Create web pages for real time applications with good sense.

Introduction and Web Design   9

Concept of WWW, Internet and WWW, HTTP Protocol : Request and Response, Web browser and Web servers, Features of Web 2.0, Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation

HTML and Style sheets   9

Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5, Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties ,manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

JavaScript   9

Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web

XML and AJAX   9

Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT, AJAX Introduction, XMLHttp, Request, and Response, Form Validation

PHP and MySQL   9

introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP, Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHPmyadmin and database bugs

Total Periods: 45

COMPONENT LAB – LIST OF EXPERIMENTS:

1. Write an HTML code to display your education details in a tabular format
2. Write an HTML code to create a Home page having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links
3. Write an HTML code to create a Registration Form. On submitting the form, the user should be asked to login with this new credentials
4. Write an HTML code to illustrate the usage of the following:
   - Ordered List
   - Unordered List
   - Definition List

5. Write an HTML code to demonstrate the usage of inline, internal and external CSS
6. Design HTML form for keeping student record and validate it using Java script
7. Write an XML program to display products
8. Writing program in XML and create a style sheet in CSS &display the document in internet explorer
9. Write HTML Programs using AJAX
10. Write an PHP and HTML program to design an entry form of student details and send it to store at MySQL database
11. Mini Project : Hospital Management System

Text Book:
   1. Jeffrey C. Jackson, "Web Technologies-A Computer Science Perspective", Pearson Education, 2012.

References:
   1. Ralph Moseley and M. T. Savaliya, "Developing Web Applications", Wiley-India, 2011
   2. Kogent Learning Solutions Inc."Web Technologies, Black Book, dreamtech Press, 2009
   3. DT Editorial Services, "HTML 5 Black Book", dreamtech Press, 2016
   4. Joel Sklar, "Web Design", Cengage Learning, 2008
   5. Harwani,, "Developing Web Applications in PHP and AJAX", McGrawHill, 2010
   6. P.J. Deitel& H.M. Deitel, "Internet and World Wide Web How to program", Pearson

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2										3	1	2	2	
CO2	2	2	2		3				2	2	2	3	1	2	3	
CO3	2	2	3		3				2	2	2	3	1	2	3	
CO4	1	2	3		3							3	1	2	2	
CO5	1											3	1	2	2	
CO6	3	3	3		3				3	3	3	3	3	3	3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

| 191HS57 | **Business English** **(Common to All B.E./B.Tech Degree Programmes)** | **L** **0** | **T** **0** | **P** **2** | **C** **MC** |

Programme: B.E./ B.Tech. (Common to all Branches)   **Sem:** 5   **Category:** HSMC
Aim: To Improve learner's Communication Skills in English

Course Outcomes: The students will be able to

CO1: Familiarize in Language Skills, Soft Skills, Inter Personal Skills, Decision Making and Business Communication

CO2: Competent in Presentation skill.

CO3: Imbibe the knowledge of effective classroom speaking and presentation

CO4: Provide opportunities to learners to practice their communicative skills to become proficient users of English

CO5: Write job applications

CO6: Acquire knowledge about the various principles of communication.

PRESENTATION   **6**
Elements of effective presentation – Structure of presentation – Presentation tools – Voice Modulation – Audience analysis – Body language – Video samples

TIME MANAGEMENT   **6**

Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity – Stress Management & Poise – Video Samples

WRITING SKILLS   **6**
Covering letter – strategies to write, resume and its various kinds.

                                                                    Total Periods: **18**

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2	2						3	3	3	3				3
CO2										3		2				2
CO3					2				2	3		2				
CO4									2	3		2			1	
CO5								3		3						

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS57	**MACHINE LEARNING PRACTICES LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Programme: B.E. Computer Science and Engineering **Sem:5** **Category: PC**

Aim: To introduce basic machine learning techniques. To develop the skills in using recent machine learning software for solving practical problems in high-performance computing environment. To develop the skills in applying appropriate supervised, semi-supervised or unsupervised learning algorithms for solving practical problems.

Course Outcomes: The Students will be able to

CO1: Construct algorithms to implement Linear regression
CO2: Illustrate the implementation of logistic regression
CO3: Describe and design multi class classification methods
CO4: Construct algorithms to implement neural networks
CO5: Outline the implementation of support vector machines
CO6: Discuss K-means clustering & PCA.

To implement Machine Learning Algorithms using difference application tools

List of Experiments:

Exercises to solve the real-world problems using the following machine learning methods:

1. Linear Regression
2. Logistic Regression
3. Multi-Class Classification
4. Neural Networks
5. Support Vector Machines
6. K-Means Clustering & PCA

Web References:

1. https://machinelearningmastery.com/linear-regression-for-machine-learning/
2. https://ml-cheatsheet.readthedocs.io/en/latest/logistic_regression.html
3. https://machinelearningmastery.com/support-vector-machines-for-machine-learning/

Total Periods: 60

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	1	1	1	1							3	2	1		
CO2	2	1	1		1							3	2		2	
CO3	1	1	1	1	1							3	1	2	1	
CO4	2	1	1	1	1							3	2			
CO5	2	1	1		1							3	2	1		
CO6	2	1	1		1							3	2		1	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS58   **MOBILE APPLICATION DEVELOPMENT LABORATORY**   L T P C
                                                                  0 0 2 1

Programme: B.E. Computer Science and Engineering   **Sem:** **5**   **Category:** PC
Prerequisites: 191CS48 – Java Laboratory
Aim: To develop programming skills in design and implementation of mobile applications.

Course Outcomes: The Students will be able to.
CO1: Outline the fundamental Android Applications and Activities
CO2: Summarize the concepts and development of User interfaces tools.
CO3: Explain the fundamentals concepts of files and databases in android applications.
CO4: Compare small computing technology and sensors in Android.
CO5: Discuss the basic concept of iOS
CO6: Interpret the android programs using advanced tools

LIST OF EXPERIMENTS:
Implementation in the following topics:
1. Develop an application that uses layouts and menus.
2. Implement audio, video and animation
3. Develop Web data base application.
4. Implement location provider.
5. Implement an application that creates notification upon receiving a message.
6. Write a Mobile Application for chatting.
7. Mini Project

Total Periods: 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
Standalone desktops with Windows or Android or iOS or Equivalent Mobile Application Development Tools with appropriate emulators and debuggers

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			2							3	3	3		3
CO2	3			2								3	2		1	
CO3	3	2										3		2		
CO4	3											3	3	1	2	2
CO5	3				2							3		2		1
CO6	3		2									3	3		3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS61	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem: 6 Category: PC**

Prerequisites: 191CS54 – Computer Networks

Aim: To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations.

Course Outcomes: The Students will be able to

CO1: Recall the concepts, characteristics, delivery models and benefits of cloud computing

CO2: Apply and design suitable virtualization concepts.

CO3: Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.

CO4: Provide the appropriate cloud computing solutions and recommendations according to the applications used.

CO5: Explain the core issues of cloud computing such as security, privacy, and interoperability

CO6: Test programming and experiment with the various cloud computing environments

INTRODUCTION TO CLOUD COMPUTING   **9**

Distributed Computing-Cluster computing- Grid computing-Characteristics of Cloud Computing-Cloud deployment models-Cloud service models-Cloud services-Cloud Applications.

CONCEPTS & TECHNOLOGIES   **9**

Virtualization-Load balancing-Scalability&Elasticity-Deployment-Replication-Monitoring-MapReduce-Identify and Access Management-Service Level Agreements-Billing.

CLOUD SERVICES & PLATFORMS   **9**

Compute services-Storage services-Database services-Application services-Content delivery services-Analytics services-Deployment& Management services, Identify and Access Management

CLOUD APPLICATION DESIGN & BENCHMARKING   **9**

Cloud application design consideration-Cloud application reference architectures-Design methodologies-Data Storage-Data analytics-Deployment & Management-Performance metrics for cloud applications-Cloud application testing

CLOUD SECURITY   **9**

Cloud Security challenges –Authentication-Authorization-identify& Access Management-Data Security-Data Integrity-Encryption& Key Management

                                                            Total Periods: 45

Text Book:
1. Cloud Computing: "A Hands-On Approach" ArshdeepBahga and Vijay K. Madisetti, published 2013.

References:
1. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier, 2012
2. Barrie Sosinsky, "Cloud Computing Bible" John Wiley & Sons, Wiley publishing, Inc. 2011
3. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy
4. Enterprise Perspective on Risks and Compliance", O'Reilly 2009
5. Bernard Golden, "Amazon Web Services for Dummies", John Wiley & Sons, 2013.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3													3		
CO2	3	2	3	3									3	2		
CO3	3	2	2	2												
CO4	3	3	3	3							2		2	2		
CO5	3	3	2										3	2	3	3
CO6	2	2	3	3	2							3	3	2	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS62	DEEP LEARNING	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem:** 06   **Category:** PC

Prerequisites: 191CS52 – Artificial Intelligence and Machine Learning

Aim: The course aims to provide an understanding of different types of Deep Architectures, including Convolutional Networks and Recurrent Networks.

Course Outcomes: The Students will be able to

CO1:   Outline the basic concepts of back propagation networks

CO2:   Recall various models in deep neural networks.

CO3:   Inspect supervised and unsupervised deep neural network architecture models

CO4:   Summarize convolutional neural network models & architecture models

CO5:   Build deep learning models in real world problems using NLP & RNN

CO6:   Discuss basic concepts of restricted boltzman machine

BACK PROPAGATION NETWORKS   **9**

Introduction-Architecture- Equations behind BPN-BPN algorithms-Applications

DEEP NEURAL NETWORKS   **9**

Deep layered network architecture- multimodal fusion architectures –Deep multiple instance learning – image analysis with deep neural networks

CONVOLUTIONAL NEURAL NETWORKS   **9**

Architecture – Layers used to build convNets - convNet architectures-case studies

NATURAL LANGUAGE PROCESSING & RECURRENT NEURAL NETWORKS   **9**

Introduction – Human languages, Phases in natural language processing, applications. Text representation in computers, encoding schemes. Resource management with XML, Management of linguistic data-Recurrent Neural Networks- Sequence Data- Types of RNN.

RESTRICTED BOLTZMANN MACHINE   **9**

Introduction – RBM with binary units – sampling in an RBM – Contrastive Divergence –Layers of RBM – Working of RBM

Total Periods: 45

References:
1. Ian Goodfellow, Yoshua Bengio, Aaron Courville,, "Deep Learning (Adaptive Computation and Machine Learning Series)", MIT Press, 2016.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2									3	1	1		
CO2	1	1	1	1								3	1	1		
CO3	2	2	1									3	1	2		2
CO4	1	2	1									3	2	1		2
CO5	1	1	2	1								3	2	2	2	
CO6	1	1	2	2								3	2	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191CS63	**INTERNET OF THINGS**	**3**	**0**	**2**	**4**

Programme: B.E. Computer Science and Engineering   **Sem: 6 Category: PC**

Prerequisites: 191EC35 – Digital Electronics and Microprocessors

Aim: To learn the concepts of IoT and implement own smart network.

Course Outcomes: The Students will be able to

CO1: Define the right sensors and components for various IoT systems.
CO2: Compare the various architectures of IoT.
CO3: Explain the various protocol standardization effortsand IoT Protocols.
CO4: Recall the basic concepts ofArduino and Raspberry Pi.
CO5: Relate the role of big data, cloud computing and data analytics in a typical IoT system.
CO6: Develop simple applications in IoT using Arduino and Raspberry Pi.

Introduction to IoT   **9**

Internet of Things-Components-Physical and Logical Design-IoT Enabling Technologies-IoT Deployment Templates- IoT Domains-IoT and M2M-IoT Platforms and Design Management.

IoT Architectures   **9**

M2M High-level ETSI architecture-IETF Architecture for IoT-OGC Architecture-IoT Reference Model-Domain Model-Information Model-Functional Model-Communication Model-IoT Sample Architectures.

IoT Protocols   **9**

Protocol Standardization for IoT-Efforts-M2M and WSN Protocols–SCADA and RFID Protocols-Unified Data Standards–Protocols–IEEE 802.15.4 –BACNet Protocol–Modbus-Zigbee Architecture–Network layer–6LowPAN -CoAP-Security.

Building IoT using Raspberry Pi and Arduino   **9**

Building IOT with RASPERRY PI-IoT Systems-Logical Design using Python-IoT Physical Devices & Endpoints-IoT Device-Building Blocks-Raspberry Pi-Board-Linux on Raspberry Pi-Raspberry Pi Interfaces-Programming Raspberry Pi with Python-Other IoT Platforms-Arduino.

Case Studies and Practices   **9**

Real world design Constraints-Applications-Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities-participatory Sensing-Data Analytics for IoT–Software & Management Tools for IoT Cloud Storage Models & Communication APIs-Cloud for IoT-Amazon Web Services for IoT.

            Total Periods: 45

COMPONENT LAB – LIST OF EXPERIMENTS:
1. Blinking an LED Arduino UNO
2. Reading values from Ultrasonic and Accelerometers
3. Implement a prototype for text instructed light control system
4. Installing Raspberry Pi OS
5. Implement a prototype for simple motor control system using Raspberry Pi.
6. Develop a smart home network using Raspberry Pi.

Text Book:
1. HonboZhou,"The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
2. Dieter Uckelmann, Mark Harrison, "Architecting the Internet of Things", Springer, 2011.
3. Arshdeep Bahga, Vijay Madisetti, "Internet of Things (A Hands-On-Approach)", VPT, 2014.

References:
1. Luigi Atzori, Antonio Lera, Giacomo Morabito, "The Internet of Things: A Survey", Journal on Networks, Elsevier Publications, October, 2010.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		3	2								3	2		2
CO2	2	3			2								2	2		2
CO3	2			2	2								2	3		3
CO4	1			2										2		2
CO5	2	2			2								2	3		
CO6	2	2		2									3			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

| **191HS67** | **Career English** **(Common to All B.E./B.Tech Degree Programmes)** | **L-T-P** **0-0-2** | **C** **MC** |

Programme: Common to all branches   **Sem:** 6   **Category:** HSMC

Prerequisites: 191HS57 – Business English

Aim: To practice English for Enhancing Employability skills

Course Outcomes: The students will be able to

CO1: Enlarge their aptitude and reasoning skills.

CO2: Deal with the barriers that affect communication in a professional set up.

CO3: Understand various stages of communication and the role of audience and purpose.

CO4: Practice English for Enhancing Employability skills.

CO5: Develop their job prospects through oral communication.

CO6: Enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.

VERBAL ABILITY   **6**

Verbal analogy, verbal reasoning, error spotting, sentence completion

GROUP DISCUSSION   **6**

Why is GD part of selection process? – Structure of GD – Moderator – Strategies in GD – Team work – Body Language – Mock GD – Video samples

INTERVIEWS   **6**

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews – Video samples
1. Resume / Report Preparation
2. Presentation Skills: Students make presentations on given topics. (8)
3. Group Discussion: Students participate in group discussions. (6)
4. Interview Skills: Students participate in Mock Interviews (8)

                                             Total Periods: **18**

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2								3	3	3	2				2
CO2						2			3	3	3	2			1	
CO3									2	3	2	2				1
CO4									3							
CO5									3	2			1			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS67	**CLOUD LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Programme: B.E. Computer Science and Engineering   **Sem:** 6   **Category:** PC

Prerequisites: 191CS54 – Computer Networks
Aim: To provide the knowledge about cloud computing environments and its applications.

Course Outcomes: The Students will be able to

CO1: Install and use a generic cloud environment that can be used as a private cloud

CO2: Implement applications on the Cloud environment

CO3: Learn to run virtual machines with different configuration

CO4: Examine the installation and configuration of Open stack cloud

CO5: Design and synthesis storage as a service using own cloud.

CO6: Utilize the cloud tool kits.

