RCOEM

Shri Ramdeobaba College of Engineering and Management, Nagpur

SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT

NAGPUR – 440013

An Autonomous College affiliated to Rashtrasant Tukadoji Maharaj Nagpur University,

Nagpur, Maharashtra (INDIA)

PROGRAMME SCHEME

2023-2024

B.TECH. (ELECTRONICS AND COMPUTER SCIENCE)

Teaching Scheme for B. Tech. Electronics and Computer Science

SEMESTER-I											
Sr. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**
				L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**	
1	BSC	PHT1007	Physics	2	1	0	3	50	50	100	3
2	BSC	PHP1007	Physics Lab	0	0	2	1	50	-	50	-
3	BSC	MAT1001	Applied Mathematics –I	2	1	0	3	50	50	100	3
4	BSC	MAP1001	Computational Mathematics Lab	0	0	2	1	50	-	50	-
5	BSC	CHP1002	Environmental Science Lab	0	0	2	1	50	-	50	-
6	ESC	ECST1001	Programming for Problem Solving	3	0	0	3	50	50	100	3
7	ESC	ECSP1001	Programming for Problem Solving Lab	0	0	2	1	50	-	50	-
8	VSEC	ECST1002	Fundamentals of Computer Engineering	2	0	0	2	50	50	100	2
9	VSEC	ECST1003	Electronics and Computer Workshop	1	0	0	1	50	-	50	-
10	VSEC	ECSP1003	Electronics and Computer Workshop Lab	0	0	2	1	50	-	50	-
11	HSSM - AEC	HUT1002	English for Professional Communication	2	0	0	2	50	50	100	2
12	HSSM-AEC	HUP1002	English for Professional Communication Lab	0	0	2	1	50	-	50	-
13	CCA	HUP0001-1 to HUP0001-10 PEP0001-21 PEP0001-22 CHP0001-31 CHP0001-32	Liberal/ Performing Arts	0	0	2	1	50	-	50	-
14	HSSM-VEC	HUT1004	Foundation course in Universal Human Value	1	0	0	1	50	-	50	-
TOTAL				**13**	**2**	**14**	**22**				
				29 Hrs.							

Teaching Scheme for B. Tech. Electronics and Computer Science

SEMESTER-II											
Sr. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**
				L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**	
1	BSC	CHT2006	Chemistry of Smart Materials	2	0	0	2	50	50	100	2
2	BSC	CHP2006	Chemistry of Smart Materials Lab	0	0	2	1	50	-	50	-
3	BSC	MAT2001	Applied Mathematics – II	2	1	0	3	50	50	100	3
4	ESC	ECST2001	Elements of IoT	3	0	0	3	50	50	100	3
5	ESC	ECSP2001	Elements of IoT Lab	0	0	2	1	50	-	50	-
6	ESC	ECST2002	Object Oriented Programming	2	1	0	3	50	50	100	3
7	ESC	ECSP2002	Object Oriented Programming Lab	0	0	2	1	50	-	50	-
8	PCC	ECST2003	Digital Electronics	3	0	0	3	50	50	100	3
9	PCC	ECSP2003	Digital Electronics Lab	0	0	2	1	50	-	50	-
10	HSSM-IKS	HUT2001	Foundational Literature of Indian Civilization	2	0	0	2	50	50	100	2
11	CCA	PET2001	Sports-Yoga-Recreation	1	0	0	1	50	-	50	
12	CCA	PEP2001	Sports-Yoga-Recreation Lab	0	0	2	1	50	-	50	-
TOTAL				**15**	**2**	**10**	**22**				
				27 Hrs.							

Exit option : Award of UG Certificate with additional 8 credits			
Exit Courses			
1	IT Support Engineer	Online/Offline Certification Course	8
2	Python		8
3	Web Designer		8

Teaching Scheme for B. Tech. Electronics and Computer Science

SEMESTER-III											
Sr. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**
				L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**	
1	PCC	ECST3001	Data Structures	2	1	0	3	50	50	100	3
2	PCC	ECSP3001	Data Structures Lab	0	0	2	1	50	-	50	-
3	PCC	ECST3002	Electronic Devices and Circuits	2	1	0	3	50	50	100	3
4	PCC	ECSP3002	Electronic Devices and Circuits Lab	0	0	2	1	50	-	50	-
5	PCC	ECST3003	Digital System Design	2	1	0	3	50	50	100	3
6	PCC	ECSP3003	Digital System Design Lab	0	0	2	1	50	-	50	-
7	MDM	ECST3004	Discrete Mathematics	2	0	0	2	50	50	100	2
8	OE		Open Elective-I/ MOOCs	2	0	0	2	50	50	100	2
9	HSSM	HUT3003	Managerial Economics	2	0	0	2	50	50	100	2
10	HSSM-VEC	ECST3005	Cyber Laws and Ethics in IT	2	0	0	2	50	50	100	2
TOTAL				**14**	**3**	**6**	**20**				
				23Hrs.							

Teaching Scheme for B. Tech. Electronics and Computer Science

SEMESTER-IV											
Sr. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**
				L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**	
1	PCC	ECST4001	Computer Architecture and Organization	2	1	0	3	50	50	100	3
2	PCC	ECSP4001	Computer Architecture and Organization Lab	0	0	2	1	50	-	50	-
3	PCC	ECST4002	Design and Analysis of Algorithms	2	1	0	3	50	50	100	3
4	PCC	ECST4003	Software Engineering	2	1	0	3	50	50	100	3
5	PCC	ECSP4003	Software Engineering Lab	0	0	2	1	50	-	50	-
6	MDM	ECST4004	Statistics for Data Analytics	3	1	0	4	50	50	100	3
7	OE		Open Elective-II/MOOCs	3	0	0	3	50	50	100	3
8	VSEC	ECSP4005	Software Laboratory - I	0	0	4	2	50	-	50	-
9	HSSM	MBT4006	Business Management and Entrepreneurship	2	0	0	2	50	50	100	2
TOTAL				**14**	**4**	**8**	**22**				
				26 Hrs.							

Exit option : Award of UG Diploma with additional 8 credits			
Exit Course			
1	Application Development (Android)	Online/Offline Certification Course	8
2	Software Engineer (Developer)		8
3	PCB Designer		8

Teaching Scheme for B.Tech. Electronics and Computer Science

SEMESTER-V											
Sr. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**
				L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**	
1	PCC	ECST5001	Operating System	2	1	0	3	50	50	100	3
2	PCC	ECSP5001	Operating System Lab	0	0	2	1	50	-	50	-
3	PCC	ECST5002	Embedded System Design	2	1	0	3	50	50	100	3
4	PCC	ECSP5002	Embedded System Design Lab	0	0	2	1	50	-	50	-
5	PCC	ECST5003	Digital VLSI Design	2	1	0	3	50	50	100	3
6	PCC	ECSP5003	Digital VLSI Design Lab	0	0	2	1	50	-	50	-
7	MDM	ECST5004	Machine learning	3	0	0	3	50	50	100	3
8	MDM	ECSP5004	Machine learning Lab	0	0	2	1	50	-	50	-
9	PEC	ECST5005	Program Elective-I	3	0	0	3	50	50	100	3
10	PEC	ECSP5005	Program Elective-I Lab	0	0	2	1	50	-	50	-
11	OE		Open elective-III/ MOOCs	3	0	0	3	50	50	100	3
TOTAL				**15**	**3**	**10**	**23**				
				28 Hrs.							

Teaching Scheme for B. Tech. Electronics and Computer Science

SEMESTER-VI											
Sr. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**
				L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**	
1	PCC	ECST6001	Database Management System	3	0	0	3	50	50	100	3
2	PCC	ECSP6001	Database Management System Lab	0	0	2	1	50	-	50	-
3	PCC	ECST6002	System Verilog for Verification	3	0	0	3	50	50	100	3
4	PCC	ECSP6002	System Verilog for Verification Lab	0	0	2	1	50	-	50	-
5	PEC	ECST6003	Programme Elective-II	3	0	0	3	50	50	100	3
6	PEC	ECSP6003	Programme Elective-II Lab	0	0	2	1	50	-	50	-
7	PEC	ECST6004	Programme Elective-III	3	0	0	3	50	50	100	3
8	PEC	ECSP6004	Programme Elective-III Lab	0	0	2	1	50	-	50	-
9	MDM	ECST6005	Data Handling and Visualization	2	0	0	2	50	50	100	2
10	VSEC	ECSP6006	Software Laboratory-II	0	0	4	2	50	-	50	
11	FP	ECSP6007	Project-1	0	0	4	2	50	50	100	-
TOTAL				**14**	**0**	**16**	**22**				
				30 Hrs.							

Exit option : Award of UG Degree with additional 8 credits			
Exit Course			
1	TBI Internship	Online/offline Certification Course	8
2	Centre for Microsystem Internship		8
3	Research Internship		8

Teaching Scheme for B. Tech. Electronics and Computer Science

SEMESTER-VII											
Sr. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**	**Maximum Marks**			**ESE Duration(Hrs)**
				L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**	
1	PCC	ECST7001	Computer Networks	3	0	0	3	50	50	100	3
2	PCC	ECSP7001	Computer Networks Lab	0	0	2	1	50	-	50	-
3	PCC	ECST7002	SOC Design	3	0	0	3	50	50	100	3
4	PCC	ECSP7002	SOC Design Lab	0	0	2	1	50	-	50	-
5	PCC	ECST7003	Information Security and Cryptography	3	0	0	3	50	50	100	3
6	MDM	ECST7004	Digital Signal Processing	3	0	0	3	50	50	100	3
7	PEC	ECST7005	Program Elective-IV	3	0	0	3	50	50	100	3
8	PRJ	ECSP7006	Project-2	0	0	4	2	50	50	100	-
9	FP	ECSP7007	Internship Evaluation	0	0	2	0				
TOTAL				**15**	**0**	**10**	**19**				
				25 Hrs.							

