Bharati Vidyapeeth

(Deemed to be University)

Pune, India

College of Engineering, Pune

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

Program Curriculum

(2021 Course)

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE

VISION OF UNIVERSITY:

Social Transformation Through Dynamic Education.

MISSION OF UNIVERSITY:

- To make available quality education in different areas of knowledge to the students as per their choice and inclination.
- To offer education to the students in a conducive ambience created by enriched infrastructure and academic facilities in its campuses.
- To bring education within the reach of rural, tribal and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities.
- To make available quality education to the students of rural, tribal, and other deprived sections of the population.

VISION OF THE INSTITUTE:

To be World Class Institute for Social Transformation Through Dynamic Education.

MISSION OF THE INSTITUTE:

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, creativity, research and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

VISION OF THE DEPARTMENT:

To impart quality education and produce high quality, creative and ethical engineers, instill professionalism, enhance student's problem-solving skills in the domain of Artificial Intelligence and Machine Learning (AI and ML).

MISSION OF THE DEPARTMENT:

1. To provide skill-based education to master the students in problem solving and analytical skills to enhance their niche expertise in the field AI and ML.
2. To educate the students with latest technologies to update their knowledge in the field of AI and ML.
3. To guide students in research on AI and ML, with aim of having an ethical impact on society by tackling societal grand challenges.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Graduates will be able to

1. To adapt, contribute and innovates ideas in the field of Artificial Intelligence and Machine Learning or productively engage in research.
2. To pursue higher studies in engineering or management.
3. Demonstrate technical skills, competency in AI and ML and promote collaborative learning and team work spirit through multi -disciplinary projects and diverse professional activities.
4. To accomplish sustainable progress in the emerging computing technologies through life-long learning.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

At the end of the program, Graduates will be able to

PSO 1: Design and develop intelligent automated systems applying mathematical, analytical, programming and operational skills to solve real world problems.

PSO 2: Apply machine learning techniques, software tools to conduct experiments, interpret data and to solve complex problems.

PSO 3: Implement engineering solutions for the benefit of society by the use of AI and ML.

Programme Outcomes (POs)

a) Apply the knowledge of mathematics, science, engineering fundamentals and principles of Artificial Intelligence & Machine Learning to solve complex problems.
b) Identify, formulate, review, analyse complex problems, interpret data and solve through conducting experiments.
c) Design safe, socio-economical and environment friendly solutions or systems for complex engineering problems.
d) Design experimentation and interpretation of data using research-based knowledge and methods to provide valid solution
e) Create, select, and apply appropriate techniques, and modern engineering tools
f) Apply reasoning informed by the contextual knowledge to assess professional, ethical, legal, security and social issues as well as responsibilities.
g) Demonstrate the knowledge about the need for sustainable development in context to the environment and society.
h) Apply ethical principles in engineering practices and commit to professional ethics.
i) Function effectively on multidisciplinary teams to accomplish the goal.
j) To communicate effectively verbally and in writing on complex engineering activities with a range of audiences.
k) Apply the knowledge and understanding of the engineering and management principles as a member and leader in a team to manage projects.
l) To recognize the need for lifelong learning and are expected to apply the techniques, skills, and modern engineering tools necessary for engineering practice and knowledge growth.

CORELATION BETWEEN GRADUATE ATTRIBUTES AND PROGRAMME OUTCOMES

Graduate Attributes/ Programme Outcomes	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Knowledge	✓											
Problem Analysis		✓										
Design/Development of solutions			✓									
Conduct Investigations of Complex Problems				✓								
Modern Tool Usage					✓							
The Engineer and Society						✓						
Environment and Sustainability							✓					
Ethics								✓				
Individual and teamwork									✓			
Communication										✓		
Project management and finance											✓	
Life-long learning												✓

DEFINITION OF CREDITS

Hour	Credit
1 Hour Lecture (L) per week	01 Credit
1 Hour Tutorial (T) per week	01 Credit
2 Hours Practical (P) per week	01 Credit
4 Hours Practical (P) per week	02 Credit

COURSE CODE AND DEFINITION

Course Code	Definitions
L	Lecture
P	Practical
T	Tutorial
UE	University Examination
TW	Term Work
OR	Oral
PR	Practical

BSC	Basic Science Course
ESC	Engineering Science Course
IA	Internal Assessment
CC	Core Course
LC	Laboratory Course
EC	Elective Course
VC	Vocational Course
INT	Internship
PROJ	Project
MOOC	Massive Open Online Course
SA	Social Activity

STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAMME

Sr. No.	Category	Breakup of Credits
1	Basic Science Course (BSC)	24
2	Engineering Science Course (ESC)	10
3	Core Course (CC)	134
4	Elective Course (EC)	10
5	Project (PROJ)	18
6	Internship (INT)	03
7	Vocational Course (VC)	08
8	Massive Open Online Course (MOOC)	06
9	Research Paper Publication (Research)	02
10	Social Activities (SA)	04
11	Laboratory Course (LC)	11
12	Mandatory Course (MC)	Non- Credit
TOTAL		**230**

DISTRIBUTION OF COURSE COMPONENTS

Sr. No.	Category	Number of Courses
1	Basic Science Course (BSC)	06
2	Engineering Science Course (ESC)	02
3	Core Course (CC)	29
4	Elective Course (EC)	02
5	Project (PROJ)	04
6	Internship (INT)	01
7	Vocational Course (VC)	04
8	Massive Open Online Course (MOOC)	03
9	Research Paper Publication (Research)	01
10	Social Activities (SA)	02
11	Laboratory Course (LC)	06
12	Mandatory Course (MC)	02
TOTAL		**62**

Program: B.TECH. Computer Science and Engineering (AI and ML) Semester – I CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P TW/OR/PR	T	Total
1		Mathematics for Computing-I	3	-	1	**60**	**40**	-	-	-	100	3	-	1	**4**
2		Physics for Computing Systems	3	2	-	**60**	**40**	25	-	-	125	3	1	-	**4**
3		Electrical Technology	4	2	-	**60**	**40**	25	-	-	125	4	1	-	**5**
4		Internet Programming	4	2	-	**60**	**40**	-	50	-	150	4	1	-	**5**
5		Programming and Problem Solving	4	4	-	**60**	**40**	-	-	75	175	4	2	-	**6**
6		Computer Systems Workshop Technology	-	2	-	**60**	**40**	-	-	75	75	-	1	-	**1**
	Total		**18**	**12**	**1**	**300**	**200**	**50**	**50**	**150**	**750**	**18**	**6**	**1**	**25**

Program: B.TECH. Computer Science and Engineering (AI and ML) Semester – II CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P TW/OR/PR	T	Total
1		Mathematics for Computing-II	3	-	1	60	40	-	-	-	100	3	-	1	**4**
2		Probability and Statistics	4	2	-	60	40	-	-	50	150	4	1	-	**5**
3		Organic and Electrochemistry	3	2	-	60	40	25	-	-	125	3	1	-	**4**
4		Digital Electronics	4	2	-	60	40	25	-	-	125	4	1	-	**5**
5		Object Oriented Programming	4	4	-	60	40	-	-	75	175	4	2	-	**6**
6		Server-Side Scripting Language	-	2	-	-	-	-	-	75	75	-	1	-	**1**
	Total		**18**	**12**	**1**	**300**	**200**	**50**	**-**	**200**	**750**	**18**	**6**	**1**	**25**

Program: B.TECH. Computer Science and Engineering (AI and ML) Semester – III CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P TW/OR/PR	T	Total
1		Discrete Mathematical Structures	3	2	1	60	40	-	50	-	150	3	1	1	**5**
2		Python Programming*****	3	4	-	60	40	-	-	75	175	3	2	-	**5**
3		Data Structures	4	4	-	60	40	-	-	75	175	4	2	-	**6**
4		Computer Organization and Microprocessor	4	2	-	60	40	-	50	-	150	4	1	-	**5**
5		Database Management Systems	4	2	-	60	40	-	-	50	150	4	1	-	**5**
6		Vocational Course-I	-	-	-	-	-	-	-	-	-	-	-	-	**2**
7		MOOC- I	-	-	-	-	-	-	-	-	-	-	-	-	**2**
8		Environmental Studies** (Mandatory Audit Course)	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total		**18**	**14**	**1**	**300**	**200**	**-**	**100**	**200**	**800**	**18**	**7**	**1**	**30**