LIST OF EXPERIMENTS

1. Use Eucalyptus or Open Nebula or Open Stack or equivalent to set up the cloud and demonstrate. Find procedure to run the virtual machine of different configuration.

2. Check how many virtual machines can be utilized at particular time.

3. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine

4. Install C compiler in the virtual machine and execute a sample program.

5. Show the virtual machine migration based on the certain condition from one node to the other.

6. Show auto scaling on Amazon Cloud.

7. Show load balancing on cloud (Amazon, Google Cloud, Windows Azure)

Total Hours   60

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	2	3	1	2							2	1	2		
CO2	2	2	3	2								2	1	2	3	
CO3	1	2	2									2	2	2		
CO4	2	2	2									2	2	2		
CO5	2	2	2									2	1	1		
CO6	2	2	2	2	2							2	2	2	2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS68	**DEEP LEARNING LABORATORY**	L 0	T 0	P 2	C 1

Programme: B.E. Computer Science and Engineering   **Sem:6**   **Category:** PC

Prerequisites: 191CS57 – Machine Learning Practices Laboratory

Aim: To build, train, and deploy real world applications such as object recognition and Computer Vision, image and video processing, text analytics, Natural Language Processing, recommender systems, and other types of classifiers.

Course Outcomes: The Students will be able to

CO1: Build, train, and deploy real world applications

CO2: Identify object recognition and Computer Vision, image and video processing and text analytics.

CO3: Use Natural Language Processing techniques

CO4: Apply recommender systems and expert system to analysis.

CO5: Discuss and analysis various type of classifiers.

CO6: Formulate the problem of knowledge extraction as combinations of data filtration, analysis and exploration methods.

List of Experiments :

1. **Introduction:** Get your first taste of deep learning by applying style transfer to your own images, and gain experience using development tools such as Anaconda and Jupyter notebooks.
2. **Neural Networks:** Learn neural networks basics, and build your first network with Python and NumPy. Use the modern deep learning framework PyTorch to build multi-layer neural networks, and analyze real data.
3. **Convolutional Neural Networks:** Learn how to build convolutional networks and use them to classify images (faces, melanomas, etc.) based on patterns and objects that appear in them. Use these networks to learn data compression and image denoising.
4. **Recurrent Neural Networks:** Build your own recurrent networks and long short-term memory networks with PyTorch; perform sentiment analysis and use recurrent networks to generate new text from TV scripts.
5. **Generative Adversarial Networks:** Learn to understand and implement the DCGAN model to simulate realistic images, with Ian Goodfellow, the inventor of GANS (generative adversarial networks).
6. **Deploying a Sentiment Analysis Model:** Use deep neural networks to design agents that can learn to take actions in a simulated environment. Apply reinforcement learning to complex control tasks like video games and robotics.
7. **Sample Project** – Real world Example

Total Periods: 60

Web References:

1. https://anaconda.org/anaconda/jupyter
2. https://numpy.org/
3. https://pytorch.org/

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	1	1							2	2	1		
CO2	2	1	1		1							2	2		2	
CO3	2	1	1	1	1							2	1	2	1	
CO4	2	1	1	1	1							2	2			
CO5	1	1	1		1							2	2	1		
CO6	2	2	1		1							2	2	1	1	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	T	P	C
191CS69	**MINI PROJECT**	**0**	**0**	**2**	**1**

Programme: B.E. Computer Science and Engineering   **Sem**   **6**   **Category**   **PROJ**

Prerequisites: All the Core Laboratory courses.

Aim: To develop students' knowledge for solving technical problems through structured project research study in order to produce competent and sound engineers.

Course Outcomes: The Students will be able to

CO1: Relate the programming language concepts and basics of Software Development Life Cycle model for the implementation of the project.

CO2: Implement a software project using SDLC model.

CO3: Develop solution using appropriate methodology for challenging real world problems.

CO4: Implement small ideas in innovative ways.

CO5: Motivate on getting a project done within a stipulated period of time.

CO6: Adapt them as a team player to complete their work through proper co-ordination.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2					2			2	2	2	3	3
CO2		3	2	2					2			2	3	2	2	2
CO3	2	3	2	3	3	3	2		3			3	3	3	3	3
CO4			3	3	3	3			2		3	2	2	2	2	3
CO5								3	2	2	2				2	
CO6						2		2	3	3	3	3			2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS71	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: 7 Category: PC**

Prerequisites: 191CS42 – Database Management Systems

Aim: To provide a platform for the dissemination of research, current practices, and future trends in the emerging discipline of big data analytics.

Course Outcomes: The Students will be able to

CO1: Understand the key issues in big data management and its associated applications in intelligent business and scientific computing

CO2: Apply Principles intelligent Distributed and Scientific computing

CO3: Access and Process Data on Distributed File System

CO4: Acquire fundamental enabling techniques and scalable algorithms like Hadoop, MapReduce and NoSQL in big data analytics.

CO5: Test skills and knowledge to install and configure big data stack.

CO6: Solve complex real world for decision making

INTRODUCTION TO BIG DATA ANALYTICS 9

Analytics, Big Data – Characteristics- Applications –Analytics flow – Big data Stack –Mapping Analytics flow to Big Data Stack- Case Study –Weather Data Analysis.

DATA ACQUISITION 9

Apache Flume- Apache Kafka- Apache Kinesis-Apache Sqoop-Apache Storm-Hive, Pig.

DATABASES 9

Relational Databases – MySQL, Non functional Databases – Amazon Dynamo DB, MongoDB, HBaseNeo4j.

BIG DATA STORAGE & PROCESSING 9

HDFS Architecture – HDFS Commands –Map Reduce Programming Model – Hadoop YARN- Apache Spark- Apache Oozie.

SETTING UP BIG DATA STACK 9

Hortonworks Data Platform (HDP) - Cloudera CDH Stack-Amazon Elastic Map Reduce (EMR) - Azure HDInsight.

Total Periods: 45

Text Book:

1. Arshdeep Bahga and Vijay K. Madisetti, "Big Data Science & Analytics A Hands-On Approach", 2016.

References:

1. VigneshPrajapati, " Big Data Analytics with R and Hadoop Set up an integrated infrastructure of R and Hadoop to turn your data analytics into Big Data analytics".
2. Frank Ohlhorst, "Big Data Analytics "Turning Big Data into Big Money", John Wiley & Sons.
3. Gordon S. Linoff, "Data analysis using SQL and Excel", Wiley Publishing Inc.
4. David Dietrich, Barry Heller and Beibei Yang "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", John Wiley & Sons, Inc.2015.
5. Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles, David Corigan, "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		3									2	2		
CO2	2	3	2	3									3	3		
CO3	3	2	2	3									2	2		
CO4	3	3	3	3	2							3	3	3		
CO5	2	2	3	2	3							2	3	3	2	
CO6	3	2	2	2								2	2	3	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS72	**IMAGE AND VIDEO ANALYTICS**	**L T P C**
		3 0 0 3

Programme: B.E. Computer Science and Engineering   **Sem: 7 Category: PC**

Prerequisites: 191CS62 – Deep Learning

Aim: The purpose of this course is to provide an understanding of the theory behind various video processing tasks. The course will extend the concepts from still images (spatial) to dynamic imagery (spatio-temporal).

Course Outcomes: The Students will be able to

CO1: Summarize the difference between analog and digital video, usage of digital videos, how digital videos are acquired, stored, different video file formats and spatio-temporal imagery.

CO2: Outline the concept of motion analysis such as motion detection, estimation and compensation.

CO3: Choose different video processing techniques such as enhancement, restoration and different filtering techniques.

CO4: List out the fundamentals of video segmentation techniques and their applications

CO5: Examine the real world to Identify as well as apply segmentation and tracking techniques to solve real-world video applications and propose solutions for the same following the ethics.

CO6: Construct different video compression techniques and unified framework.

REPRESENTATION OF DIGITAL VIDEO   **9**
Basics of Video – Analog Video – Digital Videos – Introduction to Digital Video Processing -Video Sampling and Interpolation.

MOTION DETECTION AND ESTIMATION   **9**
Notation and Preliminaries - Motion Detection- Motion Estimation - Practical Motion Estimation Algorithms – Perspectives.

VIDEO ENHANCEMENT AND RESTORATION   **9**
Spatiotemporal Noise Filtering - Coding Artifact Reduction - Blotch Detection and Removal - Vinegar Syndrome Removal - Kinescope Moire Removal - Scratch Removal.

VIDEO SEGMENTATION MOTIONAND TRACKING   **9**
Scene Change Detection- Spatiotemporal Change Detection- Motion Segmentation- Simultaneous Motion Estimation and Segmentation- Semantic Video Object Segmentation - Motion Tracking in Video- Rigid Object Tracking- Articulated Object Tracking.

VIDEO COMPRESSION AND UNIFIED FRAMEWORK   **9**
Introduction to Video Compression - Digital Video Signals and Formats -Video Compression Techniques - Transform Coding: Introduction to the Video Encoding Standards - MPEG-1 - MPEG-2 - H.261 - A Unified Framework for Video Indexing , Summarization , Browsing , and Retrieval.

Total Periods: 45

Text Book:
1. A. Murat Tekalp, "Digital Video Processing, Pearson Education", Prentice Hall U.S., 2015, ISBN: 9780133991109
2. AlBovik, "Essential Guide to Video Processing", Academic Press, 2009, ISBN 978-0-12-37445

References:
1. Yao. Wang, JomOstermann, and Ya-OinZhang, "Video Processing and Communications", Prentice Hall, 2002, ISBN 0-13-017547-1
2. AlBovik, "Handbook of Image and Video Processing", Academic Press, 2000, ISBN: 0121197905
3. Lain E.G. Richardson, "H.264 and MPEG-4 Video Compression: Video Coding for Next Generation Multimedia", Wiley, 2003, ISBN: 978--470-86960-4

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3				2							2	2	3		1
CO2	3	2	2									2	3	2	1	
CO3	3	2		2								2	3	2	1	1
CO4	3	2	2									2	2	2		1
CO5	3	2		2								2	3	2		
CO6	3	2	2									2	3	3		1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS73	**BLOCKCHAIN TECHNOLOGIES**	**L**	**T**	**P**	**C**
		3	**0**	**2**	**4**

Programme: B.E. Computer Science and Engineering   **Sem: 7   Category: PC**

Prerequisites: NIL

Aim: To understand security principles and blockchain technological innovations

Course Outcomes: The Students will be able to

CO1:   Explain the knowledge about basic concepts of Networks and Security Mechanism.
CO2:   Summarize the knowledge on the Block chain Architecture.
CO3:   Illustrate the concepts of Consensus mechanisms.
CO4:   Apply the various cryptographic algorithm for the creation of blocks.
CO5:   Develop the Blockchain implementation using the Ethereum.
CO6:   Create the Blockchain implementation using the Smart Contract.

INTRODUCTION TO BLOCKCHAIN   **9**

History of Blockchain – Decentralized system – Peer to Peer Network – Cryptography – Concept of Cryptocurrency – Bitcoin – Applications of Blockchain – Case Study.

BLOCKCHAIN ARCHITECTURE   **9**

Introduction – Components of Blockchain – The Structure of Block – Block Header – Genesis Block – Hash – Node – Transactions – Miners – Characteristics of Blockchain Architecture – Types of Blockchain Architecture.

CONSENSUS MECHANISM   **9**

Introduction about consensus – Consensus Algorithm – Types of Consensus Mechanism – Proof of Work – Proof of Stack – Proof of Elapsed Time – Delegated Proof of stack – Proof of Identity – Proof of Authority – Proof of Capacity – Hybrid PoW/ PoS.

KEY, WALLET AND ADDRESS   **9**

Introduction – Types of Encryptions–Symmetric Cryptography –Asymmetric Cryptography – Public & Private key – Bitcoin Address – Wallet – Types of crypto wallet.

ETHEREUM & SMART CONTRACT   **9**

Compare to Bitcoin – Ethereum's components   - Smart Contact – Introduction to Ethereum High-level language – Tokens – Gas – Decentralized Applications (DApps) – Decentralized Organizations (DAO's).

Total Periods: 45

COMPONENT LAB – LIST OF EXPERIMENTS:
   1. Construct a Block and create an instance
   2. Hash the data with SHA-256 algorithm
   3. RSA Encryption, Decryption and Signing
   4. Implementing Proof of Work system
   5. Implementing Elliptic Curve key pair using secp256k1 algorithm
   6. Create a linked chain with blocks

Text Book:
   1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press ,July 19, 2016.
   2. Imran Bashir, Mastering Blockchain ,Packt Publishing , 2017.

References:
 1. Andreas M. Antonopoulos, Gavin Wood, "Mastering Ethereum", O'Reilly Media, Inc,2018.
 2. Xiwei Xu , Ingo Weber , Mark Staples , Architecture for BlockchainApplications, Springer Nature Switzerland AG 2019.
 3. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media, Inc, *2/e*, 2018.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1									3	2	2		
CO2	1	2	1									2	1	1	1	
CO3	2	2										3	2	2		
CO4	1	2	2	2	2							2				
CO5	2	2	2									3	2	1		
CO6	2	2	3	1	2								2	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS74	ETHICAL HACKING AND NETWORK DEFENSE	L	T	P	C
		3	0	2	4

Programme: B.E. Computer Science and Engineering   **Sem: 7 Category: PC**

Prerequisites: NIL

Aim: To understand and analyze Information security threats & countermeasures.

Course Outcomes: The Students will be able to

CO1: Recall the basic concepts of vulnerabilities and hacking.
CO2: Apply the various tools for port scanning and foot printing in the Windows/Linux OS.
CO3: Examine the various hacking methodologies in system.
CO4: Demonstrate the various web application vulnerabilities.
CO5: Identify the types and tools for session hijacking.
CO6: Interpret the different kinds of tools for hacking the wireless networks.

ETHICAL HACKING OVERVIEW AND VULNERABILITIES   **9**

Understanding the importance of security, Concept of ethical hacking and essential Terminologies-Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking.

FOOT PRINTING AND PORT SCANNING   **9**

Foot printing - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS.

SYSTEM HACKING   **9**

Aspect of remote password guessing, Role of eavesdropping ,Various methods of password cracking, Keystroke Loggers, Understanding Sniffers ,Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing.

HACKING WEB SERVICES AND SESSION HIJACKING   **9**

Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools.

HACKING WIRELESS NETWORKS   **9**

Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless, DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.

Total Periods: 45

COMPONENT LAB – LIST OF EXPERIMENTS:
1. Implement boot sector virus and batch file execution
2. Implement any one password cracking algorithm
3. Develop DOS attack
4. Packet analyzer tool
5. Implement a program for cracking WEP password
6. Implement IP masking procedure.

Text Books:
1. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010

References:
1. RajatKhare, "Network Security and Ethical Hacking", Luniver Press, 2006
2. Ramachandran V, BackTrack 5 Wireless Penetration Testing Beginner's Guide", Packet, 3/e.
3. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1										2	3			
CO2	2		1		2			2	1			3		1		
CO3	1				1			1				1	3			
CO4	2	2		3				2				1			2	
CO5	1			1	3			2	1			2	3			
CO6	2	1			3			1	2			3		1		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

				L	**T**	**P**	**C**
191CS77	**BIG DATA ANALYTICS LABORATORY**			**0**	**0**	**2**	**1**

Programme: B.E. Computer Science and Engineering   **Sem: 7 Category: PC**

Prerequisites: 191CS47 – Database Management Systems Laboratory

Aim: To provide the knowledge of HDFS and work with big data problems.