Teaching Scheme for B. Tech. Electronics and Computer Science

SEMESTER-VIII											
Sr. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**
				L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**	
1	PEC	ECST8001	Program Elective-V	3	0	0	3	50	50	100	3
2	PEC	ECST8002	Program Elective-VI	3	0	0	3	50	50	100	3
3	PRJ	ECSP8003	Project-3	0	0	12	6	50	50	100	-
TOTAL				**6**	**0**	**12**	**12**				
				18 Hrs.							
OR											
1	Internship/ OJT	ECSP8006	Industry Internship/ TBI Internship/ Research Internship	0	0	24	12	50	50	100	-
TOTAL				**24 Hrs.**			**12**				

Teaching Scheme for B. Tech. Electronics and Computer Science

HONORS Specialization in Electronics and Computer Science (AI for edge computing)

Sr. No.	Semester	Course Code	Course Title	Hours/ week			Credits	Maximum Marks			ESE Duration (Hrs.)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	III	ECSTH3100	Fundamentals of Artificial intelligence and Edge Computing	3	0	0	3	50	50	100	3
2	IV	ECSTH4100	Single dimension signal processing on Edge	3	0	0	3	50	50	100	3
3	V	ECSTH5100	Image and Video Signal Processing on Edge	3	1	0	4	50	50	100	3
4	VI	ECSTH6100	Computer vision with Embedded Machine Learning	3	1	0	4	50	50	100	3
5	VII	ECSPH7100	Honors Project	0	0	8	4	50	50	100	-
				12	**2**	**8**	**18**				

MINOR Specialization in Electronics and Computer Science (IoT)

Sr. No.	Semester	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
								Continuous Evaluation	End Sem Exam	Total	
1	III	ECSTM3100	IoT fundamentals	3	0	0	3	50	50	100	3
2	IV	ECSTM4100	Sensor Interfacing with Arduino and ESP8266	3	0	0	3	50	50	100	3
3	V	ECSTM5100	Cloud Computing Using Raspberry Pi	3	1	0	4	50	50	100	3
4	VI	ECSTM6100	Data Management and Analytics for IoT	3	1	0	4	50	50	100	3
5	VII	ECSPM7100	Minor Project	0	0	8	4	50	50	100	-
			Total	**12**	**2**	**8**	**18**				

HONORS Specialization in Research

1	RM	ECST8004	Research Methodology	4	0	0	4	50	50	100	3
2	PRJ	ECSP8005	Research Internship	0	0	28	14	50	50	100	-
TOTAL				**4**	**0**	**28**	**18**				
				32 Hrs.							

Programme Electives

Micro Specialization		Semester V	Semester VI		Semester VII	Semester VIII	
		Elective-I	**Elective-II**	**Elective-III**	**Elective-IV**	**Elective-V**	**Elective-VI**
AI/ML	**Course Code**	ECST5005-1/ ECSP5005-1	ECST6003-1/ ECSP6003-1	ECST6004-1/ ECSP6004-1	ECST7005-1	ECST8001-1	ECST8002-1
	Course Name	Deep Learning-I	Image Processing	Deep Learning-II	Natural Language Processing	Generative Adversarial Network	Reinforcement Learning
VLSI	**Course Code**	ECST5005-2/ ECSP5005-2	ECST6003-2/ ECSP6003-2	ECST6004-2 / ECSP6004-2	ECST7005-2	ECST8001-2	ECST8002-2
	Course Name	VLSI Signal Processing	C Based VLSI Design	Design for Testability	Advanced Computer Architecture	Flexible Electronics and Sensors	Nano Electronics
IoE	**Course Code**	ECST5005-3/ ECSP5005-3	ECST6003-3/ ECSP6003-3	ECST6004-3 / ECSP6004-3	ECST7005-3	ECST8001-3	ECST8002-3
	Course Name	IoT Sensors and Devices	IoT Networks and Protocols	IoT Programming and Big Data	Cyber Security and Privacy in IoT	Autonomous Vehicle	Capstone Project
General	**Course Code**	ECST5005-4/ ECSP5005-4	ECST6003-4/ ECSP6003-4	ECST6004-4 / ECSP6004-4	ECST7005-4	ECST8001-4	ECST8002-4
	Course Name	Cloud Computing	Data Mining and Warehousing	Big Data Web Intelligence	System Design	Block Chain	Sales Force

List of Open Electives

Sr.No.	Semester	Course Code	Course Name
1	III	ECST2980	Basics of Linux Operating System
2	IV	ECST2990	Designing with Raspberry Pi
3	V	ECST3980	Programming for Vedic Mathematics Sutras

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	PHT1007				
Category	Basic Science Course				
Course Title	Physics				
Scheme & Credits	L	T	P	Credits	Semester
	2	1	0	3	I

Course Outcomes

On successful completion of the course, students will be able to

1. Outline the difference between intrinsic/extrinsic semiconductors and their carrier transport phenomena in semiconductor.
2. Illustrate the working and design aspects for the various photonic devices like LEDs, solar-cells and LASER diodes.
3. Classify materials on the basis of band theory and its importance for semiconductors.
4. Apply fundamental knowledge of quantum mechanics to examine electrons behaviour in solids at the quantum level.
5. Analyze the process of generation and recombination of excess charge carriers in semiconductors along with working principle of P-N junction and Metal-Semiconductor junction diode

Syllabus

Module 1 Introduction to Quantum Mechanics
Wave-particle duality, Heisenberg uncertainty relations, the quantum state wave function and its probability interpretation, Schrodinger's equation, Particle in an infinite potential well, Quantum tunneling,

Module 2 Electronic Materials
Formation of energy bands in solids, Classification of electronic materials, Kronig-Penny model, E-k diagram, Direct and indirect bandgaps, Valence and conduction bands, Density of states, Fermi-Dirac statistics, Fermi level, Effective mass.

Module 3 Intrinsic and Extrinsic Semiconductors
Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier transport: diffusion and drift

Module 4 Non-Equilibrium Semiconductors
Carrier generation and recombination, Continuity equation, Ambipolar transport equation, Quasi-Fermi Energy levels, Excess Carrier Lifetime, Qualitative introduction to recombination mechanisms.

Module 5 Junction Physics
p-n junction diode, Zero-applied bias, forward bias, reverse bias, Application of diode as a rectifier, Zener diode, Special diodes: Tunnel diode, Schottky diode, Ohmic contacts, NPN and PNP transistor and its characteristics,classification

Module 6 Optoelectronic Devices
Optical absorption in semiconductors**,** Light emitting diodes, Laser diode, Stimulated emission and photon amplification, Einstein Coefficients, Solar Energy Spectrum, Solar
Cells

Text Book(s)

1. Semiconductor Physics and Devices (Fourth Edition), Donald A. Neamen, McGraw-Hill 2012.
2. Semiconductor Device Physics and Design, Umesh K Mishra and Jasprit Singh, Springer 2008.
3. Electronic Devices and Circuits, Jacob Millman, Christos C. Halkias, McGraw Hill 1967.

References

1. Optoelectronics and Photonics: Principles and Practices by S. O. Kasap, Prentice Hall2001
2. Physics of Semiconductor Devices, Simon M. Sze, Wiley-Interscience (1981)

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	PHP1007				
Category	Basic Science Course				
Course Title	Physics Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course ,students will be able to

1. Develop skills required for experimentation and verification of physics laws.
2. Analyse the results obtained through proper graph plotting and Error analysis.
3. Conduct experiments to validate physical behaviour of materials/components.
4. Analyse the behaviour and characteristics of P-N Junction, Zener-Diode and other semiconductor devices.
5. Prepare laboratory reports on interpretation of experimental results

List of Experiments

1. Parameter extraction from V-I characteristics of a diode
2. Parameter extraction from V-I characteristics of a transistor
3. Analysis of diode rectifier
4. Resistivity measurement of semiconductor by Four Probe method
5. Performance and analysis of HallEffect in semiconductor to determine the Hall coefficient and carrier concentration of the majority carriers in the given specimen
6. Estimation of energy gap in semiconductor
7. Characteristics and analysis of solar cells
8. Verification of Ohm's law and error analysis of the data using Linear Least Square Fit (LLSF) method
9. Analysis of energy values and wave function using Mathematica software
10. Verification of Planck's constant

Reference: Laboratory manual of the Physics Department, RCOEM.

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	MAT1001				
Category	Basic Science Course				
Course Title	Applied Mathematics-I				
Scheme & Credits	L	T	P	Credits	Semester
	2	1	0	3	I

Course Outcomes

On successful completion of the course, students will be able to

1. Recognize first order ordinary differential equations that can be solved by each of the four methods – Linear DE, ExactDE, reducible to linear DE and reducible to exact differential equationsand use the appropriate method to solve them.
2. Solve higher order ordinary differential equations with constant and variable coefficients.
3. Find best fit curve by method of least square method and calculate correlation, regressions.
4. Recognize and understand discrete, continuous probability distributions and apply Binomial distribution, Poisson distribution and Normal distribution to appropriate problems.
5. Internalize multivariable calculus and apply it find Jacobians, maxima and minima of function/Solve numerical integrations by Newton coat formulas and Gauss-Legendre Quadrature.

Syllabus

Module 1:First order ordinary differential equations

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree:equations solvable for p, equations solvable for y, equations solvable for x and Clairaut'stype, Applications of First order Differential Equations.