Industry Taught Course -I** *(50 Marks Theory Examination)**

List of MOOCs and Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. Computer Science and Engineering (AI and ML) Semester – IV CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P TW/OR/PR	T	Total
1		Theory of Computation	3	-	1	60	40	-	-	-	100	3	-	1	**4**
2		Operating System	4	2	-	60	40	-	-	50	150	4	1	-	**5**
3		Algorithms Analysis and Design	4	2	-	60	40	-	-	75	175	4	1	-	**5**
4		Data Warehousing and Mining*****	3	4	-	60	40	-	-	50	150	3	2	-	**5**
5		Foundations of Artificial Intelligence	4	2	-	60	40	-	-	50	150	4	1	-	**5**
6		Computing Lab-I	-	4	-	-	-	-	-	75	75	-	2	-	**2**
7		Vocational Course-II	-	-	-	-	-	-	-	-	-	-	-	-	**2**
8		Social Activities - I	-	-	-	-	-	-	-	-	-	-	-	-	**2**
9		Disaster Management** (Mandatory Audit Course)	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total		**18**	**14**	**1**	**300**	**200**	**-**	**-**	**300**	**800**	**18**	**7**	**1**	**30**

Industry Taught Course -II** *(50 Marks Theory Examination)**

List of MOOCs and Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. Computer Science and Engineering (AI and ML) Semester – V CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P TW/OR/PR	T	Total
1		Machine Learning	3	2	-	60	40	-	-	50	150	3	1	-	**4**
2		Software Engineering*****	4	2	-	60	40	-	-	50	150	4	1	-	**5**
3		Internet of Things	3	2	-	60	40	-	50	-	150	3	1	-	**4**
4		Big Data Analytics	3	2	-	60	40	25	-	-	125	3	1	-	**4**
5		Compiler Construction	3	-	-	60	40	-	-	-	100	3	-	-	**3**
6		Computing Lab -II	-	4	-	-	-	-	-	75	75	-	2	-	**2**
7		Project -I Stage -I	-	2	-	-	-	-	100	-	100	-	4	-	**4**
8		Vocational Course-III	-	-	-	-	-	-	-	-	-	-	-	-	**2**
9		MOOC- II	-	-	-	-	-	-	-	-	-	-	-	-	**2**
	Total		**16**	**14**	**-**	**300**	**200**	**25**	**150**	**175**	**850**	**16**	**10**	**-**	**30**

***Industry Taught Course -III**

List of MOOCs and Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. Computer Science and Engineering (AI and ML) Semester – VI CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P TW/OR/PR	T	Total
1		Deep Learning	3	2	-	60	40	-	-	75	175	3	1	-	**4**
2		Computer Network	4	-	-	60	40	-	-	-	100	4	-	-	**4**
3		Robotic Process Automation*****	4	2	-	60	40	-	-	50	150	4	1	-	**5**
4		Soft Computing	3	-	-	60	40	-	-	-	100	3	-	-	**3**
5		Computing Lab - III	-	4	-	-	-	-	-	75	75	-	2	-	**2**
6		Quantitative Techniques, Communication and Values	2	2	-	60	40	-	-	-	100	3	-	-	**3**
7		Project -I Stage -II	-	2	-	-	-	-	100	-	100	-	4	-	**4**
8		Internship	-	-	-	-	-	-	50	-	50	-	-	-	**3**
9		Vocational Course-IV	-	-	-	-	-	-	-	-	-	-	-	-	**2**
	Total		**16**	**12**	**-**	**300**	**200**	**-**	**150**	**200**	**850**	**17**	**8**	**-**	**30**

***Industry Taught Course -IV**

List of MOOCs and Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. Computer Science and Engineering (AI and ML) Semester – VII CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P TW/OR/PR	T	Total
1		High Performance Parallel Computing	4	2	-	60	40	-	-	50	150	4	1	-	**5**
2		Natural Language Processing*****	4	2	-	60	40	-	-	50	150	4	1	-	**5**
3		Computer Vision	4	2	-	60	40	-	-	50	150	4	1	-	**5**
4		Elective –I	4	-	1	60	40	-	25	-	125	4	-	1	**5**
5		Computing Lab -IV	-	4	-	-	-	-	-	75	75	-	2	-	**2**
6		Project -II Stage -I	-	4	-	-	-	-	200	-	200	-	4	-	**4**
7		Research Paper Publication	-	-	-	-	-	-	-	-	-	-	-	-	**2**
8		MOOC- III	-		-	-	-	-	-	-	-	-	-	-	**2**
	Total		**16**	**14**	**1**	**240**	**160**	**-**	**225**	**225**	**850**	**16**	**9**	**1**	**30**

***Industry Taught Course -V**

	1	2	3	4
Elective-I	AI in Block Chain	AI for Cyber Security	Business Intelligence and Analytics	Bioinformatics

Program: B.TECH. Computer Science and Engineering (AI and ML) Semester – VIII CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P TW/OR/PR	T	Total
1		Data Visualization	4	2	-	60	40	-	-	50	150	4	1	-	**5**
2		Optimization Methods in Machine Learning	4	2	-	60	40	-	50	-	150	4	1	-	**5**
3		Reinforcement Learning*	4	2	-	60	40	-	-	50	150	4	1	-	**5**
4		Elective -II	4	-	1	60	40	-	25	-	125	4	-	1	**5**
5		Computing Lab -V	-	4	-	-	-	-	-	75	75	-	2	-	**2**
6		Project -II Stage -II	-	4	-	-	-	-	200	-	200	-	6	-	**6**
7		Social Activities - II	-	-	-	-	-	-	-	-	-	-	-	-	**2**
	Total		**16**	**14**	**1**	**240**	**160**	**-**	**275**	**175**	**850**	**16**	**11**	**1**	**30**

***Industry Taught Course -VI**

	1	2	3	4
Elective-II	Human Machine Interaction	Speech Recognition	Augmented Reality and Virtual Reality	Social Network Analytics

B.Tech. CSE (AI & ML)

Semester I Syllabus

Mathematics for Computing-I

TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
				Credits
Lecture:	03 Hours/Week	**End Semester Examination:** 60 Marks	**Theory:**	03
Tutorial:	01 Hours/Week	**Internal Assessment:** 40 Marks	**Tutorial:**	01
Total:	04 Hours/Week	**Total:** 100 Marks	**Total:**	04

Course Objectives:

1. Linear equations and its basis and dimension.
2. Linear mapping and its matrix representation.
3. Orthogonalization and diagonalization of matrices.

Prerequisite: The students should have knowledge of algebra of matrices and determinants.

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand to evaluate rank of matrix and its application in solving system of equations.
2. Understand to evaluate basis and dimension of matrix.
3. Understand to find kernel and image of linear transformation.
4. Understand to represent linear operator as matrix.
5. Understand the orthogonalization of inner product space.
6. Understand the method to find eigen values and eigen vectors.

Unit I **06 Hours**

System of Linear Equation: Vectors and linear combinations, Rank of a matrix, Gaussian elimination, LU Decomposition, Solving Systems of Linear Equations using the tools of Matrices.

Unit II **06 Hours**

Vector Spaces: Definition, linear combination, spanning sets subspaces, linear dependence and independence, basis and dimension, rank of matrix.