Course Outcomes: The Students will be able to

CO1: Demonstrate about Hadoop clusters

CO2: Explain about Hadoop Distributed File System(HDFS) to set up single and multi-node

CO3: Summarize the map reduce tasks for various applications

CO4: Analyze the various technologies & tools associated with Big Data

CO5: Discuss techniques common to NoSQL datastores

CO6: Propose solutions for Big Data Analytics problems

LIST OF EXPERIMENTS

1. Find procedure to set up Hortonworks Data Platform (HDP) - Cloudera CDH Stack
2. HDFS Commands
3. Find procedure to set up single and multi-node Hadoop cluster
4. Find procedure to load data into HDFS using
        Apache Flume
        Apache Kafka
        Apache Sqoop
5. Install & run the MongoDB Server
6. Demonstrate unstructured data into NoSQL data and do all operation with such as NoSQL query with API
7. Write a weather forecasting program using Map Reduce
8. Write an event detection program using Spark
9. Page Rank Computation.

Total Hours   60

Course Outcomes	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	2	1	2							2	1	1	1	
CO2	2	2	2	1	1							2	1	2	2	
CO3	1	1	2	1	3							2	2	2	2	
CO4	1	2	3	2	3							2	2	2	2	
CO5	1	2	1	1								2	2	2	2	
CO6	2	2	2	3	2							3	2	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS78	**VIDEO ANALYTICS LABORATORY**	L	T	P	C
		0	0	2	1

Programme: B.E. Computer Science and Engineering   **Sem: 7**   **Category:** PC

Prerequisites: 191CS68 – Deep Learning Laboratory

Aim: To understand all basic concepts in video processing techniques.

Course Outcomes: The Students will be able to
CO1: Construct image processing and enhancement techniques
CO2: Outline the different types of images with read and write operations.
CO3: Choose different types of videos processing techniques like frames &compression.
CO4: List various filtering techniques using edge detection
CO5: Build videos data collections in 2D and 3D.
CO6: Examine different image analysis in various applications.

List of experiments using MATLAB/SCILAB   **9**

1. Poor contrast image enhancement using Histogram Equalization
2. Removal of Gaussian or salt and pepper noise in an image
3. To display the grayscale image using read and write operation.
4. Conversion of videos into frames
5. Calculate and show frame difference which is widely used in video compression
6. Non-Linear Filtering technique using edge detection
7. Video dataset collection (2D and 3D)
8. Processing based on background subtraction process
9. Vehicle license plate character recognition
10. CT /Ultra sound image analysis

Total Hours: **60**

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2									1	3	3		
CO2	3	2	2									1	3	2		
CO3	3	2		2								1	3		2	
CO4	3	2	2		2							1	3		2	
CO5	3	2			2							1	3	2		2
CO6	3		2		2							1	3	3		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS79	PROJECT – I	L	T	P	C
		0	0	4	2

Programme: B.E. Computer Science and Engineering   **Sem**   **7**   **Category**   **PROJ**

Prerequisites: 191CS69 – Mini Project

Aim: To develop students' knowledge for solving technical problems through structured project research study in order to produce competent and sound engineers.

Course Outcomes: The Students will be able to

CO1: Identify and Finalize problem statement by surveying variety of domains.

CO2: Analyze and present data into meaningful information using relevant tools

CO3: Propose an optimized solution among the existing solutions.

CO4: Work independently and ethically

CO5: Present the results in written and oral format.

CO6: Apply the basic entrepreneurship skills in project management.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2		2			2				2	2	3	3
CO2	2	3	2	2					2			2	3	2	2	2
CO3	2	3	2		3				3			3	3	3	3	3
CO4	2	1	1			3		3	2		3	2	2	2	2	
CO5	1	1				3		2	2	3	2			2	2	
CO6	1	2				2			3		3				2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS89	PROJECT– II	L T P C
		0 0 12 6

Programme: B.E. Computer Science and Engineering **Sem:** 8 **Category:** PROJ

Prerequisites: 191CS79 – Project – I

Aim: To develop students' knowledge for solving technical problems through structured project research study in order to produce competent and sound engineers.

Course Outcomes: Upon completion of Final year project, students should be able to:

CO1: Identify and describe the problem and scope of project clearly.

CO2: Apply new technologies and design techniques concerned for devising a solution for a given problem statement.

CO3: Develop a proper methodology in problem solving.

CO4: Demonstrate a strong working knowledge of ethics and professional responsibility.

CO5: Communicate technical information by means of written and oral reports.

CO6: Identify basic entrepreneurship skills in project management.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2					2				2	2	3	3
CO2		3	2	2					2			2	3	2	2	2
CO3	2	3	2		3				3			3	3	3	3	3
CO4						3		3	2		3	2	2	2	2	
CO5						3		2	2	3	2			2	2	
CO6						2			3		3				2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEA	AD HOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem:** -   **Category:**   **PE**

Prerequisites: 191CS54 – Computer Networks

Aim: To learn about the protocols and architecture that support for configuration and functioning of Ad Hoc and Wireless Sensor Networks.

Course Outcomes: The Students will be able to

CO1:   Recall the concepts of Generations of cellular and Ad Hoc Wireless Networks.

CO2:   Identify the Issues in designing a MAC Protocol and its Classification.

CO3:   Analyze the protocol design issues of ad hoc and sensor networks.

CO4:   Outline the architecture of sensor networks and the various MAC protocols of sensor networks

CO5:   Summarize the routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues

CO6:   Compare the QoS related performance measurements of ad hoc and sensor networks

INTRODUCTION   **9**

Wireless LANs and PANs – Fundamentals of WLANs - Wireless WANs and MANs – First-Generation Cellular Systems – Second-Generation Cellular Systems – Third-Generation Cellular Systems - Ad hoc wireless networks: Cellular and Ad Hoc Wireless Networks - Applications of Ad Hoc Wireless Networks - Issues in Ad Hoc Wireless Networks – Ad Hoc Wireless Internet.

MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS   **9**

Issues in designing a MAC Protocol - Classification of MAC Protocols - Contention based protocols- Contention based protocols with Reservation Mechanisms - Contention based protocols with Scheduling Mechanisms - Multi channel MAC.

ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS   **9**

Issues in designing a routing and Transport Layer protocol for Ad hoc networks - proactive routing, reactive routing (on-demand), hybrid routing - Classification of Transport Layer solutions - TCP over Ad hoc wireless Networks.

WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS   **9**

Introduction - Sensor Network architecture - Layered Architecture - Clustered Architecture. Sensor node architecture - hardware and software components of a sensor node - Data dissemination - Data gathering - MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC - IEEE 802.15.4.

WSN ROUTING, LOCALIZATION & QUALITY OF SERVICE (QoS)   **9**

Issues in WSN routing - Localization - Indoor and Sensor Network Localization - absolute and relative localization, triangulation - QoS in WSN - Energy Efficient Design -Synchronization - Transport Layer issues - Security – Real time communication.

Total Periods: 45

Text Book:
  1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall Professional Technical Reference, 2008.

References:
  1. Carlos De MoraisCordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2/e, 2011.
  2. Feng Zhao and LeonidesGuibas, "Wireless Sensor Networks", Elsevier Publication - 2002.
  3. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005.
  4. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3													2		
CO2		3														3
CO3		3		2									2	3		
CO4			3										3	2	1	
CO5	2			2	2								2		2	
CO6	1	2		3											3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEB	ADVANCED JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem:**   -   **Category:**   PE
Prerequisites: 191CS43 – Object Oriented Programming
Aim: To design and develop enterprise strength distributed and multitier applications using Java Technology.

Course Outcomes: The Students will be able to

CO1: Gain the basic concepts ofJava..

CO2: Learn advanced Java programming concepts like RMI, Collections etc.

CO3: Develop network programs in Java.

CO4: Relate the concepts needed for distributed and multi-tierapplications.

CO5: Solve the real world problems using concepts like JDBC,JNDI.

CO6: Explorethe features of various platforms and frameworks like hibernate, Java Server Face used in web applicationsdevelopment.

COLLECTIONS & NETWORKING   **9**
Collections: Collection Interfaces, Concrete Collections, The Collections Framework.
Networking: Internet Addressing – Inet Address - Factory Methods - Instance Methods - TCP/IP Client Sockets - URL - URL Connection - TCP/IP Server Sockets.

DISTRIBUTED APPLICATIONS   **9**
Introduction to J2EE - Enterprise Java Bean: Preparing a Class to be a JavaBean, Creating a JavaBean, JavaBean Properties - Types of beans - Stateful Session bean, Stateless Session bean, and Entity bean. **CORBA:** Technical/Architectural Overview-RMI-IIOP.

JAVA DATABASE CONNECTIVITY   **9**
Java Database Connectivity (JDBC): Merging Data from Multiple Tables: Joining, Manipulating - Databases with JDBC, Transaction Processing, Retrieve the employee details from the Server through JDBC Driver. Java Naming and Directory Interface - Naming concepts - directory concepts - JNDI Interface - Example.

SERVER SIDE PROGRAMMING   **9**
Servlets - Introduction to servlets - Servlets life cycle - Java Server Pages (JSP): Introduction, Java Server Pages Overview, First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries

RECENT JAVA TOOLS   **9**
Spring Boot - Deploying a Spring-Boot application running with Java8 - Hibernate: Introduction to Hibernate 3.0 - Hibernate Architecture - First Hibernate Application. Java Server Faces - Installing application - writing - deploying and testing application - Request Process life cycle - Basic JSF Tags - Expression Language.

Total Periods: 45

Text Books:
1. Uttam K. Roy, "Advanced Java Programming", Oxford University press, 2015.
References:
1. Elliotte Rusty Harold, "Java Network Programming", O'Reilly Publishers, 4/e, 2013.
2. Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc., 3/e, 2004.
3. S. Malhotra and S. Choudhary, "Programming in Java", Oxford University Press. 2/e, 2014.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3										2	3	2		
CO2	3	2	1									2	3	3	2	
CO3	3	2										2	3	2	1	
CO4	3											2	3	2	2	
CO5	3	3	3									2	3	3	2	
CO6	3	2	1									2	3	3	3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEC	C# & .NET PROGRAMMING	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Prerequisites: 191CS43 – Object Oriented Programming

Aim: To introduce the .NET framework and make the student to program with C#.

Course Outcomes: The Students will be able to

CO1: Explain the basic object oriented aspects of C#&.NET application.

CO2: Describe the foundations of Common Language Runtime (CLR).

CO3: Analyze the use of language interfaces, inheritance familiar with .NET collections.

CO4: Develop code and test small C# console and GUI applications.

CO5: Building stand-alone applications in the .NET framework using C#.

CO6: Relate database driven applications and web services.

.NET FRAMEWORK & FUNDAMENTALS 9

Overview of .NET Framework - CLR - Working with .NET Framework and SDK - C# Compiler - Operators - Loops - Preprocessing Directives - Strings - Enumerated Types - Arrays - Reference and Value Types.

CLASS DESIGN AND FILE I/O 9

Introduction to C# Class - Members - Constants - Methods - Constructors - Delegates and Events - Operator Overloading –Interfaces – Generics – Structures – Exception Handling – Classes to Read and Write Streams of Data – Directories and Files.

BUILDING WINDOWS FORMS and CONTROLS 9

Programming a Windows From – Forms Control Classes – Form Class – Working With Menus – Forms Inheritance – Buttons – Panel – Labels – Textbox Controls – List Box – List View – Drag and Drop with controls

XML DATA AND CONTROLS 9

Working with XML - Techniques for Reading and Writing XML Data - Using XPath and Search XML - ADO.NET Architecture - ADO.NET Connected and Disconnected Models - XML and ADO.NET - Simple and Complex Data Binding - Data Grid View Class.

BUILDING WEB SERVICES 9

Application Domains - Remoting – Leasing and Sponsorship - .NET Coding Design Guidelines – Assemblies – Security – Application Development – Web Services - Building an XML Web Service - Web Service Client – WSDL and SOAP – Web Service with Complex Data Types – Web Service Performance.

Total Periods: 45

Text Books:

1. Stephen C. Perry, "Core C# and .NET", Pearson Education, 2006.

References:

1. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework", A press publication, 2012
2. Ian Gariffiths, Mathew Adams, Jesse Liberty, "Programming C# 4.0", OReilly, 4/e, 2010.
3. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner,"Professional C# 2012 and .NET 4.5", Wiley, 2012.
4. Harsh Bhasin, "Programming in C#", Oxford University Press, 2014.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2												3	2		2
CO2	1	1											2		1	
CO3	2		2											2		1
CO4	2	2	2												3	2
CO5	3	2	3										2		3	
CO6	3	3											2	2		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191CSED	**CYBER CRIME AND CYBER FORENSICS**	**3**	**0**	**0**	**3**

Programme: B.E. Computer Science and Engineering   **Sem: -**   **Category:**   **PE**

Prerequisites: 191CS77 – Ethical Hacking and Network Defense

Aim: To examine digital devices in a constructive way with the goal of identifying, preserving, recovering, analyzing, and presenting the evidence in a court of law

Course Outcomes: The Students will be able to

CO1: Recall the basic concepts of Cyber Crime

CO2: Resolve security related issues in networks and computer systems

CO3: Identify current issues in the practice of digital forensic.

CO4: Analyze vulnerability of victim system and how to overcome the cyber-crime attacks.

CO5: Discuss media laws in India and the ethical issues of media

CO6: Implement cyber security solutions and their uses in real time applications

OVERVIEW OF CYBER CRIME   **9**

Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime, Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

CYBER SECURITY   **9**

Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses

DIGITAL FORENSICS   **9**

Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

CYBER CRIME INVESTIGATION   **9**

Introduction to Cyber Crime investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies, Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

LAWS AND ETHICS   **9**

Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC ,Electronic Communication Privacy ACT, Legal Policies.

                                                Total Periods: **45**

Text Book:

1. Bernadette HSchell, Clemens Martin, "Cybercrime, ABC", CLIO Inc, California, 2004.

2. NIIT Authors, "Understanding Forensics in IT", PHI, 2005.

3. Nelson Phillips, Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

References:

1. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics", Tata McGraw Hill, New Delhi, 2006.

2. Robert M Slade, "Software Forensics", Tata McGraw-Hill, New Delhi, 2005.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2									3	1	1		
CO2	2	2	2	2	1							3	2	2	2	
CO3	2	2	2	2	2							3	2	1	1	
CO4	3	3	2	2	2							3	1	1	1	
CO5	2	2	3	2	3			2				3	1	1	1	
CO6	3	3	2	2	1							3	1	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEE	DATA SCIENCE AND ANLYTICS	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem: - Category: PE**

Prerequisites: 191CS71 – Big Data Analytics

Aim: To dive the data into data science using Python and learn how to effectively analyze and visualize the data.

Course Outcomes: The Students will be able to

CO1: Acquire knowledge to handle huge data.

CO2: Understand the importance of data visualization.

CO3: Identify various regression models to train and test data.

CO4: Choose the appropriate algorithms and approaches for clustering

CO5: Apply visualization techniques to resolve problem by using different datasets.

CO6: Predict and analyze large dataset with recent tools & practice.

GETTING STARTED WITH RAW DATA   **9**

The world of arrays with NumPy - Empowering data analysis with pandas - Inserting and exporting data - Data cleansing - Data operations. Inferential Statistics- Various forms of distribution - One-tailed and two-tailed tests - Type 1 and Type 2 errors The F distribution - The chi-square distribution - The chi-square test of independence.

DATA THROUGH ADVANCED VISUALIZATION   **9**

Controlling the line properties of a chart - Creating multiple plots -Playing with text - Styling your plots - Box plots – Heat maps -Scatter plots with histograms - A scatter plot matrix - Area plots - Bubble charts - Hexagon bin plots - Trellis plots - A 3D plot of a surface .

LINEAR REGRESSION   **9**

Linear Regression - Simple linear regression - Multiple regression - Training and testing a model - Logistic regression - Data preparation - Creating training and testing sets - Building a model - Model evaluation -Evaluating a model based on test data - Model building and evaluation with SciKit .