Module 2:Ordinary differential equations of higher orders

Second order linear differential equations with constant and variable coefficients, method of variation of parameters, Cauchy-Euler equation. Applications of Higher order Differential Equations.

Module 3: Statistics:

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves, correlation and regression – Rank correlation, Multiple regression and correlation and its application in Engineering.

Module 4: Differential Calculus

Taylor's and Maclaurin's series expansions, radius of curvature (Cartesian form), evolutes and involutes, Limit and continuity of functions of several variables and their partial derivatives, Eulers Theorem, chain rule, total derivative, Jacobians, Maxima, minima and saddle points; Method of Lagrange multipliers.

Module 5: Probability: (For All Branches except Mechanical Branch)
Probability spaces, conditional probability, independence, Bay's Theorem, Discrete random variables, Binomial distribution, Poisson distribution, Normal distribution. Relation between binomial, Poisson and Normal distributions.

OR

Module 5: Numerical Integration (Only for Mechanical Branch)
Simpson's 1/3rd rule, 3/8th rule, Trapezoidal rule, Gauss-Legendre Quadrature.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7.Theory and Problems of probability and statistics : 2nd ed :J. R. Spiegal ,Schaum series
8. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune VidhyarthiGrihaPrakashan, Pune-411030 (India).
9.S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	MAP1001				
Category	Basic Science Course				
Course Title	Computational Mathematics Lab				
Scheme & Credits	L	T	P	Credit	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Download SageMath and use it as an advance calculator.
2. Sketch and analyze function graphs.
3. Apply the concepts of differential calculus to find extreme value of continuous functions and analyze solutions of differential equations
4. Evaluate improper integrals and its applications to find length, area, volume, centre of gravity and mass.
5. Analyze and calculate eigen values, eigen vectors, rank nullity, and solve system of linear equations of a matrix / linear map.
6. Analyze the data to find best fit curve.

List of experiments

1. To use SageMath as advanced calculator
2. 2D Plotting with SageMath
3. 3D Plotting with SageMath
4. Differential Calculus with SageMath
5. Solution of differential equations in SageMath
6. Basics of Linear Algebra
7. Curve Fitting by using SageMath
8. Integral Calculus with SageMath

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	CHP1002				
Category	Basic Science Course				
Course Title	Environmental Science Lab				
Scheme & Credits	L	T	P	Credit	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Estimate different physicochemical parameters of water as well as Air and their analysis methods
2. Explain the uses of greener and sustainable routes for the synthesis of biofuels/nano-materials.
3. Determine nutrients/pollutants in soil sample.

List of Experiments

1. Determination of pH, turbidity and TDS present in given water/ waste water sample
2. Determination of conductivity present in given water/ waste water sample.
3. Determination of Dissolved Oxygen content in various natural sources of water/ waste water sample
4. Determination of Chemical Oxygen Demand (COD) present in various natural sources of water/ waste Water sample.
5. Determination of free residual chlorine in water/waste water sample.
6. Determination of concentration of acid in the beverage
7. Identification of micro plastics in the given water sample
8. Estimation of Copper metal from e-waste
9. Green synthesis of Biodiesel (transesterification of oil)
10. Green synthesis of Metal nanoparticles by using various plant extract
11. Demonstration on measuring ambient air quality by using Air Quality Analyzer
12. Determination of particulate matter in the air using a High Air Volume Sampler.
13. Identification of Alkali/Alkaline earth metal in water/waste water using flame photometer.
14. Determination of Organic Carbon/Total Iron/Total Nitrogen/Phosphorous/Potassium/Sulphur in Soil sample.

Text Books

1. A Textbook on Experiments and Calculations in Engineering Chemistry by S.S. Dara, S.Chand Publications
2. Advanced Practical Physical Chemistry by J.B. Yadav, Krishna's Prakashan Media (P) Limited

Reference Books

1. Collection of Interesting General Chemistry Experiments , A by A.J.Elias Universities Press Publications
2. College Practical Chemistry by V.K.Ahluwalia , S,Dhingra and A. Gulati, Universities Press Publications
3. Standard Methods for the Examination of Water and Wastewater, American Public Health Association, American Water works Association, Water Environment Federation

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	ECST1001				
Category	Engineering Science Course				
Course Title	Programming for Problem Solving				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	I

Course Outcomes

On successful completion of the course, students will be able to

1. Develop the fundamentals of C programming and choose the loops and decision-making statements to solve and execute the given problem.
2. Formulate simple algorithms for arithmetic and logical problems, translate the algorithms to programs, test and execute the programs and correct syntax and logical errors.
3. Use arrays, pointers, structures and I/O operations for the formulation of algorithms and programs.
4. Apply programming concepts to solve matrix addition, multiplication problems and searching & Sorting problems.
5. Implement iterations and recursions, to decompose a problem into functions and synthesize a complete program using divide and conquer approach.

Syllabus

Module 1 Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. Arithmetic expressions and precedence.

Module 2 C Programming Language

Introduction to C language: Keywords, Constant, Variable, Data types, Operators, Types of Statements ,Pre-processor Directives, Decision Control Statement-if, if-else, nested if-else statement, switch case, Loops and Writing and evaluation of conditionals and consequent branching.

Module 3 Arrays and Basic Algorithms

Arrays:1-D,2-D,Character arrays and Strings. Searching, Basic Sorting Algorithms, Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Module 4 Functions and Recursion

User defined and Library Functions, Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference. Recursion: As a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series.

Module 5 Pointers and Structures

Structures, Defining structures, Array of Structures, Introduction to pointers, Defining pointers, Pointer arithmetic, pointer operators, Use of Pointers in self-referential structures.

Module 6 File handling

Streams in C, Types of Files, File Input /Output Operations: Modes of file opening, Reading and writing the file, Closing the files using f flush().

Text Books

1. Programming in ANSIC:E. Balguruswami Mc GrawHill
2. Mastering C: K. R. Venugopal and S.R. Prasad, Tata Mc GrawHill

Reference Books

1. Programming with C:Byron Gottfried,Schaums Outline Series.
2. Let Us C:Yashwant Kanetkar, B P B Publication

Course Code	ECSP1001				
Category	Engineering Science Course				
Course Title	Programming for Problem Solving Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

List of Experiments

1. Using basic data types of C, implement arithmetic expressions.
2. Implement Programs using Decision Control Structures
3. Demonstrate use of Loop Control Structures
4. Implement Programs using Multi-way Decision Control Structures (Switch Case)
5. Apply Functions and Recursion to simply programs.
6. Initialize array and apply it to solve problems of 1D and 2D arrays.
7. Demonstrate use of Structures and Pointers.
8. Apply file handling concepts in C.

Note :- 2/3 Practice Programs will be taken on each of the experiments mentioned above.

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	ECST1002				
Category	Engineering Science Course				
Course Title	Fundamentals of Computer Engineering				
Scheme & Credits	L	T	P	Credits	Semester
	2	0	0	2	I

Course Outcomes

On successful completion of the course, students will be able to

1. Understand the basic components of computer systems and its functionality.
2. Understand data representation and the storage of data within a computer system.
3. Understand how computers can be linked together to share information and resources using worldwide network of networks.
4. Describe the functions of operating system and its role as a resource manager to execute any application.
5. Explore use cases and applications of AI, understand AI concepts and terms like machine learning, deep learning and neural networks.

Syllabus

Module 1

Introduction to Computer Science: Role of Algorithms, History of Computing, Science of Algorithms, Abstractions. Basics of data encoding and storage: Bits and their storage, Number system, Main memory, Mass Storage, Representing Information as Bit Patterns. Machine Architecture: CPU Basics, Stored Program concepts, Machine Language Introduction with example, Program Execution with illustrative example.

Module 2

Operating Systems: History of OS, OS Architecture, Coordinating Machine Activities. Networking and the Internet: Network Fundamentals, the Internet, the World Wide Web. Software Engineering: Introduction, Software Life Cycle. Database Systems: Database Fundamentals, Relational Model.

Module 3

Introduction to Artificial Intelligence: Intelligence and Machines, Perception, Reasoning, Machine Learning, Artificial Neural Networks, Deep Learning. Computer Graphics: Scope of Computer Graphics.

Text Books

1.Brookshear J. G., "Computer science: an overview", Eleventh Edition, Addison-Wesley Publishing Company; 2011.

Reference Books

1. Silberschatz A., Gagne G, Galvin P. B.,"Operating system concepts", Ninth Edition, Wiley, 2012.
2. Cobbaut P., "Linux Fundamentals", Samurai Media Limited, 2016.
3. Silberschatz A, Korth HF, Sudarshan S.,"Database system concepts", Sixth Edition, McGraw Hill, 2010.
4. Kurose J. F., Ross K. W., "Computer networking: a top-down approach", Sixth Edition, Pearson, 2013.
5. Peter Norvig and Stuart J. Russell, "Artificial Intelligence: A Modern Approach", Pearson, Third edition, 2010.

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	ECST1003				
Category	Programme Core Course				
Course Title	Electronics and Computer Workshop				
Scheme & Credits	L	T	P	Credits	Semester
	1	0	0	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Inspect techniques to identify and test different Electronic components and Integrated Circuits.
2. Comprehend different EDA tools required for designing of Electronic and computer related circuits.
3. Classify mounting and troubleshooting practices and OS installation
4. Understand data visualization and business intelligence tools

Syllabus

Module 1 Basic Electronic Components Testing and Measurement

Basic electronic components, data sheets, electronic test and measurement equipments: multi meter, Cathode Ray Oscilloscope (CRO), Digital storage oscilloscope(DSO), function generator, power supply, spectrum analyzer etc.