Unit III **06 Hours**

Linear Mapping: Linear mapping, Kernel and image of linear mapping, rank and nullity of a linear mapping, singular and non-singular linear mapping

Unit IV **06 Hours**

Linear mapping and matrices: Matrix representation of linear operator, change of base, similarity matrices

Unit V **06 Hours**

Inner Product space and orthogonalization: Inner product space, Cauchy-schwarz equality, orthogonality, orthogonal sets and bases, projections, Grayschist orthogonalization, orthogonal and positive definite matrices, matrix representation of inner produc**t**

Unit VI **06 Hours**

Diagonalization: Eigen values and eigen vectors

Characteristic polynomial, Cayley-Hamilton theorem, eigen values and eigen vectors, properties.

Textbooks/Reference Books

1.P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi GrihaPrakashan, Pune, 2013.

2.B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi

3.B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.

4.Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.

5.Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.

6.Michael Greenberg, Advanced Engineering Mathematics, 2nd Ed., Pearson Education, 1998.

Project Based Learning

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Gauss Elimination method.
2. LU-decomposition method
3. Rank of matrix
4. Linear combination
5. Basis and dimension
6. Spanning sets
7. Kernel and image of linear transformation
8. Rank-nullity theorem

9. Non-singular linear mapping
10. Linear operator
11. Similarity matrices
12. Change of base
13. Cauchy Schwarz equality
14. Orthogonality
15. Gram schmidt Orthoginalization
16. Matrix representation of matrix
17. Cayley-Hamilton theorem
18. Eigen values and Eigen vectors

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Physics for Computing Systems

TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
Lecture:	03 Hours/Week	**End Semester Examination:** 60 Marks	**Theory**	03
Practical:	02 Hours/Week	**Internal Assessment:** 40 Marks		
		Term Work: 25 Marks	**Practical:**	01
Total:	05 Hours/Week	**Total:** 125 Marks	**Total:**	04

Course Objectives: To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Computer Engineering and Science.

Prerequisite: Students are expected to have a basic understanding of physics and calculus.

Course Outcomes: At the completion of the course, the students should be able to**:**

1. Interpret the properties of charged particles to develop modern instruments such as electron microscopy.
2. Appraise the wave nature of light and apply it to measure stress, pressure and dimension etc.
3. Summarise the structure and properties of lasers to their performance and intended applications.
4. Classify the optical fiber, understanding the structure, types and its applications in the field of communication.
5. Solve quantum physics problems to micro level phenomena and solid-state physics.
6. Explain mechanical properties of solid matter, and connect to applications in the field of engineering.

Unit I: Modern Physics **06 Hours**

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatics focusing, Electron microscope, Wavelength and resolution, Specimen limitation, Depth of field and focus, Transmission electron microscope (TEM), Scanning electron microscope (SEM), Separation of isotopes by Bainbridge mass spectrograph, Cathode ray tube (CRT).

Unit II: Wave Optics **06 Hours**

Interference

Interference of waves, interference due to thin film (Uniform and nonuniform (only formula-no derivation is expected), Newton's ring, Applications of interference (optical flatness, highly reflecting films, non-reflecting coatings).

Diffraction

Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima

Polarisation

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism.

Unit III: Lasers **06 Hours**

Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Single Hetro-junction laser, Gas laser: CO_2 laser, Properties of lasers, Laser speckles, Applications of lasers (Engineering/ industry, medicine, Computers).

Unit IV: **Fibre Optic** **06 Hours**

Principle of fibre optics, Construction, Numerical Aperture for step index fibre; critical angle, angle of acceptance, V number, number of modes of propagation, types of optical fibres, Fibre optic communication system, advantages and disadvantages of fibre optics.

Unit V: Quantum Mechanics **06 hours**

Dual nature of matter, DeBroglie's hypothesis, Heisenberg's uncertainty principle with illustrations, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box, step potential and potential barrier (analytical discussion), tunnelling effect.

Unit VI : Solid state physics **06 Hours**

Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors

(with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

Textbooks

1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018)
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017)

Reference Books

1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)
2. Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017)
3. Principles of Physics, John W. Jewett, Cengage publishing (2013)
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
5. Principles of Solid-State Physics, H. V. Keer, New Age International (1993)
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013)
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012).

List of Laboratory Exercises (Any Eight of the Following)

1. Study of Lissajous figure by Cathode Ray Oscilloscope (CRO)
2. Determination of e/m by Thomson method
3. Determination of radius of planoconvex lens/wavelength of light/Flatness testing by Newton's rings
4. Determination of wavelength of light using diffraction grating
5. Determination of resolving power of telescope

6. Determination of thickness of a thin wire by air wedge
7. Determination of refractive index for O-ray and E-ray.
8. Determination of divergence of a laser beam.
9. Particle size by semiconductor laser.
10. Determination of wavelength of laser by diffraction grating.
11. To study Hall effect and determine the Hall voltage.
12. Calculation of conductivity by four probe method
13. Study of solar cell characteristics and calculation of fill factor.
14. Determination of band gap of semiconductor.
15. Determination of Planck's Constant by photoelectric effect.

List of Assignments

Six assignments to be given by the subject teacher (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum.

Project Based Learning

1. Measurement and effect of environmental noise in the college
2. Design and simulation of automatic solar powered time regulated water pumping
3. Solar technology: an alternative source of energy for national development
4. Design and construction of digital distance measuring instrument
5. Design and construction of automatic bell ringer
6. Design and construction of remote-control fan
7. Design and construction of sound or clap activated alarm
8. Electronic eye (Laser Security) as autoswitch/security system
9. Electric power generation by road power
10. Determination of absorption coefficient of sound absorbing materials
11. Determination of velocity of O-ray and E-ray in different double refracting materials
12. Need of medium for propagation of sound wave

13. Tesla Coil

14. Thin film interference in soap film-formation of colours

15. LiFi- wireless data transfer system using light

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Electrical Technology

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Total	125 Marks	Total	05

Course Objective:

To study of power system basics, magnetic circuits electrical machines, transformers, wiring, measurements, illumination and batteries.

Prerequisite: NIL

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Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the various parameters related to magnetic circuit.
2. Describe basic concepts of AC fundamentals and circuits.
3. Illustrate constructional features and describe different parameters of transformer.
4. Describe basic concepts of power system and three phase circuits.
5. Demonstrate AC and DC electrical machines.
6. Classify types of batteries.

Unit I **08 Hours**

Magnetic Circuits:Magnetic effect of electric current, Cross & Dot Convention, Right hand thumb rule, Concept of flux, flux linkages, magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability Kirchhoff's laws for magnetic circuits. Magnetic circuit concepts, analogy between electric& magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling.

Unit II **08 Hours**

AC Fundamentals and circuits:AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasor, phasor representation of sinusoidally varying voltage and

current. Analysis of series, parallel and series-parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, bandwidth and quality factor (simple numerical problems.

Unit III **08 Hours**

Single Phase Transformer: Faradays law of electromagnetic induction, statically and dynamically induced emf, self-inductance, mutual inductance , coefficient of coupling. Single Phase Transformer: Principle of operation, construction, e .m. f. equation, voltage ratio, current ratio, KVA rating ,determination of efficiency and regulation by direct load test, equivalent circuit, power losses,(simple numerical problems), introduction to auto transformer. Three phase transformer and its different winding connections.

08 Hours

Unit IV

Introduction to Power System and Three Phase: Circuits: General layout of electrical power system and functions of its elements, standard transmission and distribution voltages, concept of grid (elementary treatment only) Power generation to distribution through overhead lines and underground cables with single line diagram. Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relations, three phase power and its measurement (simple numerical problems).

Unit V **08 Hours**

Electrical Machines: DC & AC:Principles of electromechanical energy conversion, DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics, and applications of dc motors (simple numerical problems). single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: types, Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).

Unit VI **08 Hours**

Batteries: Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel Cadmium and Silver-Oxide batteries, charging methods used for lead-acid battery (accumulator), Care and

maintenance of lead-acid battery, Series and parallel connections of batteries, General idea of solar cells, solar panels and their applications, Introduction to maintenance free batteries, Safe disposal of Batteries; Fuel cell: Principle & Types of fuel cell.