CLUSTERING AND FILTERING   **9**

The k-means algorithm and its working - A simple example - The k-means clustering with countries - Determining the number of clusters - Clustering the countries - User-based collaborative filtering - Finding similar users - The Euclidean distance score - The Pearson correlation score - Ranking the users.

RECENT TRENDS   **9**

Applications of Data Science - Technologies for visualization - Bokeh - Recent trends in various data collection and analysis techniques- various visualization techniques, application development methods used in data science

Total Periods: 45

Text Book:
1. Jake Vander Plas, "Python Data Science Handbook", O'Reilly Media, 2015

References:
1. Stephen Klosterman, "Data Science Projects with Python: A case study approach to successful data science projects using Python, pandas, and Scikit-Learn", Kindle Edition, 2019.
2. Luca Massaron John Paul Mueller, "Python for Data Science For Dummies", John Wiley & sons, 2/e, 2020.
3. Travis Booth "Python Data Science: Hands on Learning for Beginners", Kindle Edition, 2019.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1										2	1	1	1	
CO2	2	2	2									2	1	2	2	
CO3	2	2	2	2	2							2	2	2	2	
CO4	1	2	3	2								2	2	2	3	
CO5	2	2	3	2	2							2	2	2	3	
CO6	2	2	2	3	2							3	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEF	DISTRIBUTED COMPUTING	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** PE

Prerequisites: 191CS54 – Computer Networks

Aim: To provide the knowledge of Distributed computing and its importance.

Course Outcomes: The Students will be able to

CO1: Recall the fundamental concepts in distributed computing.

CO2: Illustrate various layered protocols that simplify the programming interface to computer system.

CO3: Apply methods and techniques for distributed query processing and optimization.

CO4: Realize the concepts of distributed system applications.

CO5: Make use of open source security tools in distributed computing.

CO6: Solve distributed computing problems, services and applications.

INTRODUCTION 9

Characterization of Distributed Systems - Examples of Distributed Systems - Trends in Distributed Systems - Focus on Resource Sharing – Challenges - Case Study: The World Wide Web. System Models - Physical Models - Architectural Models - Fundamental Models. Networking and Internetworking - Types of Network - Network Principles - Internet Protocols - Case Studies: Ethernet, Wi-Fi and Bluetooth.

COMMUNICATION IN DISTRIBUTED SYSTEMS 9

Inter process Communication - The API for the Internet protocols - External data representation and marshalling - Multicast communication - Network virtualization: Overlay networks - Case study: MPI. Remote Invocation - Request-reply protocols -Remote procedure call - Remote method invocation - Case study: Java RMI. Indirect Communication - Group communication - Publish-subscribe systems - Message queues - Shared memory approaches. Operating System Concept - Communication and invocation - Operating system architecture - Virtualization at the operating system level.

DISTRIBUTED MIDDLEWARE 9

Distributed objects - CORBA - From objects to components - Enterprise JavaBeans and Fractal. Web Services - Introduction - Service descriptions and IDL for web services - A directory service for use with web services - xml security - coordination of web services - applications of web services. Peer-to-Peer systems - Introduction - Napster and its legacy - Peer-to-peer middleware - Routing overlays - Overlay case studies: Pastry, Tapestry - Application case studies: Squirrel, OceanStore, Ivy.

DISTRIBUTED SYSTEM SERVICES AND SHARED DATA 9

Distributed File Systems - File service architecture - Case study: Sun Network File System, The Andrew File System - Enhancements and further developments. Name Services - Introduction - Name services and the Domain Name System - Directory services - Case study: The Global Name Service, The X.500 Directory Service. Distributed Transactions -Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery.

NEW CHALLENGES AND CASE STUDY 9

Mobile and Ubiquitous Computing - Introduction - Association - Interoperation - Sensing and context awareness - Security and privacy - Adaptation -Case study: Cooltown. Distributed Multimedia Systems - Characteristics of multimedia data - Quality of service management - Resource management - Stream adaptation - Case studies: Tiger, BitTorrent and End System Multicast. Designing Distributed Systems: Google Case Study - Overall architecture and design philosophy - Underlying communication paradigms - Data storage and coordination services - Distributed computation services.

Total Periods: 45

Text Book:

1. G Coulouris, J. Dollimore, T. Kindberg, Gordon Blair, "Distributed System Concepts and Design", Addison Wesley, 5/e, 2012.

References:

1. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed System Principles and Paradigms", Pearson Education, 2002.

2. HagitAttiya and Jennifer Welch, "Distributed Computing: Fundamentals, Simulations and Advanced Topics", Wiley, 2004.
3. A.S.Tanenbaum, M.Van Steen, "Distributed Systems", Pearson Education, 2004.
4. M.L.Liu, "Distributed Computing Principles and Applications", Pearson Addison Wesley, 2004.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2										1	1		
CO2	2	2	2		1							2	1	1	2	
CO3	1	2	2	2	2								1	1	2	
CO4	2	2	2									3	1	2	2	
CO5	2	2	3	2	3							2	1	2	1	
CO6	3	3	2	2	2							2	1	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEG	EMBEDDED AND REAL TIME SYSTEMS	L T P C
		3 0 0 3

Programme: B.E. Computer Science and Engineering   **Sem: - Category:** PE

Prerequisites: 191CS41 – Computer Organization and Architecture

Aim: To make students understand the concepts of embedded systems.

Course Outcomes: The Students will be able to

CO1: Recall the basic concepts of embedded systems.
CO2: Outline the design metrics of embedded system.
CO3: Summarize the various protocols for serial communication.
CO4: Identify the importance of embedded software in various application domains.
CO5: Explain the need of RTOS in Embedded system software.
CO6: List the different functions of a RTOS.

FUNDAMENTALS OF EMBEDDED SYSTEM   9

Core of the embedded system, Memory, Sensors (resistive, optical, position, thermal) and Actuators (solenoid valves, relay/switch, opto-couplers), Communication Interface, Embedded firmware (RTOS, Drivers, Application programs), Power-supply (Battery technology, Solar), PCB and Passive components, Safety and reliability, environmental issues. Ethical practice. Embedded Product development life cycle, Program modeling concepts: DFG, FSM, Petri-net, UML.

EMBEDDED HARDWARE AND DESIGN   9

Introduction to ARM-v7-M (Cortex-M3), ARM-v7-R(CortexR4), Characteristics and quality attributes (Design Metric) of embedded system. Real time system's requirements, real time issues, interrupt latency.

EMBEDDED SERIAL COMMUNICATION   9

Basic communication protocols like SPI, SCI (RS232, RS485), I2C, CAN, Field-bus (Profibus), USB v2.0, 3.0, 3.1, Bluetooth, Zig-Bee, NFC, Firewire, Wireless sensor network.

EMBEDDED SOFTWARE   9

Basic embedded C programs/applications for ARM-v7, using ARM-GCC-tool-chain, Emulation of ARM-v7 (e.g. using QEMU), and Linux porting on ARM-v7 (emulation) board CASE STUDY:1) Medical monitoring systems, 2)Process control system (temp, pressure) 3)Soft real time: Automated vending machines, 4)Communication: Wireless (sensor) networks.

FIRMWARE CONCEPTS AND DESIGN   9

Real time operating system: POSIX Compliance, Need of RTOS in Embedded system software, Foreground/Background systems, multitasking, context switching, IPC, Scheduler policies, Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS. introduction to μCOS-II RTOS

Total Periods: 45

Text Book:
1. Jonathan W. Valvano, "Embedded Microcomputer Systems –Real Time Interfacing", Cengage Learning, 3/e, 2012.

References:
1. Shibu K. V, "Introduction to Embedded Systems", Tata McGraw Hill, 1994.
2. F. Vahid, "Embedded System Design –A unified hardware and software introduction", John Wiley.
3. L. B. Das, "Embedded Systems", Pearson, 2009.
4. G. Osborn, "Embedded microcontroller and processor design", Pearson
5. Frank Vahid, "Embedded Systems", Wiley India, 2002
6. http://nptel.ac.in/

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2										1	3			3
CO2			3			2						1		2	3	
CO3				3								2		3		
CO4				3								2		2		
CO5	3	2										2	3			3
CO6				3		2						2		2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	L	**T**	**P**	**C**
191CSEH **INFORMATION RETRIEVAL**	**3**	**0**	**0**	**3**

Programme: B.E. Computer Science and Engineering   **Sem: -**   **Category:**   PE

Prerequisites: NIL

Aim: To understand various searching techniques to retrieve data from databases and warehouses.

Course Outcomes: The Students will be able to

CO1:   Identify the basics concepts of information retrieval and relate with Artificial Intelligence.

CO2:   Apply the knowledge of data structures and indexing methods in information retrieval.

CO3:   Interpret the concept of Web search through different kinds of architecture.

CO4:   Relate the various search engine optimization methods.

CO5:   Enumerate the several kinds of web search algorithm with ranking methods.

CO6:   Make use of the various kinds of techniques for text mining .

INTRODUCTION   9

Introduction - History of IR - Components of IR – Issues – Open source Search engine Frameworks – The impact of the web on IR. The role of artificial intelligence (AI) in IR –IR Versus Web Search – Components of a Search engine-Characterizing the web.

INFORMATION RETRIEVAL   9

Boolean and vector - space retrieval models - Term weighting – TF- IDF weighting - cosine similarity – Preprocessing – Inverted indices – efficient processing with sparse vectors – Language Model based IR – Probabilistic IR – Latent Semantic Indexing Relevance feedback and query expansion.

WEB SEARCH ENGINE – INTRODUCTION AND CRAWLING   9

Web search overview, web structure, the user, paid placement, search engine optimization/ spam. Web size measurement –search engine optimization/spam –Web Search Architectures crawling –meta – crawlers-Focused Crawling –web indexes –Near-duplicate detection Index Compression –XML retrieval.

WEB SEARCH – LINK ANALYSIS AND SPECIALIZED SEARCH   9

Link Analysis –hubs and authorities –Page Rank and HITS algorithms –Searching and Ranking – Relevance Scoring and ranking for Web –Similarity –Hadoop & Map Reduce

Evaluation –Personalized search –Collaborative filtering and content-based recommendation of documents and products –handling "invisible" Web –Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval.

DOCUMENT TEXT MINING   9

Information filtering; organization and relevance feedback –Text Mining –Text classification and clustering –Categorization algorithms: naïve Bayes; decision trees; and nearest neighbor –Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM).

Total Periods: 45

Text Book:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, "Introduction to Information Retrieval", Cambridge University Press. 2008.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	1											2			
CO2		2		1									3	2		
CO3	1			2	2								3		3	
CO4		1		2	3								3	3		
CO5	2				2								3	3		
CO6		1			2								3	3		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEI	**INTERNET OF EVERYTHING**	**L**	**T**	**P**	**C**
	(Common to CSE & EEE)	**3**	**0**	**0**	**3**

Programme: B.E. Computer Science and Engineering / B.E. Electrical and Electronics Engineering   **Sem:** -   **Category:**   **PE**

Prerequisites: 191CS63 – Internet of Things

Aim: To provide an overview of the concepts and challenges of the IoE economy and to discuss the Internet and its evolution to the interconnection of people, processes, data, and things that forms the Internet of Everything.

Course Outcomes: The Students will be able to

CO1: Recall the basic concepts of what is the IoE.

CO2: Illustrate the Interconnection of people, process, data, and things

CO3: Demonstrate the implementation of IoE in Home automation systems.

CO4: Explain the security concerns in implementing IoE solutions.

CO5: Apply the different topology of an IoE solution model.

CO6: Summarize the basic concepts of IoB- Internet of Behavior.

WHAT IS THE IOE   **9**

Internet and its evolution to the Internet of Everything. IoE benefits to individuals and organizations Concept of a network foundation connecting billions of things and trillions of gigabytes of data to enhance decision-making processes and interactions.

PILLARS OF THE IOE   **9**

Interconnection of people, process, data, and things that forms the Internet of Everything.

CONNECTING THE UNCONNECTED   **9**

IoT application in the home and industry ,Protocol suite and its necessity for communication across a network, IoE and its affects to the evolution of data storage and access , Example of a Home IoE implementation environment.

TRANSITIONING TO THE IOE   **9**

Internet of Everything (IoE) drivers for the convergence between an organization's operational technology (OT) and information technology (IT) systems , M2M, M2P, and P2P interactions in an IoE , Business processes for evaluating a problem that can be solved with IoE, Necessary architectural structure to implement an IoE solution, Security concerns that must be considered when implementing IoE solutions.

BRINGING IT ALL TOGETHER   **9**

"What if" scenarios that can help a business understand the benefits and impediments to implementing a new solution, Physical topology and logical topology of an IoE Healthcare solution model , M2M, M2P and P2P interactions of an IoE Healthcare solution model, Concept of prototyping and why this is critical in the nascent IoE market.

         Total Periods: 45

Text Book:

1. Adrian McEwen and Hakim Cassimally, "Internet of Things", Wiley, 2013
2. Arshdeep Bhaga, "Internet of Things, A hands on approach" VPT, 1/e, 2014

References:

1. Luigi Atzori, Antonio Lera, Giacomo Morabito, "The Internet of Things: A Survey", Journal on Networks, Elsevier Publications, October, 2010.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things –Key applications and Protocols", Wiley, 2012.
3. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective" - CRC Press, 2012.
4. Dieter Uckelmann, Mark Harrison, "Architecting the Internet of Things", Springer, 2011.
5. https://cisco.netacad.net

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2	2	1								2	2	1		
CO2	3	1	1		1							2	2	2		
CO3	3	3	3	3	3							2	3	2		
CO4		2	3	3	2							2	3	3		
CO5	1		1		3							2	1	3		
CO6	1	1	1	1	3							2	1	3	2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEJ	iOS APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem:** -   **Category:** PE

Prerequisites: 191CS53 – Mobile Application Development

Aim: To use the basic knowledge in programming and are aiming to make bright career in mobile application development. This course integrates essential to grasp fundamental concepts with industry practices.

Course Outcomes: The Students will be able to

CO1: Classify the various electronic gadgets.

CO2: Summarize the concepts of OOPS applied In the Application Pattern.

CO3: Explain the fundamentals concepts of text and web views for presenting the application of data.

CO4: Compare the concepts to the files and the directives.

CO5: Interpret the knowledge in files with SQLite.

CO6: Discuss the performance for the application by applying various tools.

INTRODUCTION FOR THE IDE   **9**

iPhone and iPad Device Anatomy -iOS Architecture and SDK Frameworks -iOS and SDK Version Compatibility - Apple iOS Developer Program - Templates, Projects, and Workspaces - Creating a New Project -LLVM and LLDB – XC Test Testing Framework-Continuous Integration and Bots - Automatic Configuration.

OOPS APPLIED IN THE APPLICATION PATTERN   **9**

Classes, Objects, and Methods -Declared Properties - Memory Management - Automatic Reference Counting (ARC) -Categories and Extensions - Formal and Informal Protocols
Blocks - Model View Controller (MVC) – IB Outlets and IB Actions – Sub classing and Delegation

CREATION OF VIEWS   **9**

The View Hierarchy - Containers - Controls - Text and Web Views - Navigation View and Tab Bars - Alert Views and Action Sheets -Controlling Rotation Behavior - View Auto sizing - Auto layout - Storyboards -Adding Scenes –Segues –Transitions -Using in a Tab Bar Application - Table Views - Static and Dynamic Table Views - Delegates and Data Sources - Table View Styles - Custom Cells.

MANAGING FILES WITH SQL   **9**

Management - Directories and Files - Problems Solved by ADO.NET Entity Framework - Working with Directories - Working with Files - Reading and Writing from a File - iCloud - Key-Value Data - Archiving- SQLite Integration - Using SQLite Directly -Overview of Core Data - Managed Objects - Persistent Store Coordinator - Retrieving and Modifying Data

MEASURING PERFROMANCE   **9**

Grand Central Dispatch (GCD) - Serial and Concurrent Queues - Main Dispatch Queue - Completion Blocks Operation Queues - Synchronous and Asynchronous Downloads – Sending HTTP GET and POST Requests - Parsing JSON - Parsing XML – Airdrop - Measuring Performance - Instruments - Responsiveness - Memory Usage, Spikes, and Leaks - Networking and Power.