Module 2 Switches (Electronic and Network)

Types of Switches – Construction, Working, Characteristics & Applications

Module 3 Internet of Things (IoT) Sensors and Actuators

Types, Characteristics & Applications

Module 4 Computer Hardware and Software

Assembling and disassembling CPU and identification of peripherals, Processor mounting and troubleshooting practices, USB, Ethernet, HDMI, thunderbolt port variants (peripherals), Types of OS and OS installation, OS imaging.

Module 5 Data visualization and business intelligence tools: Power BI and Tableau

Features, Architecture, Data Modeling, Dashboard Design, Data Sources

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	ECSP1003				
Category	Programme Core Course				
Course Title	Electronics and Computer Workshop Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

1. Identification and testing of Resistors with the help of Color-Bands & by use of Multimeter and verify difference in the values.
2. Identify the various types of Capacitances and Find out the values using Color Code/written values on them.
3. Identify the terminals of a Diode and its Polarity, Identify the terminals of a Transistor and its Type (NPN or PNP)
4. Identify the various tools & write down their uses. Material required: various tools -Wire Cutter, Wire Stripper -Various types of Pliers-Vice.- Crimping Tools (RJ-11/RJ-45) -Screw-Driver
5. Identify the various type of connectors used in various Gadgets & Instruments/Equipments.
6. Solder the joint connection of wires and check it. De-soldering and Re-soldering
7. Familiarization of function generator & Power Supply and perform measurements using it.
8. Learn cathode ray oscilloscope, DSO and perform measurements.
9. Assembling of electronic circuits using SMT (Surface Mount Technology) stations
10. Study of peripherals of a computer and its functions.
11. Assembling and disassembling of PC
12. Installation of Operating Systems – Windows 30 4 Installation of Operating Systems –LINUX 36
13. Hardware Troubleshooting and Software Troubleshooting
14. Understand modern application development A • HTML B • Wordpress C • Drupal
15. Familiarization and application of data visualization and business intelligence tools: Power BI and Tableau
16. Project

Text Books

1.K. A. Navas; Electronics lab Manual; Fifth Edition; PHIlearning;2015
2.N. Kumar, T. H. Sheikh;PC Assembly and Installation; Books clinic Publishing; 2020

Reference books

1.C.Bhargava ;Digital Electronics :A Comprehensive Lab Manual;B S Publication; 2019
2.C. Zacker; PC Hardware: The Complete Reference; First Edition; McGraw HillEducation; 2017

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	HUT1002				
Category	HSSM-AEC				
Course Title	English for Professional Communication				
Scheme & Credits	L	T	P	Credits	Semester
	2	0	0	2	I

Course Outcomes

On successful completion of the course, students will be able to

1. Demonstrate effective use of word power in written as well as oral communication.
2. Understand the techniques of listening and apply the techniques of reading comprehension used in professional communication.
3. Apply the principles of functional grammar in everyday as well as professional communication.
4. Effectively implement the comprehensive principles of written communication by applying various writing styles.
5. Create precise and accurate written communication products.

Syllabus

Module 1 Vocabulary Building

Importance of using appropriate vocabulary
Techniques of vocabulary development
Commonly used power verbs, power adjectives and power adverbs.
Synonyms, antonyms, phrases & idioms, one-word substitutions and standard abbreviations

Module 2 Listening and Reading Comprehension

Listening Comprehension: active listening, reasons for poor listening, traits of a good listener, and barriers to effective listening
Reading Comprehension: types and strategies.

Module 3 Functional Grammar and Usage

Identifying Common Errors in use of: articles, prepositions, modifiers, modal auxiliaries, redundancies, and clichés
Tenses
Subject-verb agreement, noun-pronoun agreement
Voice

Module 4 Writing Skills

Sentence Structures
Sentence Types
Paragraph Writing: Principles, Techniques, and Styles

Module 5 Writing Practices

Art of Condensation: Précis, Summary, and Note Making
Correspondence writing techniques and etiquettes – academic writing
Essay Writing

Reference Books

1. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
2. Practical English Usage. Michael Swan. OUP. 1995.
3.Remedial English Grammer .F.T Wood Macmillan 2007
4. On Writing Well.William Zinsser. Harper Resource Book. 2001
5.Study Writing . Liz Hamp-Lyons and Ben Heasly. Cambridge University Pree 2006
6. Exercises in Spoken English. Parts. I-II .CIEFLL, Hyderabad. Oxford University Press

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	HUP1002				
Category	HSSM-AEC				
Course Title	English for Professional Communication Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Apply effective listening and speaking skills in professional and everyday conversations.
2. Demonstrate the techniques of effective Presentation Skills
3. Evaluate and apply the effective strategies for Group Discussions
4. Analyse and apply the effective strategies for Personal Interviews
5. Implement essential language skills- listening, speaking, reading, and writing

Syllabus

List of practicals

Computer Assisted and Activity Based Language Learning

1. Everyday Situations: Conversations and Dialogues – Speaking Skills
2. Pronunciation, Intonation, Stress, and Rhythm
3. Everyday Situations: Conversations and Dialogues – Listening Skills

Activity Based Language Learning

4. Presentation Skills: Orientation & Mock Session
5. Presentation Skills: Practice
6. Group Discussions: Orientation & Mock Session
7. Group Discussions: Practice
8. Personal Interviews: Orientation & Mock Session
9. Personal Interviews: Practice

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Title: Liberal / Performing Arts

Course Code	Course Name	Sem.	Hours/ week	Credits	Continuous Evaluation Max. marks
HUP0001-1	Fundamentals of Indian Classical Dance: Bharatnatayam	I	2	1	50
HUP0001-2	Fundamentals of Indian Classical Dance: Kathak	I	2	1	50
HUP0001-3	Introduction to Digital Photography	I	2	1	50
HUP0001-4	Introduction to Japanese Language and Culture	I	2	1	50
HUP0001-5	Art of Theatre	I	2	1	50
HUP0001-6	Introduction to French Language	I	2	1	50
HUP0001-7	Introduction to Spanish Language	I	2	1	50
HUP0001-8	Art of Painting	I	2	1	50
HUP0001-9	Art of Drawing	I	2	1	50
HUP0001-10	Nature camp	I	2	1	50
PEP0001-21	Disaster Management through Adventure Sports	I	2	1	50
PEP0001-22	Self-defense Essentials and Basics Knowledge of Defense forces	I	2	1	50
CHP0001-31	Art of Indian traditional cuisine	I	2	1	50
CHP0001-32	Remedies by Ayurveda	I	2	1	50

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	HUP0001-1				
Category	Co-Curricular Activity				
Course Title	Fundamentals of Indian Classical Dance: Bharatnatayam				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Understand the importance of dance and Bharatnataym as an Indian dance form
2. Develop skills to perform the dance form at its basic level.
3. Evaluate their strengths and interest to take bridge course to give Pratham (1^{st} level formal exam of Bharatnatayam).

Syllabus

1.Orientation in Bharatnatayam
2.Tattu Adavu till 8, NaattaAdavu 4 Steps, PakkaAdavu 1 step, Metta Adavu 1 Step, Kuditta Metta Adavu 4 Steps
3. Practice sessions
4.Tatta Kuditta Adavu (Metta), Tatta Kuditta Adavu (Metta) 2 Steps, Tirmanam Adavu 3 Steps, Kattu Adav - 3 Steps, Kattu Adav - 3 Steps
5. Practice sessions
6. Tiramanam (front) 3 Steps, Repeat of Tiramanam (Overhead) 3 Steps
7.Practice sessions
8.Final practice sessions and performances.

Recommended reading

1.Introduction to Bharata's Natyasastra, Adya Rangacharya, 2011
2.The Natyasastra and the Body in Performance: Essays on the Ancient Text, edited by Sreenath Nair, 2015
3.Bharatanatyam How to ... : A Step-by-step Approach to Learn the Classical Form, Eshwar Jayalakshmi, 2011

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	HUP0001-2				
Category	Co-Curricular Activity				
Course Title	Fundamentals of Indian Classical Dance: Kathak				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Understand the importance of dance and Kathak as an Indian dance form
2. Develop skills to perform the dance form at its basic level.
3. Evaluate their strengths and interest to take bridge course to give Prarambhik (1st level formal exam of Kathak).

Syllabus

1.Orientation in Kathak. Correct posture of kathak, Basic Movements and exercise Stepping, Chakkar of 5 count (Bhramari),
2.practice sessions of practical 1
3.Hastaks, Hastaks and Steppings, Reciting asamyukta Mudra shloka, Hastak and steppings
4.practice sessions of practical 3
5.Todas and Asamyukta hasta mudra shlok, Vandana of Shlok, 2 Todas and Vandana, Ghante Ki Tihai,
6.practice sessions of practical 5
7.2 1 Chakkardar Toda and Ginnti Ki Tihai, 2 Todas and 1 Chakkardar Toda, practice sessions
8.Final performances.

Recommended reading

1.Kathak Volume1 A "Theoretical & Practical Guide" (Kathak Dance Book), Marami Medhi & Debasish Talukdar, 2022, Anshika Publication (13 September 2022)

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	HUP0001-3				
Category	Co-Curricular Activity				
Course Title	Introduction to Digital Photography				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to
1. Develop an understanding of the technical aspects and aesthetics of Photography.
2. Apply the rules of digital photography for creating photographs.
3. Develop skills to enhance photographs through post processing.
4. Create a portfolio of their photographs in selected genre.

Syllabus

1. Orientation in digital photography**:** Genres, camera handling and settings
2. Rules of Composition
3. Rules of Composition: practice sessions
4. Understanding Exposure and Art of Pre-Visualization
5. Rules of Composition andArt of Pre-Visualization: practice sessions
6. Post Processing Photographs and Portfolio creation
7. Post Processing Photographs: practice sessions
8. Portfolio finalization and presentation in selected genre.