Textbooks:

1. B.L.Theraja, A Textbook of Electrical Technology, Vol.1, S.Chand& Company Ltd. New Delhi
2. V.K.Mehta, Basic Electrical Engineering, S Chand & Company Ltd. New Delhi.
3. J.Nagarath and Kothari, Theroy and applications of Basic Electrical Engineering, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Electrical Technology - Edward Huges (Pearson
2. Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)
3. Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)
4. Electrical, Electronics Measurements and Instruments - (Satya Prakashan)

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit.

List of Laboratory Exercises:

1. Plotting B-H characteristics for a material.
2. Load test on single phase transformer.
3. Testing and maintenance of batteries.
4. Verification of voltage and current relationships in star and delta connected 3-phase networks.
5. Load test on DC machine.
6. To find the performance of series R-L-C circuit at different condition
7. OS & SC test on single phase transformer to find efficiency and regulation
8. Speed control of DC motor
9. Study of different types of starters for DC & AC Machine
10. Load test on 3 phase Induction motor.

Project Based Learning

1. Building a small resistive load lamp bank
2. Building a small resistive load lamp bank for various types of connections like series, parallel, star, delta
3. Building a small inductive load lamp bank for various types of connections like series, parallel, star, delta
4. Building a small capacitive load lamp bank for various types of connections like series, parallel, star, delta
5. Building a small resistive load lamp bank
6. Building a staircase wiring model on a board
7. Building a Go down wiring model on a board
8. Rewinding of a choke
9. Rewinding of a small transformer
10. Building a small rectifier circuit on bread board
11. Building a mobile charger circuit on a bread board
12. Building an electric buzzer circuit
13. Building a solar charger for mobile phone
14. Building a small wind turbine
15. Small Agricultural pump model with DC motor
16. Small Agricultural pump model with AC motor

(Note: - *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Internet Programming

TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
				Credits
Lecture:	04 Hours/Week	**End Semester Examination:** 60 Marks	**Theory:**	04
Practical:	02 Hours/Week	**Internal Assessment:** 40 Marks		
		Term Work & Oral: 50 Marks	**Practical:**	01
		Total: 150 Marks	**Total:**	05

Course Overview
This course content the introduction to all web programming languages with detailed study about HTML, CSS, DHTML, XML and DNS.

Prerequisite:
Students should have basic knowledge about computers, web applications and internet.

Course Outcomes: On completion of the course, students will have the ability to
1. Explain the fundamentals of programming languages.
2. Implementation of Hyper Text Markup Language.
3. Use of Cascading Style Sheets in web page development.
4. Elucidate with implementation of Dynamic Hyper Text Markup Language.
5. Describe with implementation of Extensible Markup Language.
6. Understand and implementation of Hyper Text Transfer Protocol and DNS.

Unit I Introduction to Internet Programming **08 Hours**
Computer Network, working of internet, Web applications, Introduction to web programming languages: HTML, DHTML, JSP, PHP, Role of the Server on the internet, Introduction about Node JS and angular JS.

Unit II Hyper Text Markup Language **08 Hours**
Introduction to HTML, Tags, Div Span, Lists, Images, Hyperlink, Table, Iframe, Form, Headers, all content with HTML 5.

Unit III Cascading Style Sheets **08 Hours**

Introduction to CSS, Syntax, Selectors, background, Text Fonts, Lists Tables, Box Models, Display Positioning, Floats.

Unit IV Dynamic Hyper Text Markup Language **08 Hours**

Introduction of DHTML- HTML vs. DHTML, Advantages of DHTML, CSS of DHTML, Event Handling, Data Binding, Browser Object Models.

Unit V Extensible Markup Language **08 Hours**

Introduction of XML- Features of XML, Anatomy of XML document, The XML Declaration, Element Tags- Nesting and structure, XML text and text formatting element, Table element, Mark-up Element and Attributes, XML Objects, Checking Validity, Understanding XLinks, XPointer, Event-driven Programming, XML Scripting, XML with Style Sheet Technologies- Concept of XSL, XML Schema, Importance of XML schema, Creating Element in XML Schema, XML Schema Types.

08 Hours

Unit VI Hyper Text Transfer Protocol and DNS

DNS, WWW, HTTP, HTTPs, XML HttpRequest- Introduction, XML HttpRequest, The XML HttpRequest Object, Events for the XML HttpRequest Object, Request Object for XML HttpRequest, Response Object for XML HttpRequest, Complete working of web browser

Text / Reference Books

1 HTML & CSS: The Complete Reference, Fifth Edition Paperback by Thomas Powell, McGraw Hill Education.
2 HTML & XHTML: The Complete Reference, by Thomas Powell, McGraw Hill Education, McGraw-Hill Education.
3 XML: The Complete Reference, by Heather Williamson, McGraw Hill Education
4 HTTP Pocket Reference (Pocket Reference (O'Reilly)), Clinton Wong, O′Reilly Publication.
5 HTML & XHTML: The Definitive Guide, 5th Edition, by Bill Kennedy and Chuck Musciano, O'Reilly Publication.

List of Assignments

1. Explain the role of web programming languages in internet.
2. Explain any five HTML tags with example.

3. Consider any web-based example to explain the role of CSS in web programming.
4. Explain the role of DHTML in web programming and web applications.
5. Consider any real time scenario to explain XML.
6. Consider any real time URL and explain its DNS in detail.

List of Laboratory Exercises

1. Introduction to web format files and file extensions.
2. Implementation of simple HTML page.
3. Implementation of Images and Tables.
4. Implementation of frames.
5. Implementation of form.
6. Implementation of CSS.
7. Implementation of DHTML.
8. Implementation of XML.
9. Develop the web page with any scenario where HTML, CSS, XML will be used.
10. Develop any web project for any website or any portal.
11. Case Study on web programming languages.
12. Case Study on any web project

Project Based Learning

1. Website Development Hotel management
2. Website Development Personal Website
3. Website Development Organization website
4. Website Development Dummy Ecommerce website
5. Website Development Login page with user credentials
6. Development of a Employee Interests Survey form / Student survey form
7. Technical documentation page
8. Create image slider
9. Railway concession form
10. Website development for personal portfolio

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Programming and Problem Solving

TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
				Credits
Lecture:	04 Hours/Week	**End Semester Examination:** 60 Marks	**Theory**	04
Practical:	04 Hours/Week	**Internal Assessment:** 40 Marks		
		Term Work & Practical: 75 Marks	**Practical:**	02
		Total: 175 Marks	**Total:**	06

Course Overview

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also, by learning the basic programming constructs they can easily switch over to any other language in future.

Prerequisite:

One can learn C, without ANY knowledge of Algorithms. Basic knowledge of mathematics is required.

Course Outcomes: On completion of the course, students will have the ability to:

1. Describe the problem-solving steps and write a pseudocode for a given problem.
2. Identify the suitable control structure and write a C code for the same.
3. Write the C code for a given algorithm.
4. Illustrate use of pointers and functions
5. Write programs that perform operations using derived data types.

Unit I: Introduction to Computer Problem Solving **08 Hours**

The Problem-solving Aspect, Top Down Design, Implementation of Algorithms, Program Verification, The Efficiency of Algorithms, The Analysis of Algorithms, Fundamental Algorithms:

General problem-solving strategies: Introduction to program Planning tools-algorithm, flowcharts, and pseudo codes. Introduction to Programming Logic.

Unit II: Control structures **08 Hours**

Features of C, basic concepts, structure of C program, program, declarations, variables, data types, expressions, operator's assignment, arithmetic, relational, logical, increment and decrement, precedence of operators, type conversions, scanf and printf functions if-else, nested if-else, ladder if-else and switch statement. C Conditional control structures: for, while do-while Unconditional control structures: break, continue, goto statement

Unit III: Arrays and strings **08 Hours**

Declaration initialization of one-dimensional Array, two-dimensional array, accessing array elements, Character Array/String, Character - Handling Library Functions, Standard Input/Output Library Functions for string.