Total Periods: 45

Text Book:
1. Neil Smyth, "iOS 12 App Development Essentials: Learn to Develop iOS 12 Apps with Xcode 10 and Swift 4", Payload media Inc, 2018.

References:
1. Jesse Feiler, " iOS App Development for Dummies", John Wiley & sons, 2014.
2. Greg Lim, "Beginning iOS 13 & Swift App Development", Kindle Edition, 2019.
3. Craig Grummitt," OS Development with Swift", Atlantic Publishers and Distributors, 2017.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			2							2	3	3		3
CO2	3			2								2	2		1	
CO3	3	2										2		2		
CO4	3											2	3	1	2	2
CO5	3				2							2		2		1
CO6	3		2									2	3		3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEK	**MEDICAL IMAGE PROCESSING**	**L T P C**
		3 0 0 3

Programme: B.E. Computer Science and Engineering   **Sem:** -   **Category:** PE

Prerequisites: 191CS72 – Image and Video Analytics

Aim: To acquire the fundamental concepts of image acquisition and understand how to apply the image processing techniques for various medical images.

Course Outcomes: The Students will be able to.

CO1: Recall the image fundamentals and mathematical transforms necessary for image processing

CO2: Outline the various image enhancement and image restoration techniques

CO3: Make use of several image segmentation methods in medical images

CO4: Illustrate the basic concepts of wavelets and image compression techniques

CO5: Interpret the different types of reconstruction techniques applied to copious medical Images

CO6: Examine the medical images using suitable software

DIGITAL IMAGE FUNDAMENTALS AND IMAGE TRANSFORMS   **9**

Components of an image processing system - image representation- grey scale and colour images- Elements of visual perception- image sensing and acquisition - image sampling and quantization- Basic relationship between pixels- two dimensional orthogonal transforms - DFT, FFT, Haar transform, KLT, DCT, wavelets.

IMAGE ENHANCEMENT AND IMAGE RESTORATION   **9**

Basic gray level transformation, Histogram equalization and histogram matching, Image smoothening, Image sharpening, both spatial and frequency domain, Color image Processing color models, Pseudo color image processing, Image degradation models, restoration - mean filter, order statistics filter, adaptive filters.

IMAGE SEGMENTATION AND ANALYSIS   **9**

Edge detection- Marr Hidreth edge detector, canny edge detector, Thresholding-foundation, basic global thresholding, Segmentation-amplitude segmentation methods, clustering segmentation methods, region based segmentation, watershed segmentation algorithm, Shape analysis- topological attributes, distance, perimeter and area measurements, colour image segmentation.

MORPHOLOGICAL IMAGE PROCESSING   **9**

Erosion and dilations, opening and closing, hit or miss transformations, Image compression- fundamentals, basic image compression methods, run length, Huffman, arithmetic, transform and loss and lossless predictive coding, Digital image watermarking.

RECONSTRUCTION OF MEDICAL IMAGES AND DIP APPLICATIONS   **9**

Image reconstruction from projections, Radon transforms, inverse radon transform, Filter back projection algorithm, Fourier reconstruction of MRI Images, Reconstruction of PET, SPECT and fMRI images, Biomedical image processing – CT or MRI image analysis –Water marking –Non-destructive testing – Crack detection-Biomedical applications.

Total Periods: 45

Text Books:
1. Rafael C., Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson Education Asia, 4/e, 2018.
2. Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 3/e, 2001.

References:
1. William K. Pratt, "Digital Image Processing", John Wiley, NJ, 4/e, 2007.
2. Albert Macouski, "Medical Imaging systems", Prentice Hall, New Jersey, 2/e, 1997.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1								2	3	3	2	
CO2	3	3	2	1								2	3	2	2	
CO3	3	3	3	3								2	3	3	3	
CO4	3	3	3	2								2	3	3	1	
CO5	3	3	3	1								2	3	2	1	
CO6	3	2	1									2	2	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEL	MOBILE AND EDGE COMPUTING	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem: - Category: PE**

Prerequisites: 191CS61 – Cloud Computing

Aim: To learn about the basic understanding of the wireless communication systems and edge Computing

Course Outcomes: The Students will be able to

CO1: Explain various Mobile Computing application, services and architecture.

CO2: Summarize the protocol architecture of WLAN technology

CO3: Illustrate the Transport layer protocols in mobile networks.

CO4: Recall the key architectures and applications in edge computing

CO5: Discuss the different types of edge compute services and applications

CO6: Develop a research project related to data analytics and edge computing

INTRODUCTION   **9**

Introduction to mobile computing, Middleware and Gateways, Application and services, Internet-Ubiquitous networks, Architecture and three-tier architecture for Mobile Computing, Design consideration for Mobile Computing. 06 15% II Spread spectrum – Direct sequence, Frequency hopping. Medium Access Control - SDMA, FDMA, TDMA, CDMA, Cellular concepts- channel assignment strategy- hand off strategy interface and system capacity.

WIRELESS LANS   **9**

Wireless LAN Standards – IEEE 802 Protocol Architecture, IEEE 802.11 System Architecture, Protocol Architecture & Services, Cellular Networks: Channel allocation, multiple access, location management, Handoffs. MAC Layer & Management, Routing - Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, Mobile Agents, Service Discovery

MOBILE TRANSPORT LAYER   **9**

Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks. Protocols and Platforms for Mobile Computing - WAP, Bluetooth, XML, J2ME, JavaCard, PalmOS, Linux for Mobile Devices, Android. .

Edge Computing   **9**

Introduction to Edge Computing- The Cloud Computing analytics pipeline- : Geo-Distributed Computing-Edge Architectures- Algorithms for Sensor Networks- Edge Computing Applications

Challenges of Edge Computing   **9**

EdgeOSH: A Home Operating System for Internet of Everything-Firework: Data Analytics in Hybrid Cloud-Edge Environment, -Challenges and Opportunities in Edge Computing-Existing Edge Computing tools

Total Periods: 45

Text Book:

1. Asoke K. Talukder, Hasan Ahmad, Mobile Computing Technology- Application and Service Creation, McGraw Hill Education, 2/e.
2. Cao, Jie, Zhang, Quan, Shi, Weisong,"Edge Computing : A Primer",2018,ISBN 978-3-030-02082-8

References:

1. Jochen Schiller, "Mobile Communications", Pearson Education Asia, 2008.
2. Jonathan Rodriguez , "Fundamentals of 5G Mobile Networks", Wiley Publishers, 2015
3. https://www.springer.com/gp/book/9783030020828

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2									2	1	2	1	
CO2	2	2	2	1	1							2	1	2	2	
CO3	2	2	2									2	2	2	2	
CO4	1	2	2									2	1	1	1	
CO5	2	2	2	2								2	1	2	2	
CO6	2	2										2	2	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191CSEM	**MODELING AND SIMULATION**	**3**	**0**	**0**	**3**

Programme: B.E. Computer Science and Engineering **Sem:** - **Category:** **PE**

Prerequisites: NIL

Aim: The aim of this course is to understand the fundamental concepts of Network Simulation.

Course Outcomes: The Students will be able to

CO1: Recall the basics of network simulation.

CO2: Summarize the concepts of modeling and simulation for higher layer protocols.

CO3: Interpret the Pre Processing and Post Processing steps inns2simulation.

CO4: Examine the organization and components ofns3.

CO5: Estimate the various result analysis methods inns3simulation.

CO6: Illustrate the simple simulations of wired and wireless networks using ns3.

INTRODUCTION TO NETWORK SIMULATION **9**

Simulation of Computer Networks - Computer Networks and the Layering Concept - System Modeling - Basics of Computer Network Simulation - Time-Dependent Simulation - A Simulation Example: A Single-Channel Queuing System – Basics of Tcl/OTcl and AWK programming.

MODELING AND SIMULATION FOR HIGHER LAYER PROTOCOLS **9**

Physical Layer Modeling and Simulation-Medium Access Control Modeling and Simulation-Network Layer-Transport and Application Layers-Example of Higher Layer Modeling: Transport Layer Performance Analysis-Example of Higher Layer Modeling: Detailed Network Layer Modeling

PRE PROCESSING AND POST PROCESSING **9**

Traffic and Topology generation - Variable Tracing - Trace File Format – Packet Tracing – Packet Trace Format – Compilation of Simulation Results – Network visualization using nam – Xgraph - Case Studies: Simple-Simulations of wired and wireless networks.

SIMULATION USING NS3 **9**

Installation - Software Organization of ns3 - Structure of ns3 code - Events and Simulator – Object Model - Configuration and Attributes – Packets – Helpers – Node and Net Devices - Logging – Tracing – Data Collection –Statistical Framework

RESULT ANALYSIS IN NS3 **9**

Network visualization using Net Anim – Trace File Analysis – Tcp dump - Wireshark – Making plots using the Gnuplot class - Case Studies: Simple Simulations of wired and wireless networks

Total Periods: **45**

Text Book:

1. Teerawat Issariyakul and Ekram Hossain, "Introduction to Network Simulator NS2", Springer Science Business Media, LLC, New York, NY10013, USA, 2009.
2. Jack Burbank William Kasch Jon Ward, "An Introduction to Network Modeling and Simulation for the Practicing Engineer", John Wiley & Sons, 2011, ISBN: 978-0-470-46726-8.

References:

1. ns3 manual -https://www.nsnam.org/docs/manual/ns-3-manual.pdf
2. http://www.isi.edu/nsnam/ns/
4. https://www.nsnam.org/
5. https://www.nsnam.org/docs/tutorial/html/
6. https://www.nsnam.org/docs/tutorial/html/conceptual-overview.html
7. http://wing.nitk.ac.in/downloads/ns3-tutorials.htm
8. http://wing.nitk.ac.in/downloads/ns3-tutorials.html

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2									1	1			
CO2	2	2	2	2	1							1	1	1		
CO3	2	2	2	1	2							1	1			1
CO4	2	3	2	2	2							2	2	2		
CO5	2	2	3	2	2							2		2		1
CO6	3	2	2	3	3							2	3			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L T P C
191CSEN	**NATURAL LANGUAGE PROCESSING**	**3 0 0 3**

Programme: B.E. Computer Science and Engineering   **Sem:** - **Category:** PE

Prerequisites: 191CS51 – Theory of Computation

Aim: To describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes: The Students will be able to

CO1: Outline Natural Language Processing tasks in syntax, semantics, and pragmatics.
CO2: Explain Morphology and Part of Speech Tagging
CO3: Show how syntax parsing techniques can be used.
CO4: Explain the use of semantic analysis methods.
CO5: Relate a few applications of NLP.
CO6: Solve problems using systematic ways and learning independently.

INTRODUCTION   **9**

Human languages, models, ambiguity, processing paradigms; Phases in natural language processing, applications. Text representation in computers, encoding schemes. Linguistics resources- Introduction to corpus, elements in balanced corpus, PropBank, VerbNet etc. Resource management with XML, Management of linguistic data.

REGULAR EXPRESSION   **9**

Finite State Automata, word recognition, lexicon. Morphology, acquisition models, Finite State Transducer. N-grams, smoothing, entropy, HMM, ME, SVM, CRF.

SPEECH TAGGING   **9**

Stochastic POS tagging, HMM, Transformation based tagging (TBL), Handling of unknown words, named entities, multi word expressions. A survey on natural language grammars, lexeme, phonemes, phrases and idioms, word order, agreement, tense, aspect and mood and agreement, Context Free Grammar, spoken language syntax.

PARSING   **9**

Unification, probabilistic parsing, Tree Bank. Semantics- Meaning representation, semantic analysis, lexical semantics, Word Net Word Sense Disambiguation- Sectional restriction, machine learning approaches, dictionary-based approaches. Discourse- Reference resolution, constraints on co-reference, algorithm for pronoun resolution, text coherence, discourse structure.

APPLICATIONS OF NLP   **9**

Spell-checking, Summarization Information Retrieval-Vector space model, term weighting, homonymy, polysemy, synonymy, improving user queries. Machine Translation– Overview.

    Total Periods: 45

Text Book:
1. Daniel Jurafsky and James H Martin. Speech and Language Processing, Pearson Education, 2/e, 2009.

References:
1. James A., "Natural language Understanding", Pearson Education, 2/e, 1994.
2. Bharati A., Sangal R., Chaitanya V., "Natural language processing: a Paninian perspective", PHI, 2000
3. Siddiqui T., Tiwary U. S. Natural language processing and Information retrieval, OUP,2009
4. http://nptel.ac.in/

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2											1		2		
CO2	2	2										1	3			
CO3		2										1	2			
CO4	3	2										1		2		
CO5	2					2						1		2		
CO6	2											1			3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEO	NEURAL NETWORKS	L T P C
		3 0 0 3

Programme: B.E. Computer Science and Engineering   **Sem:** -   **Category:** PE
Prerequisites: 191CS62 – Deep Learning
Aim: To provide an idea about neural networks and its architectures.
Course Outcomes: The Students will be able to.
CO1: Explain the basics of neural networks
CO2: Define the artificial neuron models and learning strategies.
CO3: Classify the concepts of discrete and continuous algorithms
CO4: Summarize the multi layered feed forward networks and back-propagation algorithms.
CO5: Apply the general concept of associative memories.
CO6: Illustrate the architecture of hop field networks and neural networks applications.

INTRODUCTION TO NEURAL NETWORKS   **9**

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS   **9**

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.

SINGLE LAYER FEED FORWARD NETWORKS   **9**

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model.

MULTI- LAYER FEED FORWARD NETWORKS   **9**

Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

ASSOCIATIVE MEMORIES   **9**

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function.Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis. Neural network applications: Process identification, control, fault diagnosis.

Total Periods: 45

References:
1. Laurene Fausett, "Fundamentals of Neural Networks" , Pearson Education,2004..
2. Simon Haykin, "Neural Networks- A comprehensive foundation", PearsonEducation, 2003.
3. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networksusing MATLAB 6.0", TATA Mc Graw Hill, 2006.
4. S. Rajasekharan and G. A. Vijayalakshmi pai, "Neural Networks, Fuzzy logic,Genetic algorithms: synthesis and applications", PHI Publication, 2004.
5. Timothy J. Ross, "Fuzzy Logic With Engineering Applications", Tata McGraw-Hill Inc. 2000

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3											2	1	1		
CO2		1	2	1								2	2	2		1
CO3	3	2	2	2								2	3	3		2
CO4	1	3	2	2	3							2	3	3		2
CO5	2	2	1	2								2	3	3		
CO6	2	3	1	3	3							2	1	2		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEP	SEARCH ENGINE OPTIMIZATION MARKETING	L T P C
		3 0 0 3

Programme: B.E. Computer Science and Engineering   **Sem: - Category: PE**

Prerequisites: 191CS71 – Big Data Analytics

Aim: To use the basic knowledge of search engine and are aiming to become expert in search engine optimization. This course illuminates the role of social media and user data in search.

Course Outcomes: The Students will be able to

CO1:   Demonstrate the search engines and Rankingconcepts.
CO2:   Illustrate the various search engine plan for the implementation of historical progress
CO3:   Summarize the social media metrics for the document analysis.
CO4:   Recall the Essential factors for optimizing a Website for Search Engines.
CO5:   Analyze the performance of search engine by using SEO tools.
CO6:   Apply the online tools and resources to implement successful SEO campaigns.