Reference material

1. Scott Kelby (2020) The Digital Photography Book: The Step-by-Step Secrets for how to Make Your Photos Look Like the Pros, Rocky Nook, USA
2. Larry Hall (2014) Digital Photography Guide: From Beginner to Intermediate: A Compilation of Important Information in Digital Photography, Speedy Publishing LLC, Newark
3. J Miotke(2010) BetterPhoto Basics: The Absolute Beginner's Guide to Taking Photos Like a Pro, AMPHOTO Books, Crown Publishing Group, USA

Course Code	HUP0001-4				
Category	Co-Curricular Activity				
Course Title	Introduction to Japanese Language and Culture				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to
1. Gain a brief understanding about Japan as a country and Japanese culture.
2. Develop ability to use vocabulary required for basic level communication in Japanese language.
3. Write and read the first script in Japanese language.
4. Frame simple sentences in Japanese in order to handle everyday conversations
5. Write in basic Japanese about the topics closely related to the learner.

Syllabus

1.Orientation about Japan, its language, and its culture
2.Communication Skills 1: Vocabulary for basic Japanese language
3. Practice sessions
4.Writing Skills 1: Reading and writing first script in Japanese
5.Practice sessions
6.Communication Skills 2: framing sentences
7.Practice sessions
8.Writing Skills 2: Write basic Japanese and practice

Recommended reading

1.Marugoto Starter (A1) Rikai - Course Book for Communicative Language Competences, by The Japan Foundation, Goyal Publishers & Distributors Pvt. Ltd (ISBN: 9788183078047)
2.Japanese Kana Script Practice Book – Vol. 1 Hiragana, by AmeyaPatki, Daiichi Japanese Language Solutions (ISBN: 9788194562900)

Course Code	HUP0001-5				
Category	Co-Curricular Activity				
Course Title	Art of Theatre				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Understand and synthesize the working of the prominent genres of theatre across the world.
2. Apply the skill of voice and speech in theatre and public speaking
3. Apply the art of acting and also develop generic skills such as confidence, communication skills, self-responsibility, motivation,commitment, interpersonal skills, problem solving, and self-discipline.
4. Apply the skills, acquired related to technical/production aspects of theatre and also develop problem solving and interpersonal skills.

Syllabus

1. Orientation in theatre
2. Voice and Speech training
3. Voice and Speech training: practice sessions
4. Art of acting
5. Art of acting: practice sessions
6. Art of script writing
7. Art of script writing: practice sessions
8. Final performances

Reference books

1. Boleslavsky, R. (2022). Acting: The First Six Lessons (1st ed., pp. 1-92). Delhi Open Books.
2. Shakthi, C. (2017). No Drama Just Theatre(1st ed., pp. 1-171). Partridge.
3. Bruder, M., Cohn, L. M., Olnek, M., Pollack, N., Previto, R., &Zigler, S. (1986). A Practical Handbook for the Actor (1st ed.). Vinatge Books New York.

Course Code	HUP1003-6				
Category	Co-Curricular Activity				
Course Title	Introduction to French Language				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to
1. Demonstrate basic knowledge about France, the culture and similarities/differences between India and France
2. Learn to use simple language structures in everyday communication.
3. Develop ability to write in basic French about themselves and others.
4. Develop ability to understand beginner level texts in French

Syllabus

List of Practicals

1. Orientation about France, the language, and culture
2. Communication Skills 1: Vocabulary building for everyday conversations
3. Practice sessions
4. Reading and writing Skills : Reading and writing simple text in French
5. Practice sessions
6. Communication Skills 2: listening comprehension
7. Practice sessions
8. Writing Skills: Write basic French and practice

Recommended reading

1. 15-minute French by Caroline Lemoine
2. Cours de Langue et de Civilisation Françaises by G. Mauger Vol. 1.1
3. Cosmopolite I by Natalie Hirschsprung, Tony Tricot

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code					
Course Code	HUP0001-7				
Category	Co-Curricular Activity				
Course Title	Introduction to Spanish Language				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Demonstrate basic knowledge about Spain, the culture and similarities/differences between India and France
2. Learn to use simple language structures in everyday communication.
3. Develop ability to write in basic Spanish about themselves and others.
4. Develop ability to read and understand beginner level texts in Spanish

Syllabus

List of Practicals

1. Orientation about Spain, the language, and culture
2. Communication Skills 1: Vocabulary building for everyday conversations
3. Practice sessions
4. Reading and writing Skills : Reading and writing simple text in Spanish
6. Communication Skills 2: listening comprehension
7. Practice sessions
8.Writing Skills: Write basic Spanish and practice

Recommended reading

1.15-Minute Spanish by Ana Bremon
2.Aula Internacional 1 by Jaime Corpas ,Eva Garcia, Agustin Garmendia.
3.Chicos Chicas Libro del Alumno by María Ángeles Palomino

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	HUP0001-8				
Category	Co-Curricular Activity				
Course Title	Art of Painting				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to
1.Become familiar with the basic methods, techniques & tools of painting.
2. Train the eye and hand to develop sense of balance, proportion and rhythm.
3. Develop the ability to observe and render simple natural forms.
4. Enjoy the challenging and nuanced process of painting.

Syllabus

1.Orientation in Painting tools & basics of lines, shapes, light, shadows and textures
2.The art of observation how to see shapes in drawing
3.Introduction Water colorhow to handle water paints
4.:Introduction to acrylic colorshow to handle acrylic paints
5.Explore layering paint and capturing the quality of light with paint.
6. Create landscape painting
7.Create Abstract painting
8. Paint on Canvas (try to recreate any famous painting)

Reference material

1. Drawing made easy by Navneet Gala; 2015th edition
2. Alla Prima II Everything I Know about Painting--And More by Richard Schmid with Katie Swatland
3.Daily Painting: Paint Small and Often To Become a More Creative, Productive, and Successful Artist by Carol Marine

Syllabus of Semester I B.Tech.

Department of Electronics and Computer Science

Course Code	HUP0001-9				
Category	Co-Curricular Activity				
Course Title	Art of Drawing				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Become familiar with the basic methods, techniques & tools of drawing.
2. Train the eye and hand to develop sense of balance, proportion and rhythm.
3. Develop the ability to observe and render simple natural forms.
4. Enjoy the challenging and nuanced process of drawing.

Syllabus

1. Orientation in Drawing tools & basics of lines, shapes, light, shadows and textures
2. The art of observation how to see shapes in drawing
3. One/two-point basic linear perspective
4. Nature drawing and landscapes
5. Gestalt principles of visual composition
6. Figure drawing: structure and proportions of human body
7. Gesture drawing: expression and compositions of human figures
8. Memory drawing: an exercise to combine the techniques learnt

Reference material

1. Drawing made easy by Navneet Gala; 2015th edition
2. Perspective Made Easy (Dover Art Instruction) by Ernest R. Norling

Course Code	HUP0001-10				
Category	Co-Curricular Activity				
Course Title	Nature Camp				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to
1. Develop an affinity with nature by observing and understanding it marvels with guidance from experts
2. Develop an understanding of the challenges and solutions associated with nature and its conservation.

Course content

In collaboration with the Forest Department and/or a local NGO working in the field of environment conservation, this course would be conducted in 24 hours. Students will be taken to a tiger reserve in Vidarbha region or Forest fringe villages or work with an NGO from Vidarbha region working on natural resource management. The camps (for 2 days) will cover any one of the following topics as decided by the course coordinator:

1. Awareness about each element of biodiversity (camps on moths, butterflies, birds, other wildlife etc)
2. Environment management (water, forest, wildlife) – practices of Forest Department in managing a tiger reserve, and other aspects of water and forest conservation.
3. Sustainable natural resource management - initiatives by rural communities and local NGOs
4. Man-animal conflict and solutions (socio-economic and technical) – role of local communities and Forest Department
5. Traditional practices in environment conservation – role of local communities and local NGOs

Course Code	PEP0001-21				
Category	Co-Curricular Activity				
Course Title	Disaster Management Through Adventure Sports				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On completion of the course, students will be able to

1. Understand the meaning and importance of Adventure sports.
2. Learn the various types of adventure sports, the equipment and resources required to practicedisaster Management activities.
3. Learn the safety measures about different risk and their management.
4. To apply Disaster management theory to institutional & Societal problems and situations.

Syllabus

1. Basic adventure
2. First AID
3. various types of knots
4. Shelter making
5. Disaster management
6. Team building and goal setting
7. Realization of fear, risk and their roles and analysing safety Management Plan

Course Code	PEP0001-22				
Category	Co-Curricular Activity				
Course Title	Self-defense Essentials and Basics Knowledge of Defense forces				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to

- Understand the meaning, need and fitness requirements to implement self-defense
- Learn the basic techniques of selected combative sports.
- Learn to prepare basic Physical Training for Defense forces.
- Implement survival techniques during emergencies.

Syllabus

- General conditioning and self-defense specific conditioning
- Applications of techniques of combative sports for self-defense.
- Self-defense techniques for specific situations: chain snatching, knife or stick attack, holding fromback or front etc.
- Basic Military Knowledge and exposure making students Confident, bold, disciplined and trains themto join Armed Forces.