Unit IV: Functions and structures **08 Hours**

What is a Function, Benefits of a Function, Function Terminology, Array of Structures, How does Function Works, Scope and Lifetime of Variables in function ,Storage Classes of Variables , Call by value and call by reference ,Recursion ,Overview of Structures , Defining and Using a Structure , Structures within a Structure

Unit V: Pointers **08 Hours**

Declaring and Initializing Pointers, Function and Pointer Parameters, Pointer Arithmetic, Pointer and Arrays, Two Dimensional Arrays and Pointers.

Unit VI: Files **08 Hours**

File, Opening and Closing of Files, Writing and Reading in Text Format, Writing and Reading in Binary Format, Command Line Arguments.

Textbooks

1 Let Us C by Yashavant Kanetkar, 13e, BPB Publication.
2.Brain W.Kernighan & Dennis Ritchie, C Programming Language, 2nd edition, PHI
3.E. Balaguruswamy, Programming in ANSI C 5th Edition McGraw-Hill
4 How to Solve it by Computer by R. G. Dromey, 1e, Pearson Education.

Reference Books

1 C: The Complete Reference by Herbert Schildt.

List of Assignments (Course coordinator can design his/her own theory assignment. Following are samples of theory assignments.)

1. Write a pseudocode and draw a flowchart for a given problem.
2. Justify the selection of appropriate control structure.
3. Write a function to check whether the string is palindrome.
4. List and explain the working of standard string I/O functions.
5. Define a dynamic array to store the student record.
6. List and explain the different modes of opening file.

List of Laboratory Exercises (Course coordinator can design his/her own practical assignment. Following are samples of practical assignments.)

1. Describe the problem-solving steps
2. Write a pseudocode and draw a flowchart
3. Use mathematical operators and basic data types
4. Demonstrate use of control structures
5. Demonstrate use of logical operators
6. Solve the real time problem using single- and two-dimensional array
7. Perform the operations on string
8. Solve the problems using recursive and non-recursive functions
9. Solve the problems using dynamic memory allocations
10. Perform the operations on files

Project Based Learning

1. Calendar using C
2. Snake Game
3. Cricket score display
4. Quiz game
5. Phone-book application
6. Election System
7. Simple Result system

8. Typing Tutor
9. Bill Calculator
10. Grade Calculator
11. CGPA Calculator
12. Digital Clock
13. Contact Management System
14. IP finder
15. Bank Management System.
16. Departmental Store Management.
17. Hangman Game Project.
18. Library Management System

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Computer System Workshop Technology

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
					Credits
Practical:	02 Hours/Week	**Term Work & Practical:**	75 Marks	**Practical:**	01
		Total:	75 Marks	**Total Credit:**	01

Course Objective:
Provide student a much-needed knowledge of computer hardware and networking, enabling them to identify computer hardware, software and network related problems, and develop an ability to use the basics of computing, necessary for computing courses.

Prerequisite: Basic knowledge of Computer and Electronics.

Course Outcomes: On completion of the course, students will have the ability to:
1. Identify the architecture of a computer and its different components, including their technology evolution.
2. Apply their knowledge about computer peripherals to identify problems.
3. Install and uninstall given software step-by-step.
4. Demonstrate the working of Internet
5. Prepare document using Latex
6. Use GitHub tool for coding and collaboration.

Unit I **06 Hours**

Computer hardware peripherals: Introduction to hardware components, random access memory (RAM), Types Of RAM & their speed, tips for buying ram, how to add memory to a computer, problems when installing memory, Central Processing Unit (CPU), Types Of CPU: considerations when buying a new CPU (Types & Differences), different speeds available for CPU and what do they mean, 32 Bit vs 64 Bit – Which One To Choose &Why? How to choose a CPU type for different needs? Graphic Card & Types, how to install a Graphics Card, Jumper Switch settings, Hard Disk upgrade, Different ports and why we use them - USB, PS2, DivX, Graphic card & types, Virtual Memory and how to configure it for optimum system performance.

Unit II **06 Hours**

Assembly of Computer and Software Installations: Assembling the motherboard, replacing fan, how to avoid common mistakes during assembly, Installation of system software: Operating system (Windows and Linux), Installations step for operating system, Dual booting, Configure the BIOS, Installation of Antivirus, Installation of the open source software such as Scilab, Latex Installation of MS Office.

Unit III **06 Hours**

Basic Diagnostic of Hardware and Software: Diagnosis of Power Up problem, Boot Drive, Errant Keyboard, mouse problems, slow computer performance, Computer freezes and displays BSOD (Blue screen of death), no display on monitor, no sound, computer rebooting or turning itself off, how to troubleshoot a computer that does not boot, Registry Cleaner.

Unit IV **06 Hours**

Computer network environments: Network connecting devices. Configure the TCP/IP setting, connect to Local Area Network and access the Internet, Configuring Wireless network. Server and Its Configuration, Email Clients, Browsers, Office tools, customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers, Browsing netiquettes and cyber laws. Cloud Access Tools.

Unit V **06 Hours**

Configuration of External devices: Physical set-up of Printers- Performing test print out, Printing of document etc, Scanner set-up, Webcam, Bluetooth device, Memory card reader etc

Unit VI **06 Hours**

Productivity tools: Open Source Tools Such as Latex, GitHub

Latex: Format words, lines, and paragraphs, design pages, create lists, tables, references, and figures in LATEX. Introduction to LaTex Packages and classes. Using Git, Version Control Systems, interacting with GitHub, Reverting Changes, Creating Pull Requests.

Textbooks

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. PC Hardware and A+ Handbook – Kate J. Chase PHI (Microsoft)
3. LaTeX Companion – Leslie Lamport, PHI/Pearson
4. https://nptel.ac.in/courses/106/105/106105081/
5. http://nptel.ac.in/courses/106105084/
6. https://guides.github.com/
7. Introduction to Linux: Installation and Programming, N B Venkateswarlu,BS Publication.

Reference Books

1. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
2. Computer Fundamentals, MS Office and Internet & Web Technology by Dinesh Maidasani.

List of Laboratory Exercises

1. Demonstrate the Computer Hardware Components and explain its working.
2. Demonstrate the Networking Components and explain its working.
3. Installation of operating system MS windows, Unix on the personal computer
4. Installation of Application software Scilab, Latex, MS office on the personal computer
5. Troubleshooting hardware related problem.
6. Customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
7. Execution of Important "layout" and formatting commands in Latex,
8. Installation of Antivirus and customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms

Project Based Learning

1. Collect specifications of similar types of hardware and software and prepare report comparing them
2. Assembling and disassembling the PC back to working condition.
3. Installation of operating systems LINUX on Server and different packages on a PC.

4. Practice hardware troubleshooting exercises related to various components of computer like monitor, drives, memory devices, printers etc. and software troubleshooting related to BIOS etc
5. To start your own computer repair workshop. What would your initial planning involve? What would you look for in terms of building, furnishings, tools and any other equipment that you can think of?
6. Cyber Hygiene: Installing antivirus for Windows.
7. Prepare the report of need of programming language in 21st century.
8. Collect various types of computer hardware and prepare summary report
9. Prepare Seminar report using LaTex
10. Prepare Project report using LaText

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list.

B. Tech. CSE (AI & ML)
Semester II Syllabus

Mathematics for Computing-II

TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
				Credits
Lecture:	03 Hours/Week	**End Semester Examination:**60 Marks	**Theory:**	03
Tutorial:	01 Hours/Week	**Internal Assessment:** 40 Marks	**Tutorial:**	01
		Total: 100 Marks	**Total:**	04

Course Objectives:

1. Fourier series and integral transforms.
2. Multiple integrals and its applications.
3. Vector calculus and its applications.

Prerequisite: The students should have knowledge of vector algebra, derivative and integration.

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand to represents periodic functions as fourier series.
2. Understand methods of finding fourier and Z-transforms.
3. Understand the method of laplace transform of piecewise continuous functions.
4. Understand concepts of double and triple integrals.
5. Understand to vector derivative for physical quantities.
6. Understand to evaluate line, surface and volume integrals.