INTRODUCTION ABOUT SEARCH ENGINE AND BASICS   **9**

The Mission of Search Engines - The Human Goals of Searching -Determining Searcher Intent: A Challenge for Search - How People Search - Understanding Search and Engine Results - Algorithm-Based Ranking Systems -The Knowledge Graph - Analyzing Ranking Factors - Using Advanced Search Techniques - Vertical Search Engines.

SEO PLANNING AND IMPLEMENTATION   **9**

Understanding Search Engine Traffic and Visitor Intent - Developing an SEO Plan Prior to Site Development - Advanced Methods for Planning and Evaluation - The Importance of Planning - Identifying the Site Development Process and Players - Identifying Current Server Statistics Software and Gaining Access - Determining Top Competitors - Assessing Historical Progress.

SOCIAL MEDIA AND USER DATA PLAY A ROLE IN SEARCH   **9**

Correlation Between Social Signals and Google Rankings - Does Google Use Google+ as a Ranking Signal? - Monitoring, Measuring, and Improving Social Media - User Engagement as a Measure of Search Quality - Document Analysis -Optimizing User Experience to Improve SEO.

MEASURING TRAFFIC AND METRICS IN SEO   **9**

Diagnosing the Cause of a Traffic Loss - Panda - Penguin – Penalties - Tracking Results and Measuring Success - Measuring Search Traffic - Tying SEO to Conversion and ROI - Competitive and Diagnostic Search Metrics - Key Performance Indicators for Long-Tail SEO.

FUTURE OF SEO AND ANALYSIS   **9**

SEO Research and Search Performance Analysis - Competitive Analysis - Using Search Engine–Supplied SEO Tools- The SEO Industry on the Web - The Ongoing Evolution of Search - More Searchable Content and Content Types - More Personalized, Localized, and User-Influenced Search - Increasing Importance of Local, Mobile, and Voice Search.

                                                              Total Periods: 45

Text Book:

1. Eric Enge, Stephan Spencer, and Jessie C. Stricchiola , **"**The Art of SEO Mastering Search Engine",O'Reilly Media Inc, 3/e, 2015.

References:

1. John Jantsch (Author), Phil Singleton, "SEO for Growth: The Ultimate Guide for Marketers, Web Designers &Entrepreneurs", Kindle Edition, 2016.

2. Jeremy Jacob, "SEO: Search Engine Optimization Complete Guide: How To Rank On The First Page Of Google in 2019", Kindle Edition, 2019.

3. Priya Kanwar, Varinder Tapria, "Search Engine Optimization", Kindle Edition, 2010.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1											2		
CO2	3	2		1												
CO3	1	1	2	1									3			
CO4	1	1	1									2			2	
CO5	2	2		1	3										3	
CO6	3	2	1	1	3							2				3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSEQ	SOCIAL WEB MINING	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering **Sem: -** **Category:** PE

Prerequisites: 191CS52 – Artificial Intelligence and Machine Learning

Aim: To focus extensively on building a better search engine crawler.

Course Outcomes: The Students will be able to

CO1: Recall the fundamental concepts of web mining

CO2: Classify the supervised and unsupervised learning algorithms

CO3: Demonstrate the models for information retrieval

CO4: Analyze the social network using different algorithms

CO5: Summarize the methods used for opinion mining

CO6: Explain the techniques of Web usage mining

INTRODUCTION TO WEB DATA MINING AND DATA MINING FOUNDATIONS 9

Introduction – World Wide Web (WWW), A Brief History of the Web and the Internet, Web Data Mining-Data Mining, Web Mining. Data Mining Foundations – Association Rules and Sequential Patterns – Basic Concepts of Association Rules, Apriori Algorithm- Frequent Itemset Generation, Association Rule Generation, Data Formats for Association Rule Mining, Mining with multiple minimum supports – Extended Model, Mining Algorithm, Rule Generation, Mining Class Association Rules, Basic Concepts of Sequential Patterns, Mining Sequential Patterns on GSP, Mining Sequential

SUPERVISED AND UNSUPERVISED LEARNING 9

Supervised Learning – Basic Concepts, Decision Tree Induction – Learning Algorithm, Impurity Function, Handling of Continuous Attributes, Classifier Evaluation, Rule Induction – Sequential Covering, Rule Learning, Classification Based on Associations, Naïve Bayesian Classification, Naïve Bayesian Text Classification – Probabilistic Framework, Naïve Bayesian Model.

Unsupervised Learning – Basic Concepts , K-means Clustering – K-means Algorithm, Representation of Clusters, Hierarchical Clustering – Single link method, Complete link Method, Average link method, Strength and Weakness.

INFORMATION RETRIEVAL AND WEB SEARCH 9

Basic Concepts of Information Retrieval, Information Retrieval Methods – Boolean Model, Vector Space Model and Statistical Language Model, Relevance Feedback, Evaluation Measures, Text and Web Page Preprocessing – Stopword Removal, Stemming, Web Page Preprocessing, Duplicate Detection, Inverted Index and Its Compression – Inverted Index, Search using Inverted Index, Index Construction, Index Compression, Latent Semantic Indexing – Singular Value Decomposition, Query and Retrieval, Web Search, Meta Search, Web Spamming.

LINK ANALYSIS AND WEB CRAWLING 9

Link Analysis – Social Network Analysis, Co-Citation and Bibliographic Coupling, Page Rank Algorithm, HITS Algorithm, Community Discovery-Problem Definition, Bipartite Core Communities, Maximum Flow Communities, Email Communities. **Web Crawling** – A Basic Crawler Algorithm- Breadth First Crawlers, Preferential Crawlers, Implementation Issues – Fetching, Parsing, Stopword Removal, Link Extraction, Spider Traps, Page Repository, Universal Crawlers, Focused Crawlers, Topical Crawlers, Evaluation, Crawler Ethics and Conflicts.

OPINION MINING AND WEB USAGE MINING 9

Opinion Mining – Sentiment Classification – Classification based on Sentiment Phrases, Classification Using Text Classification Methods, Feature based Opinion Mining and Summarization – Problem Definition, Object feature extraction, Feature Extraction from Pros and Cons of Format1, Feature Extraction from Reviews of Format 2 and 3, Comparative Sentence and Relation Mining, Opinion Search and Opinion Spam. **Web Usage Mining** – Data Collection and Preprocessing- Sources and Types of Data, Key Elements of Web usage Data Preprocessing, Data Modeling for Web Usage Mining, Discovery and Analysis of Web usage Patterns -Session and Visitor Analysis, Cluster Analysis and Visitor Segmentation, Association and Correlation Analysis, Analysis of Sequential and Navigation Patterns.

Total Periods: 45

Text Book:

1. Bing Liu, "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data", 2/e, Springer Publications, 2011.

References:
1. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", 3/e, Elsevier Publications, 2011.
2. Anthony Scime, "Web Mining: Applications and Techniques", IGI Publishing, 2004.
3. Soumen Chakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data", Morgan Kaufmann, 2002

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1									2	2			
CO2	3	2	1	1	3							2	2	3		2
CO3	2	2	1									2	3		3	
CO4	3	2		1								2	2	2		
CO5	3	2		2								2		2		
CO6	3	3	1	1	3							2	3			3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191CSER	**SOFT COMPUTING ALGORITHMS**	**3**	**0**	**0**	**3**

Programme: B.E. Computer Science and Engineering **Sem: -** **Category: PE**

Prerequisites: NIL

Aim: To provide a way for understanding the concepts of ANN, Genetic Algorithms and Fuzzy systems and its applications.

Course Outcomes: The Students will be able to

CO1: Outline the fundamental of neural networks with related architectures.

CO2: Classify the concepts of fuzzy set theory and its methods.

CO3: Summarize the fundamentals concepts of genetic algorithms and its operations.

CO4: Recall the performance of various hybrid systems.

CO5: Develop various hybrid systems based on genetic algorithms and fuzzy logic.

CO6: Utilize various matlab toolboxes to implement neural networks, fuzzy logic and genetic algorithms.

NEURAL NETWORKS **9**

Fundamentals of Neural Networks - History Architectures - Learning methods - XOR problem - Delta rule - derivation - Back propagation - applications - parameters in BPN -Associative memory - Hetero associative - BAM-energy function - problems - applications of associative memories - ART1 - ART2 - applications of adaptive networks.

FUZZY LOGIC **9**

Fuzzy set theory - crisp sets - fuzzy sets - crisp relations - Fuzzy relations - Fuzzy systems -Crisp logic - predicate logic - fuzzy logic - fuzzy based systems - Defuzzification methods -applications.

GENETIC ALGORITHMS **9**

Fundamentals of GA - creation of off-springs - encoding - fitness function - reproduction –crossover insertion& deletion-mutation-bitwise operators–applications.

HYBRID SYSTEMS **9**

Hybrid systems - Neuro Fuzzy - Neuro Genetic - fuzzy Genetic hybrids - GA based Weight determination and applications - fuzzy BPN - simplified fuzzy ARTMAP.

PROGRAMMING USING MATLAB **9**

Using Neural Network toolbox - Using Fuzzy Logic toolbox - Using Genetic Algorithm & Directed Search toolbox.

Total Periods: 45

Text Book:

1. Rajasekaran.S and Vijayalakshmi Pai.G.A, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2011.

References:

1. Timothy J.Ross,''Fuzzy Logic with Engineering applications", John Wiley and Sons, 2010.
2. 2.Jang.J.S.R, Sun.C.T, Mizutani.E, "Neuro fuzzy and Soft Computing ", PHI Learning Pvt. Ltd., 2012.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.

Course Outcomes	**Programme Outcomes (POs)**												**Programme Specific Outcomes (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3		2	2								1		3		2
CO2	3	2		2								1	2	1		
CO3	3		2									1		3	1	
CO4	3		2									1	3		2	1
CO5	3	2										1	3	2		1
CO6	3		2		2							1	3	2	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CSES	SYSTEM SOFTWARE	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem:** -   **Category:** PE

Prerequisites: 191CS51 – Theory of Computation

Aim: To gain the knowledge of the system software and able to know the design and implementation a simple assembler and compiler.

Course Outcomes: The Students will be able to

CO1: Explain the relationship between system software and machine architecture.

CO2: Summarize the machine dependent and independent assembler features

CO3: Make use of compiler construction tools.

CO4: Apply the code generation algorithms to get the machine code for the optimized code.

CO5: Elaborate the optimization techniques to have a better code for code generation

CO6: Outline the concepts of register allocation and assignment.

INTRODUCTION   **9**

System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and

ASSEMBLERS   **9**

Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass and Multi pass assemblers.

INTRODUCTION TO COMPILING AND SYNTAX ANALYSIS   **9**

Compilers – Phases of a compiler – Cousins of the Compiler – Compiler construction tools Lexical Analysis – Role of Lexical Analyzer – Specification and recognition of Tokens. Syntax Analysis – The role of the parser – Context-free grammars – Writing a grammar – Top down parsing – Bottom-up Parsing – LR parsers – Constructing an SLR(1) parsing table

INTERMEDIATE CODE GENERATION AND CODE OPTIMIZATION   **9**

Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – Procedure calls – Introduction to code optimization – Principal Sources of Optimization – Optimization of basic Blocks – loops in flow graphs – Peephole optimization – Introduction to Global Data Flow Analysis.

CODE GENERATION   **9**

Issues in the design of a code generator – The target machine – Run-time storage management – Basic blocks and flow graphs – Next-use information – A simple code generator – Register allocation and assignment – The DAG representation of basic blocks – Generating code from DAGs.

                                                                 Total Periods: 45

Text Book:

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", Pearson Education Asia, 2003.
2. K. Muneeswaran, "Compiler Design", Oxford University Press, 2013.

References:

1. Allen I. Holub "Compiler Design in C", Prentice Hall of India, 2003.
2. C.N.Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003.
3. J.P. Bennet, "Introduction to Compiler Techniques", 2/e, TMGH, 2003.
4. John J. Donovan "System Programming", Tata McGraw-Hill, 2000.
5. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1		2							2		2		
CO2	2	2	1		1							2				
CO3	2	2	2	1	3							2	3			
CO4	3	3	1	1								2			2	
CO5	2	2	1	2								2			3	
CO6	3	3	3	1	3							2				3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC72	DIGITAL IMAGE PROCESSING (Common to CSE & ECE)	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering / B.E. Electronics and Communication Engineering   **Sem:** -   **Category:** PE / PC

Prerequisites: NIL

Aim: To analyze digital image fundamentals and familiar with image compression and segmentation techniques

Course Outcomes: The Students will be able to

CO1: Elaborate the basic concepts of sampling and quantization.
CO2: Apply the different types of image transforms and analyze its properties.
CO3: Analyze the different techniques employed for the enhancement of images.
CO4: Evaluate the methodologies for image segmentation and restoration
CO5: Analyze compression techniques and the standards.
CO6: Examine different feature extraction techniques for image analysis and recognition.

DIGITAL IMAGE FUNDAMENTALS   **9**

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

IMAGE ENHANCEMENT   **9**

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering – Smoothing and Sharpening Spatial Filtering – **Frequency Domain:** Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

IMAGE RESTORATION AND SEGMENTATION   **9**

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation-Morphological processing- erosion and dilation - Segmentation by morphological watersheds.

WAVELETS AND IMAGE COMPRESSION   **9**

Wavelets – Subband coding - Multiresolution expansions - Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding –Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

IMAGE REPRESENTATION AND RECOGNITION   **9**

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

TOTAL PERIODS   **45**

TEXT BOOKS

1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Pearson Education, 3/e, 2010.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.

REFERENCES

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing using MATLAB", Tata Mc Graw Hill Pvt. Ltd., 3/e, 2011.
2. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
3. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", PHILearning Pvt. Ltd., 1/e, 2011.
4. http://eeweb.poly.edu/~onur/lectures/lectures.html.
5. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3			3	3					2		2	2	2	3	2
CO2	2			3						2		2	2		3	2
CO3	2			3	3								2		3	2
CO4	3			3	3							2			3	2
CO5	3			3	2								2		3	2
CO6	3			3	3							3			3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	T	P	C
191OE1A	**GREEN COMPUTING**	**3**	**0**	**0**	**3**

Programme: B.E. Computer Science and Engineering   **Sem:** -   **Category:** **OE**
Prerequisites: NIL
Aim: To understand all basic concepts in Green Computing.
Course Outcomes: The Students will be able to
CO1: Recall the basic knowledge of Green computing fundamentals
CO2: Illustrate the Architecture , design and development model in green computing
CO3: Demonstrate the telecommuting, data center and grid framework.
CO4: Analyze green compliance Protocols, Standards, and Audits.
CO5: Experiment with various green computing Case Study Scenarios.
CO6: Apply the concepts of ERBS.

FUNDAMENTALS   **9**
Green IT Fundamentals: Business, IT, and the Environment - Green computing: carbon foot print, scoop on power - Green IT Strategies: Drivers, Dimensions, and Goals - Environmentally Responsible Business: Policies, Practices, and Metrics.

GREEN ASSETS AND MODELING   **9**
Green Assets: Buildings, Data Centers, Networks, and Devices - Green Business Process Management: Modeling, Optimization, and Collaboration - Green Enterprise Architecture - Environmental Intelligence - Green Supply Chains - Green Information Systems: Design and Development Models.

GRID FRAMEWORK   **9**
Virtualizing of IT systems - Role of electric utilities, Telecommuting, teleconferencing and teleporting - Materials recycling - Best ways for Green PC - Green Data center - Green Grid framework.

GREEN COMPLIANCE   **9**
Socio-cultural aspects of Green IT - Green Enterprise Transformation Roadmap - Green Compliance: Protocols, Standards, and Audits - Emergent Carbon Issues: Technologies and Future.

CASE STUDIES   **9**
The Environmentally Responsible Business Strategies (ERBS) - Case Study Scenarios for Trial Runs - Case Studies - Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

    Total Periods: 45

Text Books:
1. Bhuvan Unhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2011
2. Woody Leonhard, Katherrine Murray, "Green Home computing for dummies", August 2009.