Course Code	CHP0001-31				
Category	Co-Curricular Activity				
Course Title	Art of Indian traditional cuisine				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Understand the factors that affect regional eating habits and the unique ingredients found in various states of India
2. Get insight to prepare popular dishes from various regions of India. ·

Module 1. Indian Regional foods and snacks - factors effecting eating habits.
Module 2. Indian gravies – ingredients, their importance
Module 3. Indian Sweets - ingredients, their importance
Module 4. Presentation of Indian Meals, Menu Planning, Food Costing
Module 5. Food Preservatives and Safety

List of experiments

1) Introduction to cookery : does and don'ts
2) Introduction to Indian cuisine, philosophy and classification.
3) Regional influence on Indian Food- factors affecting eating habits
4) Preparation of Garam masala and or Chat masala with ingredients and their importance
5) Preparation of different gravies such as white, yellow or brown gravies with ingredients and theirimportance
6) Preparation of Indian sweets like Besan ke laddu with ingredients and their importance
7) Presentation of meal, Menu planning and Food costing
8) Common chemical food preservatives and their safety standards.

Reference books

1. Arora, K.,; Theory of cookery; First Edition, Frank Brothers Company (Pub) Pvt.Ltd., 2008 ISBN:9788184095036, 8184095031
2. Philip, Thangam . E.,; Modern Cookery: Vol. 1; Sixth Edition, Orient BlackSwan., 2008 ISBN:9788125040446, 8125040447ali
3. Parvinder S;Quantity Food Production Operations and Indian Cuisine (Oxford Higher Education); FirstEdition; Oxford University Press, 2011 ISBN 10: 0198068492 ISBN 13: 9780198068495
4. Singh, Yogesh; A Culinary Tour of India; First Edition I.K. International Publishing House Pvt.Ltd. ISBN 978-93-84588-48-9
5. Singh Shakesh;Simplifying Indian Cuisine;First Edition, Aman Publications, ISBN81-8204-054X6.Dubey Krishna Gopal; The Indian Cuisine;PHI Learning Pvt. Ltd.ISBN978-81 203-4170-8

Course Code	CHP0001-32				
Category	Co-Curricular Activity				
Course Title	Introduction to Remedies by Ayurveda				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Know basic principle of Ayurvedic formulations.
2. Different types of Natural Remedies.
3. Basic idea about their Characterization

Module 1. Introduction to Ayurveda
Module 2. Different types of Ayurvedic formulations: Churn, Bhasma, Vati, Tailum
Module 3. Introduction to Methods of preparation
Module 4. Characterization, applications

Practicals based on above syllabus

1.Preparations of some medicinal oils like Bramhi tel, Bramhi Awala, Vatnashak Tel, Bhurngraj Tel etc.
2.Preparation of Churn, like Trifala Churn, Hingastak Churn, Trikut Churn etc.
3.Preparation of some Bhasmas and vati

Books

1. Chemistry and Pharmacology of Ayurvedic Medicinal Plants by Mukund Sabnis, Chaukhambha Amarbharati Prakashan.
2. Everyday Ayurveda by Shailesh Rathod
3. A text Book of Rasashastra by Vikas Dhole and Prakash Paranjpe
4. A text Book of Bhaiajya Kalpana Vij¯nana

Course Code	HUT1004				
Category	HSSM-VEC				
Course Title	Foundation Course In Universal Human Value				
Scheme & Credits	L	T	P	Credits	Semester
	1	0	0	1	I

Course Outcomes

On successful completion of the course, students will be able to

1. Develop a holistic perspective of life
2. Better understanding of inter-personal relationships and relationship with society and nature.
3. An ability to strengthen self-reflection

Syllabus

Module 1 Aspirations and concerns
Need for Value Education: Guidelines and content of value education.
Exploring our aspirations and concerns: Knowing yourself, Basic human aspirations Need for a holistic perspective, Role of UHV; Self-Management: harmony in human being

Module 2 Health
Harmony of the Self and Body, Mental and physical health; Health for family, friends and society.

Module 3 Relationships and Society
Harmony in relationships, Foundational values: Trust, Respect, Reverence for excellence, Gratitude and love; harmony in society; harmony with nature.

Reference Material
The primary resource material for teaching this course consists of
1. Text book: R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

Reference books
1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
9. A.N.Tripathy, 2003, Human Values, New Age International Publishers.

Course Code	CHT2006				
Category	Basic Science Course				
Course Title	Chemistry of Smart Materials				
Scheme & Credits	L	T	P	Credits	Semester
	2	0	0	2	II

Course Outcomes

On successful completion of the course, students will be able to

1. Classify and explain the different types of sensors for various applications.
2. Discuss unique properties of nano-materials to solve challenges in our life and applications in computational world.
3. Discuss how spectroscopic methods are used for qualitative and quantitative analysis.
4. Analyze the utilization of green computing technology for environmental issues

Syllabus

Module 1 Smart Sensors and Materials

RFID and IONT materials: Synthesis, properties and applications in logistic information, intelligent packaging systems (Graphene oxide, carbon nanotubes (CNTs) and polyaniline).
Sensors: Introduction, types of sensors (Piezoelectric and electrochemical), nanomaterials for sensing applications (Strain sensors, gas sensor, biomolecules and volatile organic compounds).

Module 2 Nanomaterials

Introduction, classification, size dependent properties, surface area, optical and catalytic properties, Synthesis methods of nanomaterials- Top down and bottom-up approach.
Carbon nanomaterials: Types, properties and applications of CNT and graphene.
Applications of nano materials.

Module 3 Characterization Techniques and computational tools

Fundamentals of spectroscopy, Electronic Spectroscopy, Nuclear Magnetic Resonance Spectroscopy. Basics of Nuclear magnetic resonance quantum computer
Synthesis of drugs, basic soft-wares for bio-chemical assessment of drugs.

Module 4 Green Computing and Chemistry

E-wastes- Types, environmental and health risks, segregation and recycling (Hydrometallurgical, pyrometallurgical and direct recycling), Extraction of precious metals from e-wastes, Twelve principles of Green Chemistry. Green Computing, Role of Green Computing in Environment and Research, Green devices and Green data Servers.

Text Books

1. Shikha Agrawal, Engineering Chemistry : Fundamentals and Applications, Cambridge University Press.
2. Dr. Rajshree Khare, A Textbook of Engineering Chemistry(AICTE), S.K. Kataria & Sons.
3. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand Publications.
4. A.K.Das and M. Das, An introduction to nanomaterials and nanoscience, CBS Publishers and Distributors
5. M Afshar Alam, Sapna Jain, Hena Parveen, Green Computing Approach Towards Sustainable Development, Wiley Interscience Publications.
6. Sensor & transducers, D. Patranabis, 2nd edition, PHI

Reference Books

1.E-waste recycling and management: present scenarios and environmental issues, Khan, Anish, and Abdullah M. Asiri. 2019, Springer, Vol. 33. ISBN: 978-3-030-14186-8.

2. Hans-Eckhardt Schaefer, Nanoscience: The Science of the Small in Physics, Engineering, Chemistry, Biology and Medicine, Springer-Verlag Berlin Heidelberg.

Syllabus of Semester II B.Tech.

Department of Electronics and Computer Science

Course Code	CHP2006				
Category	Basic Science Course				
Course Title	Chemistry of Smart Materials Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	II

Course Outcomes

On successful completion of the course, students will be able to

1. Apply the fundamental principles of measurement and skills in preparation and handling of hazardous chemicals and interpret the statistical data related to measurements.
2. Estimate the rate constants of reactions and order of the reaction and/or to validate adsorption isotherms.
3. Use of various computational tools for analysis of different spectral properties and bio-activities.

List of Experiments

1. Preparation of different Solutions: Molar solution, Normal solution and percent solution and Determination of concentration.
2. Demonstration of Handling of hazardous chemicals, MSDS (material safety data sheet), waste minimization strategies and chemical waste disposal.
3. Basic statistical analysis of results of neutralization of acid against the base and preparing acceptable graphs using software.
4. Prediction of infrared/NMR spectral and analytical data of organic molecules using Computational Software.
5. Spectroscopic/Colorimetric determine of wavelength of maximum absorption of chemical/biological compound in solution and determination of concentration using Lambert-Beer's Law.
6. To study chemical kinetics of peroxydisulphate and iodide ions reactions and to find out order of the reaction and analysis of experimental data using Computational Software.
7. Molecular docking of drugs using open computational software. (Demonstration experiment)
8. Determination of rate of the reaction at room temperature and analysis of experimental data using Computational Software
9. Use of open access software for the interpretation of various parameters of materials including drugs
10. Estimation of Copper from PCB

Reference Books

1.S. S. Dara, A Textbook on Experiments and Calculations in Engineering Chemistry, S. Chand Publications.

2.J. B. Yadav, Advanced Practical Physical Chemistry, Krishna's Prakashan Media (P) Limited.

3.A. J. Elias, Collection of Interesting General Chemistry Experiments, Universities Press Publications.

4.V. K. Ahluwalia, S. Dhingra and A. Gulati, College Practical Chemistry, Universities Press Publications.

5.Ashutosh Kar , Advanced Practical Medicinal Chemistry, New Age International Publisher.

Reference Books

1.David Young, Computational Chemistry: A Practical Guide for Applying Techniques to Real World Problems, Wiley Interscience Publications

Syllabus of Semester II B.Tech.

Department of Electronics and Computer Science

Course Code	MAT2001				
Category	Basic Science Course				
Course Title	Applied Mathematics-II				
Scheme & Credits	L	T	P	Credits	Semester
	2	1	0	3	II

Course Outcomes

On successful completion of the course, students will be able to

1. Interpret the solutions of system of linear equations and use the concepts of Eigen values, Eigen vectors to find diagonalization of matrices, reduction of quadratic form to canonical form.
2. Evaluate definite and improper integrals using Beta, Gamma functions. Also trace cartesian curves.
3. Solve multiple integration by change of order, change of variable methods and apply it to find area, volume, mass and centre of gravity.
4. Understand geometric meaning of gradient, curl, divergence
5. Perform line, surface and volume integrals of vector-valued functions/ Analyze and compare different sets of data and classify the data by means of diagrams and graph.