Unit I **06 Hours**

Fourier Series: Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis

Unit II **06 Hours**

Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory

Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit III **06 Hours**

Laplace Transform and its application: Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

Unit IV **06 Hours**

Multiple Integrals and their Application: Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values, moment of inertia, centre of gravity

Unit V **06 Hours**

Vector Differential Calculus: Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.

Unit VI **06 Hours**

Vector Integral Calculus and Applications: Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problem in engineering.

Textbooks/Reference books

1.P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi GrihaPrakashan, Pune, 2013.

2.B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi

3.B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.

4.Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.

5.Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.

Project Based Learning

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Fourier series
2. Harmonic analysis
3. Fourier transform
4. Z-Transform
5. Laplace transform technique to solve ODE
6. Multiple Integral to evaluate area and volume
7. Directional derivative
8. Divergence and curl
9. Greens theorem
10. Gauss Divergence Theorem
11. Stokes theorem
12. Unit step function
13. Solenoidal and irrotational fields
14. Simple difference equation
15. Periodic functions

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Probability and Statistics

TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
				Credits
Lecture:	04 Hours/Week	**End Semester Examination:** 60 Marks	**Theory:**	04
Practical:	02 Hours/Week	**Internal Assessment:** 40 Marks		
		Term Work & Practical: 50 Marks	**Practical:**	01
		Total Marks: 150 Marks	**Total:**	05

Course Objectives:
To Study

1. Probability theory and expected value.
2. Probability distribution and its applications.
3. Multiple regression and ANOVA.

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand rank of matrix and test consistency of system of linear equations.
2. Understand to represent periodic function as Fourier series.
3. Understand the methods to find Fourier and Z transform.
4. Understand various numerical technique for ordinary and partial differential equation.
5. Understand the hypothesis techniques.
6. Understand concept of graph and its applications of tree.

Unit I **08 Hours**

Probability Theory: Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes' theorem of inverse probability, Properties of probabilities.

Unit II **08 Hours**

Random Variable and Mathematical Expectation. Definition of random variables, Probability distributions, Probability mass function, Probability density

function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs, Examples

Unit III **08 Hours**

Theoretical Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution

Unit IV **08 Hours**

Correlation: Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient, Properties of Spearman's rank correlation coefficient, Probable errors, Examples.

Unit V **08 Hours**

Linear Regression Analysis: Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient.

Unit VI **08 Hours**

Multiple Regression and ANOVA: Multiple regression & multiple correlation, Analysis of variance (one way, two way with as well as without interaction).

Textbooks

1.S. C. Gupta, "Fundamentals of Statistics", 46th Edition, Himalaya Publishing House.
2.G. V. Kumbhojkar, "Probability and Random Processes", 14th Edition, C. Jamnadas and co.
3.Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability and Statistics, Schaum's Outlines
4.Kishor S. Trivedi, "Probability, Statistics with Reliability, Queuing and Computer Science Applications", 2nd Edition, Wiley India Pvt. Ltd.

5.Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction to Probability And Statistics, 3 rd Edition, Wiley Publication.
6.I.R. Miller, J.E. Freund and R. Johnson.Fun "Probability and Statistics for Engineers" (4th Edition).

List of Assignments

1. Assignment based on Probability Theory.
2. Assignment based on Random Variable and Mathematical Expectation.
3. Assignment based on Theoretical Probability Distributions.
4. Assignment based on Correlation.
5. Assignment based on Linear Regression Analysis.
6. Assignment based on Multiple Regression and ANOVA.

List of Laboratory Exercises (The course coordinator may frame 8-10 experiments)

Project Based Learning

Students are expected prepare report on any one topic, write its definition, applications and analyze the hypothetical data. Also, write pseudo code for it, wherever applicable.

1. Bayes theorem
2. Additive and multiplicative law of probability
3. Mathematical expectation
4. Joint and marginal probability distribution
5. Theoretical probability distribution
6. Coefficient of correlation
7. Regression estimates
8. Simple regression model
9. Multiple regression model
10. One-way ANOVA
11. Two-way ANOVA
12. Correlation
13. Multiple correlation

(Note: - *Students in a group of 3 to 4 shall complete any one project from the above list.)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Organic and Electrochemistry

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lectures:	03 Hours/Week	**End Semester Examination:**	60 Marks	**Theory:**	03
Practical:	02 Hours/Week	**Internal Assessment:**	40 Marks	**Practical**	01
		Term Work: 25 Marks			
		Total: 125 Marks		**Total:**	04

Course Objectives:

The student should acquire the knowledge of

1. To develop the interest among the students regarding chemistry and their applications in engineering.
2. To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.
3. The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the computing field.

Course Outcomes: On completion of the course, students will have the ability to:

1. Differentiate between ionic and covalent bonding and classify the bonding in a compound as ionic or covalent.
2. Develop a working knowledge of the twelve fundamental principles of green chemistry and what it is all about.
3. Apply standard reduction potential data to determine the relative strength of oxidizing/reducing agents.
4. Demonstrate the knowledge of polymer materials for futuristic engineering applications.
5. Describe the properties of materials and Application of semiconductor electronics

Unit I **06 Hours**

Chemical Bonding in Molecules: MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra and magnetic properties of complexes with relevance to bio-inorganic chemistry, organ metallic chemistry.

Unit II **06 Hours**

Green Chemistry: Introduction, Twelve Principles of Green chemistry, numerical on atom economy, synthesis, adipic acid and indigo. Organic dye- Traditional methods of organic dye. Green solvents (ionic liquid supercritical CO2), and products from natural materials.

Unit III **06 Hours**

Electrochemistry: Electrochemical cells and Galvanic cells, EMF of a cell, Single electrode potential, Nernst equation, Electrochemical series, Types of electrodes, Reference electrodes, pH, pOH, acids and basis, Fuel cells, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Ni-Cd Batteries, Li-Ion Batteries, Li-Po Batteries.

Unit IV **06 Hours**

Polymers for the Electronics Industry: Polymers, Conduction mechanism, Preparation of conductive polymers, Polyacetylene, Poly (p-phenlylene), Polyhetrocyclic systems, Polyaniline Poly (Phenylene sulphide), Poly (1,6-heptadiyne), Applications, Photonic applications.

Unit V **06 Hours**

Semi-Conductors, Insulators and Superconductors: Semi conductivity in non-elemental materials, Preparations of semiconductors, Chalcogen photoconductors, photocopying process Introduction to Superconductors, types of Superconductors, Properties of superconductors, Applications of Superconductors, Electrical insulators, or Dielectrics.

Unit VI **06 Hours**

Fuels and Lubricants: Classification of fuels, Calorific values, Comparison between solid, liquid and gaseous fuels, Theoretical calculation of calorific value of a fuel, Selection of coal, analysis of coal, Natural Gas, Producer gas, water gas, Lubricants, Mechanism of lubrication, classification of lubricants, lubricating oils, Solid lubricants, Greases or Semi-Solid lubricants, Synthetic lubricants, Lubricating emulsions, Properties of lubricating oils.

Textbooks

1. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGRAW Hill, 2008.
2. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G.Cowie, Blackie Academic & Professional, 1994.
3. A Text Book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004
4. Engineering Chemistry (16th Edition) Jain, Jain, Dhanpat Rai Publishing Company, 2013.
5. Inorganic Chemistry (4th edition), D. F. Shrives and P. W. Atkins, Oxford University, Oxford, 2006.
6. Applications of Absorption Spectroscopy of Organic Compounds (4th edition), John R. Dyer, Prentice Hall of India Pvt. Ltd., 1978.
7. Reactions, Rearrangements and Reagents (4th edition), S. N. Sanyal, Bharti Bhawan (P & D), 2003.