References:
1. Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center: steps for the Journey", Shoff/IBM rebook, 2011.
2. John Lamb, "The Greening of IT", Pearson Education, 2009.
3. Jason Harris, "Green Computing and Green IT- Best Practices on regulations &industry", Lulu.com, 2008.
4. Carl speshocky, "Empowering Green Initiatives with IT", John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), "Green computing: Large Scale energy efficiency", CRC Press, 2012.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3						2					2				
CO2			3		2		2					2	3	3		
CO3				1	2		2					2				2
CO4	1	3	1				2					2		2		
CO5		2		3	3		2					2	2			3
CO6	2	1	2		2		2					2	1	1	3	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191OE1B	JAVA SCRIPTS	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem:**   -   **Category:**   OE

Prerequisites: NIL

Aim: To offer an overview of all JavaScript basics, including HTML for building web pages.

Course Outcomes: The Students will be able to

CO1: Recall the concepts of basic JavaScript.

CO2: Illustrate the looping statements and functions in JavaScripts.

CO3: Summarize the advance java script concepts.

CO4: Construct various applications using canvas tool.

CO5: Develop game applications andsetup.

CO6: Build various java script oriented applications anddevelopment.

FUNDAMENTALS   **9**

JavaScript, Data types and Variables - Variables, Strings, Booleans, Arrays, Objects, Basics of HTML - Tags and Elements, HTML Hierarchy.

FUNCTIONS AND LOOPS   **9**

Anatomy of a Function, Function Creation, Calling Function, Passing Arguments into Functions, Conditionals, Loops, Programming Challenges for Functions and Loops,

ADVANCED JAVASCRIPT   **9**

DOM and jQuery, Interactive Programming, Mouse Events, Buried Treasure - Creating the Web Page with HTML, Picking a Random Treasure Location, Click Handler, Object Oriented Programming - Adding Methods to Objects, Creating Objects Using Constructors, Customizing Objects with Prototypes.

CANVAS   **9**

Creating a Basic Canvas, Drawing on the Canvas, Changing the Drawing Color, Drawing Lines or Paths, Filling Paths, Drawing Arcs and Circles, Drawing Lots of Circles with Function, Animating the Size of a Square, Bouncing a Ball, Keyboard Events, Moving a Ball with the Keyboard.

GAME DEVELOPMENT   **9**

Making a Snake Game - The Structure of the Game, Game Setup, Drawing the Border, Displaying the Score, Ending the Game.

Total Periods: **45**

Text Book:

1. Nick Morgan, "Java Script for Kids", no starch press, San Francisco, 2015.

References:

1. Marijn Haverbeke, "Eloquent Java Script", no starch press, San Francisco, 2014.
2. David Sawyer McFarland, "Java Script & JQuery", 3/e, USA, 2014.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1											2	3		3	
CO2	2	2	1									2	2			3
CO3	2	1		2								2		2		
CO4	3	2	3	1								2		3	2	2
CO5	3			2								2	2			
CO6	3	2										2			3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191OE1C	**PYTHON FOUNDATIONS**	**L T P C**
		3 0 0 3

Programme: B.E. Computer Science and Engineering   **Sem:** - **Category:** OE
Prerequisites: NIL

Aim: To review the ideas of computer science, programming, and problem-solving ability in python.

Course Outcomes: The Students will be able to

CO1: Recall the fundamental knowledge in python programming.
CO2: Illustrate the concept of strings and functions in python programs.
CO3: Demonstrate tuples, dictionaries, files and exceptions in python.
CO4: Apply the file handling techniques and object implementation inPython.
CO5: Summarize the concepts of GUI and Database inpython
CO6: Develop problem solving skills and programmingcapability.

BASICS IN PYTHON   9

Python Overview - Comments - Identifiers - Keywords - Variables - Data types - Operators -Statement and Expressions - String Operations - Boolean Expressions - Control Statements -Iterations - Input from Keyboard.

STRINGS AND FUNCTIONS   9

Built-in Functions - Composition of Functions - User defined functions - Parameters and Arguments - Function calls - The return statement - Python recursive function - Anonymous Functions. Strings - String Traversal - Escape Characters - String formatting operator

LISTS AND DICTIONARIES   9

Lists-Traversing a List - Built-in list operators, methods-Tuples-Values - Operations - Functions - Dictionaries - Values - Update - Properties Operations

FILE MANAGEMENT AND OOPS CONCEPT   9

Files, Exceptions, Class, Objects in python - Built-in Class attributes - Inheritance - Method Overriding - Data Encapsulation - Data hiding.

GRAPHICS AND DATA SCIENCE   9

Graphics – Turtle - Canvas - Frame - Widgets - Creating Database - Tables - Data Frames from Excel - Data Visualization - Histogram - Creating pie chart – Line graph

Total Periods: 45

Text Books:
1. E.Balagurusamy, "Introduction to Computing and Problem Solving Using Python", McGraw-Hill Education (India) Private Ltd., 2016.
2. Allen B. Downey, ``Think Python: How to Think like a Computer Scientist'', Updated for Python 3, Shroff/O'Reilly Publishers, 2/e, 2016 (http://greenteapress.com/wp/think- python/).

References:
1. Dr.R.Nageswara Rao, "Core Python Programming", Dream tech Press, 2/e, 2018.
2. John V.Guttag, "Introduction to Computation and Programming using Python", 2/e, 2016.
3. John Paul Mueller, "Beginning Programming with python For Dummies", 2014.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2			3								2	2			
CO2	3		3									2	3	2		3
CO3		3										2		2		
CO4	2		2									2		3		
CO5		3	2		3							2		2		
CO6	2	2		2	3							2	3			2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191OE1D	WEB DEVELOPMENT USING PHP	L	T	P	C
		3	0	0	3

Programme: B.E. Computer Science and Engineering   **Sem:** -   **Category:** OE
Prerequisites: NIL
Aim: To study the concepts of PHP and develop web page using PHP.
Course Outcomes: The Students will be able to
CO1: Recall the basic PHPconcepts
CO2: Illustrate the various basic programmingconcept.
CO3: Develop a simple PHP web page program
CO4: Summarize the use of object orientedconcepts.
CO5: Explain the use of files and database storageconnectivity
CO6: Experiment with server-side programming concept on theweb.

INTRODUCTION   **9**
Essential PHP - Getting PHP - Creating and running first PHP page-mixing HTML and PHP-printing text and HTML - commands line PHP code - Working with variables - Operators -Flow controls - PHP using Loop statements - String functions.

ARRAYS AND FUNCTIONS   **9**
Handling arrays with loops - PHP array functions - Extracting Sorting arrays - Using PHP's array operator - Handling multidimensional arrays - Using multidimensional arrays - Other array functions. Creating functions in PHP-Passing functions, arrays, reference returning data from functions, arrays, lists, references.

WEB PAGE AND BROWSER HANDLING WITH PHP   **9**
Introducing variable scope in PHP - Accessing Global data - Working with static variables -PHP conditional functions - PHP variable functions - Nesting functions - Creating include files - Returning errors from functions - Setting up webpages to communicate with PHP -Handling text fields, text areas, checkboxes, radio buttons, list box, password control, hidden control, image maps, file uploads, buttons.

OBJECT ORIENTED PROGRAMMING WITH PHP   **9**
Creating classes and objects - Setting access to properties and Methods - Constructor and destructor - Overloading and overriding methods - Auto loading classes - Static methods -Static members and inheritance - Creating classes and interfaces - comparing object - using final keyword

FILE HANDLING AND DATABASES.   **9**
Opening files using fopen-Closing a file-Parsing Files-getting, setting, copying and deleting files - Accessing the Database with PHP - Updating Databases - Inserting new data items into a database - Deleting records - Creating new table and databases - sorting a data.

           Total Periods: 45

Text Books:
2. Steven Holzner, "The Complete Reference PHP", Tata McGraw Hill Education, 2008
References:
3. Larry Ullman, "PHP for the WEB: Visual Quick start Guide", Peachpit Press, 5/e, 2016.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1											2	3			
CO2	2	2	2									2		3		2
CO3	2	1	1									2	2		2	
CO4	3	2										2		2		
CO5	3			3								2	2			2
CO6	3	3		3								2		3		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191BAEA	ENGINEERING ECONOMICS AND ACCOUNTING	L	T	P	C
		3	0	0	3

Programme: B.E. / B.Tech   **Sem:** --   **Category:**   HS

Prerequisites: NIL

Aim: To enable the students and provide an analytical idea about economics and accounting practices.

Course Outcomes: The students will be able to

CO1: Evaluate the economic theories, cost concepts and major economic problems

CO2: Gain the knowledge about Demand, Supply and its types.

CO3: Describe the concept of theory of production

CO4: Determine the recent pricing methods in market and prepare internal rate of return, payback period, net present value for project selection

CO5: Understand accounting systems and analyze financial statements using ratio analysis.

CO6: Provide an analytical idea about financial feasibility.

INTRODUCTION TO ECONOMICS & DEMAND   **9**

Managerial Economics - Relationship with other disciplines - Firms: Types, objectives and goals - Managerial decisions - Decision analysis. Demand - Types of demand - Determinants of demand - Demand function - Demand elasticity - Demand forecasting.

SUPPLY, PRODUCTION AND COST CONCEPTS   **9**

Supply - Determinants of supply - Supply function - Supply elasticity. **Production function** - Introduction - Production Process & Function - One Variable and Two Variable Inputs - Isoquants - Returns to scale. **Cost Concepts** - Cost function – Types of Cost - Determinants of cost - Short run and Long run cost curves - Cost Output Decision - Estimation of Cost.

PRICING AND CAPITAL BUDGETING   **9**

Pricing - Determinants of Price - Pricing under different objectives and different market structures - Price discrimination - Pricing methods in practice. **Capital Budgeting -** Investments - Risks and return evaluation of investment decision - Average rate of return - Payback Period - Net Present Value - Internal rate of return.

FINANCIAL ACCOUNTING   **9**

Financial Accounting - Trail Balance, Balance sheet and related concepts: Trading Account, Profit & Loss Statement and related concepts - Analysis & Interpretation of financial statements - Financial Ratio Analysis.

COST ACCOUNTING   **9**

Cost Accounting - Types of costing - traditional costing approach - activity based costing - full cost pricing - marginal cost pricing - going rate pricing - bid pricing - feasibility reports - technical, economic and financial feasibility.

                                        Total Periods: **45**

Text Books:

1. McGuigan, Moyer and Harris, "Managerial Economics; Applications, Strategy and Tactics", Cengage Learning, 13/e, 2013.
2. Prasanna Chandra. "Fundamentals of Financial Management", Tata McGraw Hill Publishing Ltd., 8/e, 2011.

References:

1. Paresh Shah, "Basic Financial Accounting for Management", Oxford University Press, New Delhi, 2007.
2. Sasmitha Mishra, 'Engineering Economics and Costing', PHI Learning, 2/e, 2010.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		1				3					3		3			
CO2	1										3	2				3
CO3				2							3					
CO4											3					
CO5		2									3			2	3	
CO6		2									3	1				

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191BAEB	**ENTREPRENEURSHIP**	**3**	**0**	**0**	**3**

Programme: B.E. / B.Tech   **Sem: --   Category: HS**

Prerequisites: NIL

Aim: To develop and strengthen entrepreneurial quality and motivation in students and impart basic entrepreneurial skills and understandings to run a business efficiently and effectively.

Course Outcomes: The students will be able to

CO1: Gain knowledge about the idéologies of entrepreneur.

CO2: Demonstrate a solid fundamental knowledge of entrepreneur and their successful characteristics within the broad field of entrepreneurism.

CO3: Learn to how prepare the feasible business plan and project reports for initiating businesses.

CO4: Trace out the ways to get financing for starting up the business and taxation issues.

CO5: Describe the ways of sickness in business and its turnout initiatives by the Government policies.

CO6: Develop and strengthen entrepreneurial quality and motivation in students and impart basic entrepreneurial skills

ENTREPRENEURSHIP   **9**

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth. Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager.

MOTIVATION   **9**

Attributes and Characteristics of a successful Entrepreneur, Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.-women Entrepreneurs.

BUSINESS PLAN PREPARATION   **9**

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

FINANCING AND ACCOUNTING   **9**

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

SUPPORT TO ENTREPRENEURS   **9**

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

Total Periods: 45

Text Books:

1. Hisrich, "Entrepreneurship", 9/e, Tata McGraw Hill, New Delhi, 2014.
2. S. S. Khanka, "Entrepreneurial Development", S.Chand and Co. Ltd., New Delhi, (Revised Edition), 2013.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2					3			3		3	3	1			
CO2	2					3			2		2	2			2	
CO3	2	3	3	3							1				3	
CO4								1				1				
CO5											2					
CO6	1								3	1	2	1			2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191BAEC	ESSENTIALS OF MANAGEMENT	L	T	P	C
		3	0	0	3

Programme: B.E. / B.Tech **Sem:** -- **Category:** HS

Prerequisites: NIL

Aim: To study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

Course Outcomes: The students will be able to

CO1: Demonstrate knowledge of managerial functions, types of organizations, managers, and managerial roles and skills

CO2: Discuss and apply the planning, organizing and control processes.

CO3: Analyze organizational structure, and organizational control and culture.

CO4: Adapt motivation and leadership qualities and effective communicate through both oral and written presentations.

CO5: Conduct research and analyze information by using both human and technological resources.

CO6: Study the control management system and process.

INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

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

PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

ORGANISING 9

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

DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

Total Periods: 45

Text Books:

1. Harold Koontz, Heinz Weihrich and Mark V Cannice, 'Management - A global & Entrepreneurial Perspective', Tata McGraw Hill, 12/e, 2014.
2. James A.F. Stoner, R. Edward Freeman, Daniel R. Gilbert Jr., 'Management ', Prentice-Hall of India, 6/e, 2012.

References:

1. JAF Stoner, Freeman R.E, Daniel R Gilbert,"Management", Pearson Education, 6/e, 2004.
2. Robert Kreitner, Mamata Mohapatra, "Management", Biztantra, 2008.
3. Stephen A. Robbins, David A. Decenzo, Mary Coulter, "Fundamentals of Management", Pearson Education, 7/e, 2011.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2								3		3	1		3	3	
CO2									3		3					
CO3						2		2							1	
CO4									1	3					1	
CO5		3		3	3						2			2		
CO6	1				1						3					2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

		L	**T**	**P**	**C**
191BAED	**INTELLECTUAL PROPERTY RIGHTS**	**3**	**0**	**0**	**3**

Programme: B.E. / B.Tech   **Sem:** --   **Category:** HS

Prerequisites: NIL

Aim: To provide an idea about IPR, registration and its enforcement.

Course Outcomes: The students will be able to

CO1: Gain the knowledge of Intellectual property rights in professional society.

CO2: Identify the process that shapes the registration of various categories of Intellectual Property Rights.

CO3: Enhance familiarity with agreements, and legislations of act relating to IPR.

CO4: Become aware of digital products and respective legislations.

CO5: Increase the ability of individuals to recognize and enforcing the legislations.

CO6: Provide an idea about IPR, registration and its enforcement.

INTRODUCTION   **9**

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

REGISTRATION OF IPRs   **9**

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad.

AGREEMENTS AND LEGISLATIONS   **9**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

DIGITAL PRODUCTS AND LAW   **9**

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

ENFORCEMENT OF IPRs   **9**

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

                                         Total Periods: **45**

Text Books:

1. S.V. Satarkar, 'Intellectual Property Rights and Copy Rights', ESS Publications, New Delhi, 2002.
2. Vinod V. Sople, 'Managing Intellectual Property', PHI Learning Pvt. Ltd, 4/e, 2014.