Syllabus

Module 1: Matrices:
Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigen values and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms, Introduction to n-dimensional space.

Module 2: Integral Calculus:
Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Tracing of curves(Cartesian form)

Module 3: **Multiple Integrals**
Multiple Integration: Double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: area, mass and volume by double integration, Center of mass and Gravity (basic concepts).

Module 4 : Vector Calculus (Differentiation)
Scalar point function, Vector point function, vector differentiation, gradient, divergence and curl, directional derivatives with their physical interpretations, solenoidal and irrotational motions, Scalar potential function.

Module 5 : Vector Calculus (Integration)(All Branches except Biomedical Engineering)

Vector integration: Line integrals, work done, conservative fields, surface integrals and volume integrals, Stoke's theorem, Gauss divergence theorem, Green's theorem and their simple applications.

OR

Module 5 : : Descriptive Statistics (Only for Bio-Medical Engineering)

Types of statistical data: categorical, ranked, discrete, and continuous. Distinction between univariate, bi-variate, and multivariate statistics, Visualization techniques such as joint contingency tables, scatter plots, 2D histograms and line graphs , Measures of central tendency and Dispersion .

Topics for self learning

Rolle's theorem, Mean value theorems, Indeterminate forms, Applications of definite integrals to evaluate perimeter, area, surface areas and volumes of revolutions.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Volume I & II, Pune VidhyarthiGrihaPrakashan, Pune-411030 (India).
6. Biomedical Statistics -Shantikumar Yadav , Sompal Singh, Ruchika Gupta
7. Theory and Problems of Probability and Statistics - M.R. Spiegal (Mc Graw Hill) Schaum Series

Course Code	ECST2001				
Category	Engineering Science Course				
Course Title	Elements of IoT				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	II

Course Outcomes

On successful completion of the course, students will be able to

1. Wire Raspberry Pi and create a fully functional computer
2. Use Python-based IDE and trace and debug Python code on the device
3. Measure physical parameter using sensors
4. Implement various communication protocols for wired and wireless communication
5. Interfaces different motors and create robots

Syllabus

Module 1

Basic functionality of the Raspberry Pi and Arduino and its Processor, setting and configuring the board, differentiating Raspberry Pi from other platform like arduino, begal, asus thinker etc. Overclocking, Component overview.

Module 2

Introduction to Linux: Implications of an operating system on the behavior of the Raspberry Pi, Overview of Linux and its terminal command, aptget-update, aptget-upgrade, navigating the file system and managing processes, text-based user interface through the shell, overview of graphic user interface.

Module 3

Programming the Raspberry Pi: Python: Introducing to Python programming language; Python Programming Environment, Python Expressions, Strings, Functions, Function Arguments, Lists, List Methods, Control Flow, Numpy, PIP (Python Installation Package) and customized libraries. C++ programming: Basic C++ programming approach, header file structure and library organization, Cross Compiler and its configuration.

Module 4

Exploring Electronics with the Raspberry Pi: Communication facilities on raspberry Pi (I2C, SPI, UART), working with RPil. GPIO library, Interfacing of Sensors and Actuators.
Project 2: Set UP a Pi motion detector
Project 3: Set UP a Pi ADC/DAC
Project 4: CONSTRUCT a digital weather station
Project 5: CONSTRUCT a Traffic Light Controller

Module 5

Communication using Raspberry Pi: Wired and Wireless communication, TCP, IP configurations, SSH, Putty terminal usage.
Project 6: Set UP file server
Project 7: Network YOUR keyboard and MOUSE
Project 8: Create a portable wireless access point
Project 9: COMMUNICATE with ARDUINO
Project 10: CONSTRUCT a digital server based weather station

Module 6

Robotic Motion PI: DC, Servo, Stepper, Motor Drivers, Motor Shields, Camera Interfacing, remote data logging.
Project11:Keyboard Control Robot
Project 12: Wireless Robot

Text Books

1. Raspberry Pi 3: An introduction to using with Python Scratch, Javascript and more, Gary Mitnick, Create Space Independent Publishing Platform, 2017.
2. Raspberry Pi for Python Programmers Cookbook, Tim Cox, Packt Publishing Limited; 2nd Revised edition, 2016.
3. Raspberry Pi User Guide, EbenUptonand Gareth Halfacree, John Wiley& Sons, 2016.

Course Code	ECSP2001				
Category	Engineering Science Course				
Course Title	Elements of IoT Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	II

Course Outcomes

On successful completion of the course, students will be able to
1. Wire Raspberry Pi and create a fully functional computer
2. Use Python-based IDE and trace and debug Python code on the device
3. Measure physical parameter using sensors
4. Implement various communication protocols for wired and wireless communication
5. Interfaces different motors and create robots

List of Experiments

1. LED control on Esp8266 programmed via Arduino IDE.
2. User identification using rfid chip RC522
3. Motor interfacing with Raspberry Pi.
4. Send SMS alert from RPi if obstacle detected.
5. To check door status on intialstate.com usng Rpi via internet
6. To send DHT11 temperature to thingspeak using raspberry pi
7. Image tweeted when camera detects motion using Raspberry Pi.
8. Send data of various sensor to Thingspeak using Nodemcu
9. Display DHT11 sensor data on OLED screen using Nodemcu.
10. ESP8266 GPIO Control via Web Server programmed via Arduino IDE.

Course Code	ECST2002				
Category	Engineering Science Course				
Course Title	Object Oriented Programming				
Scheme & Credits	L	T	P	Credits	Semester
	2	1	0	3	II

Course Outcomes

On successful completion of the course, students will be able to
1. Understand the principles of object-oriented programming; create classes, instantiate objects and invoke methods.
2. Apply the concepts of generics and implement collection classes and develop reusable programs using the concepts of OOP.
3. Apply the concepts of Multithreading and Exception handling to develop efficient and error free Codes for solving classic synchronization problems.
4. Utilize modern design tools and collection framework to solve real world problems

Syllabus

Module 1
Features of Object Oriented Programming languages, Abstraction, Encapsulation, Inheritance, polymorphism and late binding. Concept of a class, Access control of members of a class, instantiating a class, constructor and method overloading and overriding.

Module 2
Concept of inheritance, methods of derivation, use of super keyword and final keyword in inheritance, run time polymorphism, abstract classes and methods, Interface, implementation of interface.

Module 3
Creating packages, importing packages, static and non-static members, Lambda Expressions Introduction, Block, Passing Lambda expression as Argument.

Module 4
Exceptions, types of exception, use of try catch block, handling multiple exceptions, using finally, throw and throws clause, user defined exceptions, file handling in Java, Serialization.

Module 5
Generics, generic class with two type parameter, bounded generics. Collection classes: Array list, Linked List, Hash set, Tree set, Hash Map.

Module 6
Multithreading: Java Thread models, creating thread using runnable interface and extending Thread, thread priorities, Thread Synchronization, Inter Thread communications. Introduction to Design Patterns, Need of Design Pattern, Classification of Design Patterns.

Text Books
1. Herbert Schildt; JAVA, the Complete Reference; Ninth Edition, Tata McGraw- Hill Publishing Company Limited.
2. Design Patterns by Erich Gamma, Pearson Education.

Course Code	ECSP2002				
Category	Engineering Science Course				
Course Title	Object Oriented Programming Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	II

List of Experiments

1. Implement the Classes and Objects in Java.
2. Implement a program in java with Constructors and destructors. Also implement the concept of overloading.
3. Demonstrate use of Inheritance.
4. Implement a concept of Interface in Java.
5. Demonstrate use of Multi Thread.
6. Implement Packages and import that package in programe.
7. Demonstrate use of Exception handling mechanism.
8. Apply concept of generics class and method.
9. Demonstrate collection framework and perform some basic operations on the Array List and Hashset.
10. Apply file handling concepts in Java.

Syllabus of Semester II B.Tech.

Department of Electronics and Computer Science

Course Code	ECST2003				
Category	Programme Core Course				
Course Title	Digital Electronics				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	II

Course Outcomes

On successful completion of the course, students will be able to

1. Apply various optimization techniques to minimize digital circuits.
2. Design combinational logic circuits.
3. Analyze and design asynchronous and synchronous sequential circuits.
4. Discuss x86 architecture

Syllabus

Module 1

Basics of Digital Electronics: Motivation for digital systems: Number Systems and arithmetic's, Logic and Boolean algebra, logic gates & truth tables, SOP, POS, Minimization of combinational circuits using Karnaugh-maps.

Module 2

Combinational Circuit Design: Multiplexers, De-multiplexers, Encoders, Decoders, Code Converters, Adders, Subtractor (Half, Full), BCD Adder/ Subtractor, ripple and carry look-ahead addition, Unsigned Multiplier.

Module 3

Sequential circuit Design-I: Storage elements, Flip-flops and latches: D, T, J/K, S/R flip-flops: level triggered, edge triggered, Master Slave flip-flop, flip flop conversion, timing analysis.

Module 4

Sequential circuit Design-II: Design of asynchronous and synchronous counters, Registers & Shift registers, Application of shift register: ring counter, Johnson counter, sequence generator and detector, serial adder; Linear feedback shift register (LFSR)

Module 5

Design of synchronous sequential circuit using Mealy model and Moore model: state transition diagram, algorithm state machine (ASM) chart

Module 6

Introduction to X86 architecture.