List of Laboratory Exercises

1. Determination of Hardness of water sample by EDTA method.
2. Determination of Chloride content in water sample by precipitation titration method.
3. To determine strength of acid by pH – metric Titration
4. To measure the Conductance of a solution by conductometric titration
5. Measurement of Surface tension of a given liquid by Stalgmometer.
6. Determination of viscosity of a given liquid by Ostwald's Viscometer.
7. Determination of Saponification value of an oil sample.
8. To determine alkalinity water sample.
9. Determination of Hardness of water sample by EDTA method.
10. Determination of Chloride content in water sample by precipitation titration method.
11. To determine strength of acid by pH – metric Titration
12. To Prepare Phenol formaldehyde/Urea formaldehyde resin.

Project Based Learning

1. Green Chemistry approach to Nano-Structured Electronics.
2. Assessment of Environmentally Benign Photopolymers as an Alternative to the Use of Formaldehyde Based Textile Finishing Agents
3. Solvent-Free Synthesis of Phthalocyanines
4. Synthesis of Conjugated Polymers and Molecules Using Sugar Reagents and Solventless Reactions

5. Environmentally Benign Control of Polymer Solubility: Photoresist Materials Using DNA Mimics
6. Enzymatic Synthesis of Non-Formaldehyde Phenolic Polymers: Control of Hydrogen Peroxide Concentration.
7. The materials chemistry and electrochemistry of lithium and sodium-ion batteries
8. Electroplating- the principles, how different metals can be used and the practical applications.
9. Electroplating, Metal Polishing, Anodizing, Phosphating Metal Finishing and Powder Coating Projects.
10. To determine calorific value of a fuel by any suitable method
11. To study various properties of lubricants
12. To study various types of lubricants and its properties.
13. To determine quality of coal sample & its analysis.
14. To study mechanism of lubrication.
15. To study coal analysis & its significance.

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit –V, Unit – VI

Digital Electronics

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lectures:	04 Hours/Week	**End Semester Examination:**	60 Marks	**Theory:**	04
Practical:	02 Hours/Week	**Internal Assessment:**	40 Marks		
		Term Work: 25 Marks		**Practical**	01
		Total: 125 Marks		**Total:**	05

Course Objective:

1. To present the Digital fundamentals, Boolean algebra and its applications in digital systems
2. To familiarize with the design of various combinational digital circuits using logic gates
3. To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
4. To understand the various semiconductor memories and related technology

Prerequisite: Physics, Mathematics, Basics of electrical engineering

Course Outcomes: On completion of the course, students will have the ability to:

1. Comprehend different number systems and Boolean algebraic principles.
2. Apply logic design minimization techniques to simplify Boolean expressions
3. Analyse and design combinational logic circuits.
4. Demonstrate the operations of systems with sequential circuit elements.
5. Comprehend characteristics and structure of Programmable Logic Devices and Memory.

Unit I **08 Hours**

Digital systems:

Number Systems: Introduction to Number Systems-Decimal, Binary, Octal, Hexadecimal, Conversion of number system, Representation of Negative Numbers, 1's complement and 2's complement. Binary Arithmetic: Binary addition, Binary subtraction, Subtraction using 1's complement and 2's complement, Binary multiplication, and division. Digital Codes: BCD code, Excess-3 code, Gray code and ASCII code. Logic Gates: Logical Operators, Logic Gates-Basic Gates, Universal Gates, realization of other gates using universal gates.

Unit II **08 Hours**

Logic Design Minimization: Boolean algebra, De Morgan's Theorems, Standard representation of logic functions, Sum of Product (SOP) form, Product of Sum (POS) form, Simplification of logical functions, Minimization of SOP and POS forms using Karnaugh-Maps up to 4 variables Don't care condition, Quine-McCluskey Method.

Unit III **08 Hours**

Combinational Circuits: Binary and BCD arithmetic, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder (IC 7483), BCD adder, Code converters

Multiplexers, De multiplexer, Decoder (IC 74138) and their use in combinational logic design, Priority Encoder, Digital Comparators, Parity generators and Checker (IC 74180), ALU

Unit IV **08 Hours**

Sequential Circuits: Flip- flop: SR, JK, D, T flip flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop.

Registers: Buffer register, Shift register.

Counters: Asynchronous counters, Synchronous counters, Modulus counters

Unit V **08 Hours**

FSM and ASM charts: Introduction to FSM, Moore and Mealy State machine, state machine as a sequential controller. Design of state machines: state table, state assignment, transition/excitation table, excitation maps and

equations, logic realization, ASM chart notations, ASM block, State diagram, ASM chart for sequential circuits, Multiplexer Controller.

Unit VI **08 Hours**

Memory and PLD: Semiconductor memories: memory organization, memory expansion, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM Programmable logic devices: Study of PROM, PAL, PLAs. Architecture of PLA, designing combinational circuits using PLDs.

Textbooks

1. M. Morris Mano and M. D. Ciletti, Digital Design, Pearson Education.
2. RP Jain, Modern Digital Electronics, Tata McGraw Hill Publication.
3. F.J. Hill and G.L. Peterson, Switching Theory and Logic Design, John Wiley
4. J.F.Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2
5. David J. Comer, Digital Logic & State Machine Design, Oxford University Press.
6. Digital Integrated Electronics- H.Taub & D.Shilling, Mc Graw Hill.

List of Laboratory Exercises

1. Verify truth tables of logic gates. (AND, OR, XOR, NOT, NAND, NOR). Simplify the given Boolean expression using K-map and implement using gates
2. State De-Morgan's theorem and write Boolean laws. Implement NAND and NOR as Universal gates.
3. Design (truth table, K-map) and implement half and full adder/ subtractor.
4. Design (truth table, K-map) and implement 4-bit BCD to Excess-3 Code converters.
5. Study of magnitude Comparator using IC 7485
6. Implement of logic functions using multiplexer IC 74151 (Verification, cascading & logic function implementation)
7. Implement logic functions using 3:8 decoder IC 74138.
8. Verify truth tables of different types of flip flops.
9. Design (State diagram, state table & K map) and implement 3 bit Up and Down Asynchronous and Synchronous Counter using JK flip-flop

Project Based Learning

1.Survey report of basic gates ICs 7432, 4011, 4050, 4070,4071,4010
2. Implement combinational logic Circuit of given Boolean Equation.

3. Implement Half Adder and Half Subtractor.
4. Implement Full Adder using two Half Adders
5. Build 4-bit parallel Adder / Subtractor using IC.
6. Build Code Converters: Binary to Gray
7. Build Code Converters: Excess 3 to Binary)
8. Implement Two Bit Magnitude Comparator using IC 7485
9. Implement given combinational logic using MUX
10. Implement 7 segment decoder driver using IC 7447.
11. Build a Decade counter and Up-Down Counter.
12. Build a Shift Registers: SISO and SIPO
13. Implement the Johnson Counter and Ring Counter.
14.Survey Report on Static I/O and transfer Characteristic of TTL and CMOS.
15. Implement given Boolean Function using PLA.
(Function and Equation will be given by Subject Teacher)

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit –V, Unit – VI

Object Oriented Programming

TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
Lecture:	04 Hours/Week	**End Semester Examination:** 60 Marks	**Theory:**	04
Practical:	04 Hours/Week	**Internal Assessment:** 40 Marks		
		Term Work & Practical: 75 Marks	**Practical:**	02
		Total:175 Marks	**Total:**	06

Course Objectives -:
It covers Object Oriented Concepts through Java Programming language and it also covers Multiprogramming and Exception Handling.

Prerequisite: C Programming

Course Outcomes: At the end of the course, the students should be able to**:**

1. To apply fundamental programming constructs.
2. To illustrate the concept of packages, classes and objects.
3. To elaborate the concept of strings, arrays and vectors.
4. To implement the concept of inheritance and interfaces.
5. To implement the concept of exception handling and multithreading.
6. To develop GUI based application.

Unit I: Introduction to Object Oriented Programming **08 Hours**

OOP concepts: History and Features of Java, Difference between Procedural and Object-Oriented Programming, Objects, class, Encapsulation, Abstraction, Inheritance, Polymorphism, message passing, Java Virtual Machine, Basic programming constructs: variables, data types, operators, unsigned right shift operator, expressions, branching and looping.