References:

1. Deborah E. Bouchoux, 'Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets', Cengage Learning, 3/e, 2012.
2. Prabuddha Ganguli, 'Intellectual Property Rights: Unleashing the Knowledge Economy', McGraw Hill Education, 2011.
3. Derek Bosworth and Elizabeth Webster, 'The Management of Intellectual Property', Edward Elgar Publishing Ltd., 2013.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2					3		3			3	2			2	3
CO2					1	2					2					2
CO3						2		2				2				
CO4	1				2	2				1						2
CO5											3			1		
CO6						2		1	2		2					2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191BAEE	PROFESSIONAL ETHICS IN ENGINEERING	L	T	P	C
		3	0	0	3

Programme: B.E. / B.Tech **Sem:** -- **Category:** HS

Prerequisites: NIL

Aim: To enable the students to create an awareness on Engineering Ethics and Human Values.

Course Outcomes: The students will be able to

CO1: Gain the knowledge of human values in professional society.

CO2: Identify the core values that shape the ethical behavior of an engineer.

CO3: Enhance familiarity with codes of conduct, and responsibilities of engineers in professional society to ensure balanced outlook

CO4: Become aware of ethical concerns and conflicts.

CO5: Increase the ability to recognize and resolve ethical dilemmas.

CO6: Instill moral and social ethics and loyalty and to appreciate the rights of others.

HUMAN VALUES 9

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

ENGINEERING ETHICS 9

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

GLOBAL ISSUES 9

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

Total Periods: 45

Text Books:
1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2012.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Ray James, Elian Englehardt Wadsworth publishing co, 6/e, 2013.

References:
1. Charles D Fleddermann, 'Engineering Ethics', Prentice Hall, New Mexico, 2012.
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2013.
3. Edmund G Seebauer and Robert L Barry, 'Fundamentals of Ethics for Scientists and Engineers', Oxford University Press, 2013.
4. David Erman & Michele Shauf, 'Computers, Ethics and Society, Oxford University Press, 2012.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2					3			3		3	3	1			
CO2	2					3		2	2		2	2			2	
CO3	2	3	3	3							1				3	
CO4								1				1				
CO5								2			2					
CO6	1							2	3	1	2	1			2	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191BAEF	WOMEN STUDIES AND WOMEN EMPOWERMENT	L	T	P	C
		3	0	0	3

Programme: B.E. / B.Tech   **Sem:** --   **Category:**   HS

Prerequisites: NIL

Aim: To study the legal provisions for women and women's access to justice and familiarize the students with the notion of gender and its operation in society.

Course Outcomes: The students will be able to

CO1: Gain knowledge in laws related to women's, rights protection.

CO2: Assist the students to look at stereotypical representation of women in the media and equip them to critique them.

CO3: Familiarize students with the specific cultural contexts of women in India.

CO4: Study the legal provisions for women and women's access to justice.

CO5: Familiarize with the notion of gender and its operation in society.

CO6: Be aware about work place related issues and discriminatory wages.

WOMEN'S STUDIES: AN INTRODUCTION   **9**

Women's Studies -Definition, Scope and Controversies. Basic concepts of Women's Studies- Women's Studies perspectives- Gender: Perspectives-Gender sensitive approach- Gender and sex- Biological determinism- stereotyping- Socialization- Patriarchy- Devaluation- Marginalization- Silencing- Male Gaze- Power politics- Gynocriticism- Gender mainstreaming- Gender and work- Invisibility-Glass ceiling. Women's Studies in India.

LEGISLATION AND GENDER JUSTICE   **9**

Women's rights as human rights, UN Conventions, Convention on the Elimination of all forms of Discrimination against Women (CEDAW), Millennium Development Goals (MDGs) - Women's Rights in the Indian Constitution, Fundamental Rights, Directive Principles- Protective legislation for women in the Indian constitution- Anti dowry, SITA, PNDT, and Prevention Sexual Harassment at Workplace (Visaka case), Domestic violence (Prevention) Act- Women's Rights to property, Uniform Civil Code, Property rights according to religions background Muslim, Christian.

FEMINIST THEORIES   **9**

Early feminist thinkers- J.S Mill, Mary Wollstonecraft - Women's Movements before and during the world war.- Recent trends in feminist thinking- Masculinities, Eco-feminism, queer theory, transgender politics, Cyber feminism, Post-colonial - Different Schools of feminist through in the Indian contest- National and regional feminist thoughts.

GENDER AND MASS MEDIA   **9**

Definition of gender, difference between sex and gender- Feminist terminology, stereotyping, patriarchy, silencing, margin alisation - Male Gaze, Feminist film criticism, thematic and semiotic analysis- Various forms of mass media. Print media, radio, visual, new media- internet, feminism and cyber space, texting, SMS and cell phone usage - Influence of media in society, patriarchy - in operation, use of feminist methods for - critiquing media representation, practice sessions.

WOMEN AND SOCIETY IN INDIA   **9**

Women's position from Vedic times to the present, women participation in India's independence movement - Social construction of gender and gender roles – Socialisation - Women in family- Women in family- feminization of poverty, violence against women, empowerment measures - Women and environment- eco-feminist movements, women and globalization- women's labour, discriminatory wages, changing working conditions and work place related issues.

                                             Total Periods: 45

Text Books:

1. Roberta Rosenberg, "Women's Studies: An Interdisciplinary Anthology", Peter Lang, 2001.
2. Jean Fox O'Barr, "Feminism in Action: Building Institutions and Community through Women's Studies", University of North Carolina Press, 1994.

References:

1. Jill Duerr Berrick, "Faces of Poverty: Portraits of Women and Children on Welfare", Oxford University Press, 1997.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1					3		3				2	1			
CO2		1				3				3						
CO3						3						2				
CO4						3						2				
CO5						3			2			2			2	
CO6						3			2			2			2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191MC01	DESIGN THINKING	L	T	P	C
		2	0	0	0

Programme: B.E., / B. Tech   **Sem:** -   **Category:** MC

Prerequisites: NIL

Aim: To impart knowledge on design thinking process for understanding complex designs and to provide design skills to analyze design thinking issues and apply the tools and techniques of design.

Course Outcomes: Students will be able to

CO1: Demonstrate knowledge of design thinking process

CO2: Recall design thinking techniques to design relevant products/services

CO3: Apply human centered design (HCD) methodology for product or service design.

CO4: Use ideation techniques for developing innovative products or services

CO5: Analyse the causes for the problems in the design of products or services

CO6: Perform the steps to gain practical knowledge of prototyping, testing and validation.

OVERVIEW OF DESIGN THINKING PROCESS   **6**

Introduction to design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, Understanding design thinking and its process model, Design thinking tools. Human-Centered Design (HCD) process - Empathize, Define, Ideate, Prototype and Test and Iterate or Empathize, Analyze, Solve and Test.

EMPATHIZE   **6**

Design thinking phases, How to emphatize, Role of empathy in design thinking, purpose of empathy maps, Things to be done prior to empathy mapping, creation of user personas, customer journey mapping, How might we questions

SOLVE / IDEATE   **6**

Silent brainstorming, metaphors for ideation, CREATE and What-If tool for ideation, introduction to TRIZ, Inventive principles and their applications

ANALYZE / DEFINE   **6**

Root cause analysis, conflict of interest, perspective analysis, big picture thinking through system operator, big picture thinking through function modeling.

TEST (PROTOTYPING AND VALIDATION)   **6**

Prototyping, Assumptions during the design thinking process, Validation in the market, best practices of presentation.

                   Total Periods   **30**

References

1. Dr. Bala Ramadurai, "Karmic Design Thinking", TRIZ Innovation India, 1/e, 2020.
2. Karl T. Ulrich, "Design Creation of Artifacts in Society", Trustees of the University of Pennsylvania Publisher, USA, 2011
3. Alma R. Hoffmann, "Sketching as Design Thinking", Taylor & Francis, UK, 2019
4. Michael Lewrick, Patrick Link and Larry Leifer, "The Design Thinking Playbook", Wiley, USA, 2018.

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1		2										3			
CO2			2										3			
CO3			2						2				3			
CO4				2	2	3	2							2		
CO5		3				3	2						2			
CO6	2		1	3												2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191MC02	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C
		2	0	0	0

Programme: B.E., / B. Tech   **Sem:** -   **Category:** MC

Prerequisites: NIL

Aim: To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

Course Outcomes: Students will be able to

CO1: Identify the concept of Traditional knowledge and its importance

CO2: Explain the need and importance of protecting traditional knowledge.

CO3: Illustrate the various enactments related to the protection of traditional knowledge.

CO4: Interpret the concepts of Intellectual property to protect the traditional knowledge.

CO5: Identify the importance of conservation and sustainable development of environment

CO6: Explain the importance of Traditional knowledge in Agriculture and Medicine.

INTRODUCTION TO TRADITIONAL KNOWLEDGE   **6**

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

PROTECTION OF TRADITIONAL KNOWLEDGE   **6**

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

LEGAL FRAME WORK AND TRADITIONAL KNOWLEDGE   **6**

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);
The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY   **6**

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS   **6**

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

         Total Periods   **30**

References
1. Amit Jha, "Traditional Knowledge System in India", 2009.
2. Basanta Kumar Mohanta, Vipin Kumar Singh, "Traditional Knowledge System and Technology in India", Pratibha Prakashan 2012.
3. Amit Jha, "Traditional Knowledge System in India", Atlantic publishers, 2002
4. Kapil Kapoor, Michel Danino, "Knowledge Traditions and Practices of India", 2012

E-Resources:
1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1					2		2								2
CO2						2		3								2
CO3								2								2
CO4					2										2	
CO5							3						1			
CO6						3		2						3		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191MC03	INDIAN CONSTITUTION	L	T	P	C
		2	0	0	0

Programme: B.E., / B. Tech   **Sem:** -   **Category:** MC

Prerequisites: NIL

Aim: To understand the importance of Indian constitution, Administration, Concept and Development of Human Rights, election commission.

Course Outcomes: Students will be able to

CO1: Know the sources, features and principles of Indian Constitution.

CO2: Learn about Union Government and its administration.

CO3: Learn about State government and its administration.

CO4: Get acquainted with Local administration and Panchayat Raj

CO5: Be aware of basic concepts and developments of Human Rights.

CO6: Gain knowledge on roles and functioning of Election Commission.

INTRODUCTION TO INDIAN CONSTITUTION   **6**

Constitution' meaning of the term, Indian Constitution- Sources and constitutional history, Features- Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNION GOVERNMENT AND STATE GOVERNMENT   **6**

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

State Government and its Administration

Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

LOCAL ADMINISTRATION AND PACHAYAT RAJ   **6**

Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,

Panchayat raj: Introduction, PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

CONCEPT AND DEVELOPMENT OF HUMAN RIGHTS   **6**

Meaning Scope and Development of Human Rights, United Nations and Human Rights – UNHCR, UDHR 1948, ICCPR 1996 and ICESCR 1966, Human Rights in India: Protection of Human Rights Act, 1993 - (NHRC and SHRC), First, Second and Third Generation Human Rights, Judicial Activism and Human Rights.

ELECTION COMMISSION   **6**

Election Commission- Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

                                           Total Periods   30

References

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4E, 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution
9. Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd. New Delhi
10. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil

Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-Resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1			1			3		1						2		
CO2						3		2						2		
CO3						2		2						2		
CO4								1						3		
CO5			1					3								1
CO6						2		3								1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191MC04	UNIVERSAL HUMAN VALUES	L	T	P	C
		2	0	0	0

Programme: B.E., / B. Tech   **Sem:** -   **Category:** MC

Prerequisites: NIL

Aim: To facilitate the competence to understand the harmony in nature/existence and participation of human being in the nature/existence.

Course Outcomes: Students will be able to

CO1: Ensure the clarity about human aspirations, goal, activities and purpose of life.

CO2: Develop the understanding of human tradition and its various components.

CO3: Critically evaluate their preconditioning and present beliefs.

CO4: Begin with, and then to continue within the student leading to continuous self- evolution.

CO5: Verify the truth or reality in their own right, based on their Natural Acceptance and subsequent Experiential Validation.

CO6: Set do's and don'ts related to values.

INTRODUCTION   6

The basic human aspirations and their fulfillment through Right understanding and Resolution; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.

UNDERSTANDING HUMAN BEING AND ITS EXPANSION   6

The domain of right understanding starts from understanding the human being (the knower, the experience and the doer); and extends up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).

ACTIVITIES OF THE SELF   6

Understanding the human being comprehensively is the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Reasons for harmony/contradiction in the self.

UNDERSTANDING CO-EXISTENCE WITH OTHER ORDERS   6

The need and the process of inner evolution (through self-exploration, self-awareness and self-evaluation)- particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).

EXPANSION OF HARMONY FROM SELF TO ENTIRE EXISTENCE   6

Understanding different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavour viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from self to Nature and entire Existence.

Total Periods   30

References

1. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Sangal, G. P. Bagaria (2010), Excel Books, New Delhi [ISBN 978-8- 174-46781-2]
2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
3. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India
4. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA
5. Ishandi Nau Upnishad, Shankaracharya, Geeta press, Gorakhpur,
6. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
7. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1								1				2				
CO2					3			2						2		
CO3		2		2				3					1			
CO4												2				1
CO5				2									2			
CO6								2				1	3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191MC05	**YOGA**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**0**

Programme: B.E., / B. Tech   **Sem:** -   **Category:** MC

Prerequisites: NIL

Aim: To promote positive health, prevention of stress related health problems and rehabilitation through Yoga.

Course Outcomes: Students will be able to

CO1: Know about the history and evolution of Yoga**.**

CO2: Practice skills in Yoga for health.

CO3: Find out the habits to ensure mental and emotional balance.

CO4: Demonstrate basic skills associated with yoga activities including strength and flexibility, balance and coordination.

CO5: Demonstrate the ability to perform yoga movements in various combination and forms.

CO6: Demonstrate the ability to create and present various yoga sequences.

FOUNDATIONS OF YOGA   **5**

Origin of Yoga, History and Development of Yoga; Etymology and Definitions, Misconceptions, Aim and Objectives of Yoga, True Nature and Principles of Yoga.

YOUTH AND YOGA   **5**

Youth and yoga- yoga as a tool for healthy lifestyle, Yoga as a preventive, promotive and curative method. Pranayama and Different Yoga traditions and their impacts.

ROLE OF YOGA IN PREVENTIVE HEALTH CARE   **5**

Role of Yoga in preventive health care – Yoga as a way of life, Heyam dukham anagatam; Potential causes of Ill-health: Tapatrayas and Kleshas, Physical and Physiological manifestation of Disease: Vyadhi, Alasya, Angamejayatva and Ssvasa-prashvasa.

METHODS OF TEACHING YOGA   **5**

Teaching and Learning: Concepts and Relationship between the two; Principles of Teaching: Levels and Phases of Teaching, Quality of perfect Yoga Guru; Yogic levels of learning, Vidyarthi, Shishya, Mumukshu; Meaning and scope of Teaching methods, and factors influencing them; Sources of Teaching methods;

ASAN AND PRANAYAM   **10**

Asan and Pranayam:

- Various yog poses and their benefits for mind & body
- Regularization of breathing techniques and its effects
- Different Phases in Pranayama Pracice:
  - Puraka (Inhalation), Kumbhaka (Retension) and Recaka (Exhalation)
  - Breathing Ratio in Pranayama Practice
  - Application of Bandhas in Pranayama

                                                 Total Periods   **30**

References

1. Yogic Asanas for Group Tarining-Part-I", Janardan Swami Yogabhyasi Mandal, Nagpur.
2. Swami Vivekananda, "Rajayoga or conquering the Internal Nature" Advaita Ashrama Publication, Kolkata.
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Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1								3					2			
CO2						2										3
CO3								2					1			
CO4												1	1			
CO5					2			1				1	2			
CO6	2							1				2				2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)