Unit II: Class, Object, Packages and Input/output **08 Hours**

Class, object, data members, member functions Constructors, types, static members and functions Method overloading Packages in java, types, user defined packages Input and output functions in Java, Buffered reader class, scanner class

Unit III: Array, String and Vector **08 Hours**

Array, Strings, String Buffer and its Constructors, Vectors, Methods of the Vector Class, Constructor of Vector.

Unit IV: **Inheritance and Polymorphism** **08 Hours**

Use of Inheritance, Types of Inheritance in Java, Role of Constructors in inheritance, Polymorphism in OOP, Types of Polymorphism, static and dynamic polymorphism, Overriding Super Class Methods. Use of "super" keyword. Interfaces, Implementing interfaces.

Unit V: Exception handling and Multithreading **08 hours**

Exception handling using try, catch, finally, throw and throws, Multiple try and catch blocks, user defined exception Thread lifecycle, thread class methods, creating threads using extends and implements keyword.

Unit VI: GUI programming in JAVA **08 Hours**

Applet and applet life cycle, creating applets, graphics class functions, parameter passing to applet, Font and Color class. Event handling using event class AWT: working with windows, using AWT controls for GUI design Swing class in JAVA.

Textbooks

1. Herbert Schildt, 'JAVA: The Complete Reference', Ninth Edition, Oracle Press
2. E. Balagurusamy, 'Programming with Java', McGraw Hill Education.

Reference Books

1. Ivor Horton, "Beginning JAVA", Wiley India.
2. Dietal and Dietal, "Java: How to Program", 8th Edition, PHI .
3. "JAVA Programming", Black Book, Dreamtech Press.
4 "Learn to Master Java programming", Staredu solutions

List of Assignments (Course coordinator can design his/her own theory assignment. Following are samples of theory assignments.)

1. Explain the Object-Oriented Concepts in detail.
2. Illustrate the Constructor, Method Overloading. Explain use of Scanner Class.
3. Explain the Strings and Vector Class Methods with suitable example.
4. Define the Abstract Class and Abstract methods with suitable example.
5. Define Exception. Explain the Try, Catch and Finally keyword.

6. Explain Applet and AWT Package with its Classes.

List of Laboratory Exercises (Course coordinator can design his/her own practical assignment. Following are samples of practical assignments.)

1. Programs on Basic programming constructs like branching and looping
2. Program on accepting input through keyboard.
3. Programs on class and objects
4. Program on method and constructor overloading.
5. Program on Packages.
6. Program on 2D array, strings functions
7. Program on String Buffer and Vectors
8. Program on types of inheritance
9. Program on Multiple Inheritance
10. Program on abstract class and abstract methods.
11. Program using super and final keyword.
12. Program on Exception handling
13. Program on user defined exception
14. Program on Multithreading
15. Program on Graphics class
16. Program on applet class
17. Program to create GUI application
18. Mini Project based on the content of the syllabus (Group of 2-3 students)

Project Based Learning

1. Smart City Project
2. Currency Converter
3. Online Exam Project in Java
4. Moving Balls mini project using Java Applet
5. Text Editor in Java using AWT controls.
6. Album Manager Project in Java
7. Vehicle Management System in Java
8. Music Player project in Java
9. Student Management System Project in Java
10. Simple Calculator project in Java
11. Image to PDF Convertor in java
12. Simple Chat System

13. Online Quiz project
14. Pong game in java
15. Tokenize implementation.

(Note: - *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Server-Side Scripting Language

TEACHING SCHEME	EXAMINATION SCHEME	CREDIT SCHEME
		Credits
Practical: 02 Hours/Week	**Term Work &Practical:** 75 Marks	**Practical:** 01
	Total: 75 Marks	**Total:** 01

Course Objectives:
The objective of this course is to impart students with the knowledge to setup the development environment, design and develop dynamic database driven web applications using PHP.

Prerequisite: Internet Programming

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand the basics of PHP Programming.
2. Design interactive forms using PHP.
3. Implement various operations on arrays and control structures.
4. Create database and show the database connectivity.
5. Implement cookies and session.
6. Develop dynamic web content.

Unit I: Introduction to web **6 Hours**

Introduction to web technology, Web application, Web server, Client and Server, Scripting languages.

Unit II: Basics of PHP **6 Hours**

PHP Basics, Introduction, XAMPP & WAMPP, Configure php.ini, PHP Syntax, Variables, Strings, Constants, Operators, Echo / Print, If....Else.....Elseif , Switch.

Unit III: Functions in PHP **6 Hours**

Loops, For, Foreach, While, Functions, string functions - introduction, user defined functions, Strings & Patterns, Quoting, Matching, Extracting, Searching, Replacing, Formatting, PCRE ▪ NOWDOC, Encodings.

Unit IV: Arrays in PHP **6 Hours**

Arrays, Introduction, Array syntax, Array Index, get length without using pre-defined functions, Array push and pull, Associative arrays, loop through arrays, Multidimensional Arrays, Array functions, Array Sorting without using pre-defined functions, Introduction to PostgreSQL.

Unit V: Interacting with database **6 Hours**

Understand MySQL, simple SQL, retrieval, PHP database functions.

Unit VI: Session and cookies in PHP **6 Hours**

Sessions - introduction, Start a PHP session, session variables, modify session, destroy session, Cookies, Start a PHP Cookies, Cookie variables , modify Cookie ,destroy Cookie.

Text Books

1. Learning PHP, MySQL & Javascript, Robin Nixon, OREILLY, 4th Editon, 2015
2. Head First PHP & MySQL-Lynn Beighley & Michael Morrison-O'Reilly
3. PHP: A Beginner's Guide-Vikram Vaswani- McGraw-Hill Education.

Reference Books

1. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill
2. The Joy of PHP Programming: A Beginner's Guide – Alan Forbes, BeakCheck LLC,6th edition

List of Laboratory Exercises (Course coordinator can design his/her own practical assignment. Following are samples of practical assignments.)

1. Write a PHP function to count total number of vowels from the string. Accept a string using HTML form.

2. Write a PHP script to print Fibonacci series.
3. Create a student registration form using text box, check box, radio button, select, submit button. Display the user inserted value in new PHP page.
4. Write a program to perform the following operations on an associative array.
   i) Display elements of an array along with their keys.
   ii) Display size of array.
   iii) Delete an element from an array from the given index.
5. Write a Program to insert a roll no and student name in a database (use PostgreSQL data to create a database).
6. Write PHP script to demonstrate passing variables with cookies.
7. Implement Admin login/logout functionality and cookie wherever required.
8. Write a PHP script to connect MYSQL server from your web application. Write a PHP script to create and drop database.
9. Create database using phpMyAdmin. Write a program to read input data from table and display the information in tabular form.
10. Develop PHP application using forms and database.
11. Mini Project

Project Based Learning

1. To create a PHP-powered web portal that needs no authentication for visitors to view the information published.
2. To develop a website offering car renting services.
3. Develop a converter program for the area, length, speed, temperature, volume, and weight.
4. To create a social network like Facebook.
5. To create a website having songs and related information, such as personnel details, duration, genre, etc.
6. To develop a simple and effective web-based photo editor with editing, selection, and positioning photos as well as to prepare publication-ready images.

7. To develop a small tool for customer relationship management.
8. To develop Time Table Generator
9. To collect, organize, and manage student information effectively.
10. Online School Administration Management System
11. Online Paying Guest Accommodation Project
12. College Admission Predictor
13. ERP System for College Management
14. CRM For Internet Service Provider
15. Online Blood Bank Project
16. Movie Success Prediction Using Data Mining
17. Web-based Chat Application with Webcam
18. College Social Network Project
19. Canteen Food Ordering and Management System
20. Fake Product Review Monitoring & Removal for Genuine Ratings

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list