Text Books

1.Donald P. Leach, Albert P. Malvino and Goutam Saha, “Digital Principles & Applications 8e”, McGraw Hill
2.Douglas V. Hall “Microprocessors and Interfacing” Tata McGraw Hill Education Private Limited, 2005

Reference Books

1.Thomas L Floyd, “Digital Fundamentals 9e”, Pearson
2.M. Morris Mano and Michael D. Ciletti, “Digital Design 5e”, Pearson
3.Taub and Shilling, “Digital Integrated Electronics”, McGraw Hill
4.A Anand Kumar, “Fundamentals of Digital Circuits” Fourth Edition, PHI
5.Kip R. Irvine, “Assembly Language for x86 Processors” Seventh Edition, Pearson Education

Syllabus of Semester II B.Tech.

Department of Electronics and Computer Science

Course Code	ECSP2003				
Category	Programme Core Course				
Course Title	Digital Electronics Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	II

List of Experiments

1. To verify truth table of different logic gates.
2. Design basic logic gates using universal gate and verify its truth table.
3. To verify following Boolean expressions using gates and Multisim software.
    a) A+AB+AB
    b) AB(C+AC)
4. To implement the following arithmetic circuits using (a) logic gates IC's and (b) using Multisim software.
    a) Full adder
    b) Half subtractor
5. Implement the function F = Σm (1,3,5,7,8,9,11,13,15) using 16:1 and 8:1 multiplexer.
6. Verify the truth table of SR, JK, JKMS, T and D flip flop.
7. To study the following functions of Shift register using IC 7495
    a) SIPO
    b) PIPO
    c) PISO
    d) SISO
8. Design and verify 2 bit synchronous down counter using S-R flip-flop.
9. Design and verify the functionality of a sequence detector to detect the sequence 1101 using Melay and Moore model and use J-K flop-flop to implement the design.
10. To study architecture, memory segmentation and pipeline of 8086 microprocessor.

Syllabus of Semester II B.Tech.

Department of Electronics and Computer Science

Course Code	HUT2001				
Category	Engineering Science Course				
Course Title	Foundational Literature of Indian Civilization				
Scheme & Credits	L	T	P	Credits	Semester
	2	0	0	2	II

Course Outcomes

On successful completion of the course, students will be able to

1. Understand the Indian knowledge system and its scientific approach
2. Get introduced to the Vedic corpus and recognize the multi-faceted nature of the knowledge contained in the Vedic corpus
3. Understand the salient features of the philosophical systems of the Vedic and non-Vedic schools
4. Develop a basic understanding of the ancient wisdom recorded in various Indian literary work

Syllabus

Module 1 Overview of Indian Knowledge System

Importance of ancient knowledge, defining IKS, IKS classification framework, Historicity of IKS, Some unique aspects of IKS.

Module 2 The Vedic corpus

Introduction of Vedas, four Vedas, divisions of four Vedas, six Vedangas , Distinct features of Vedic life.

Module 3 Indian Philosophical systems

Development and unique features, Vedic schools of philosophy, Samkhya and Yoga School of philosophy, Nayay and Vaisesika school of philosophy,Purva-mimamsa and Vedanta schools of Philosophy, Non-vedic philosophies: Jainism, Buddhism, and other approaches

Module 4 Indian wisdom through ages

Panchtantras, **Purans:** contents and issues of interests, **Itihasa:** uniqueness of the two epics (Ramayan and Mahabharata), Key issues and messages from Ramayana, Mahabharata – a source of worldly wisdom; **Indian ancient Sanskrit literature:**Kalidas, Vishakadutta, Bhavbhuti, Shudraka* *any one text as decided by the course teacher

Reference material

1.B. Mahadevan, Vinayak Rajat Bhar, Nagendra Pavana R. N., “Introduction to Indian Knowledge System: Concepts and Applications” PHI, 2022

2.S.C. Chatterjee and D.M. Datta, An introduction to Indian Philosophy, University of Calcutta, 1984

Syllabus of Semester II B.Tech.

Department of Electronics and Computer Science

Course Code	PET2001				
Category	Basic Science Course				
Course Title	Sports-Yoga-Recreation				
Scheme & Credits	L	T	P	Credits	Semester
	1	0	0	1	II

Course Outcomes

On successful completion of the course, students will be able to

1. Understand fundamental skills, basic principle and practices of sports and Yoga.
2. Practically learn the principles of implementing general and specific conditioning of physical exercisesand yoga.
3. Develop Health-related fitness and Body-mind co-ordination through various fitness activities,sports, recreational games and yoga.
4. Practice Healthy & active living with reducing Sedentary Life style.

Syllabus

Module 1 Theory: Introduction

- Meaning, Definition and Importance of Health & Wellness
- Dimensions of Health and Wellness
- Factors influencing Health and Wellness
- Physical Fitness, Nutrition, Habits, Age, Gender, Lifestyle, Body Types
- Health & Wellness through Physical Activities, Sports, Games, Yoga and Recreation activities
- Causes of Stress & Stress relief through Exercise and Yoga
- Safety in Sport

References

1. Russell, R.P. (1994). Health and Fitness Through Physical Education. USA: Human Kinetics.
2. Uppal, A.K. (1992). Physical Fitness. New Delhi: Friends Publication.
3. AAPHERD "Health related Physical Fitness Test Manual."1980 Published by Association drive Reston Virginia
4. Kumar, Ajith. (1984) Yoga Pravesha. Bengaluru: Rashtrothanna Prakashana.

5.Dr. Devinder K. Kansal, A Textbook of Test Evaluation, Accreditation, Measurements and Standards (TEAMS 'Science)

Course Code	PEP2001				
Category	Basic Science Course				
Course Title	Sports-Yoga-Recreation Lab				
Scheme & Credits	L	T	P	Credit	Semester
	0	0	2	1	II

Course Outcomes:

On completion of the course, students will be able to:

1. Understand fundamental skills, basic principle and practices of sports and Yoga.
2. Practically learn the principles of implementing general and specific conditioning of physical exercises and yoga.
3. Develop Health-related fitness and Body-mind co-ordination through various fitness activities, sports, recreational games and yoga.
4. practice Healthy & active living with reducing Sedentary Life style.

Module 1: - Practical- Exercises for Health and Wellness

- Warm-Up and Cool Down - General & Specific Exercises
- Physical Fitness Activities
- Stretching Exercises
- General & Specific Exercises for Strength, Speed, Agility, Flexibility, coordinative abilities
- Cardiovascular Exercises
- Assessment of BMI
- Relaxation techniques
- Physical Efficiency Tests

Module 2: - Yoga

- Shukshma Vyayam
- Suryanamaskar
- Basic Set of Yogasanas – Sitting, standing, supine and prone position
- Basic Set of Pranayama & Meditation

References:

1. Russell, R.P. (1994). Health and Fitness Through Physical Education. USA: Human Kinetics.
2. Uppal, A.K. (1992). Physical Fitness. New Delhi: Friends Publication.
3. AAPHERD "Health related Physical Fitness Test Manual."1980 Published by Association drive Reston Virginia
4. Kumar, Ajith. (1984) Yoga Pravesha. Bengaluru: Rashtrothanna Prakashana.
5. Dr. Devinder K. Kansal, A Textbook of Test Evaluation, Accreditation, Measurements and Standards (TEAMS 'Science)

Course Code	ECST3001				
Category	Programme Core Course				
Course Title	Data Structures				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	III

Course Outcomes
On successful completion of the course, students will be able to:

1. Understand the concepts of data structures.
2. Apply the concepts of linear (stacks, queues, linked lists) and non-linear (trees, graphs) data structures.
3. Implement different searching and sorting techniques.
4. Demonstrate the use and applicability of data conversion techniques
5. Devise algorithms for solving real-world problems.

Syllabus

Module I:(5Hours)
Understanding data structures and algorithms, Python for data, Variables and expressions, Flow control and iteration, Overview of data types, objects and python modules, Types of Data Structures- User defined, Built in data types: List, Set, Dictionary, tuple.

Module II:(5Hours)
Linear Data Structure Arrays, Pointer structures, Nodes, Representation of arrays, Applications of arrays, sparse matrix and its representation.

Module III:(4Hours)
Stack: Stack-Definitions & Concepts, Operations on Stacks, Applications of Stacks, Queue: Representation of Queue, Operations on Queue, Applications of Queue, Linked List: Singly Linked List, Doubly Linked list, Circular linked list, Linked implementation of Stack, Linked implementation of Queue, Applications of linked list.

Module IV:(6Hours)

Nonlinear Data Structure: Tree-Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, postorder, preorder), Binary search trees, Representationof Graphs, Elementary Graph operations, Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree.

Module V :(5Hours)
Sorting and searching, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Sorting on several keys, List and Table Sort, Linear Search, Binary Search.

Module VI :(5Hours)
Hashing and Symbol Tables, Perfect hashing functions, putting elements, getting elements, Testing the hash table, Non-string keys, Growing a hash table, Open addressing.

Text Books

Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", Wiley, 2013**.**

Reference Books

Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2019. ISBN-13: 978-0-8153-9437-2. 2.

Benjamin Baka, "Python Data Structures and Algorithms" Published by Packt Publishing Ltd., 2017.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECSP3001				
Category	Programme Core Course				
Course Title	Data Structures Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	III

List of Experiments

1. Write a Python program for class, Flower, that has three instance variables of type str, int, and float that respectively represent the name of the flower, its number of petals, and its price. Your class must include a constructor method that initializes each variable to an appropriate value, and your class should include methods for setting the value of each type, and retrieving the value of each type.

2. Develop an inheritance hierarchy based upon a Polygon class that has abstract methods area()and perimeter().Implement classes Triangle, Quadrilateral, Pentagon, that extend this base class, with the obvious meanings for the area( ) and perimeter( ) methods. Write a simple program that allows users to create polygons of the various types and input their geometric dimensions, and the program then outputs their area and perimeter.

3. Implement Method Overloading and Method Overriding.

4. Illustrate the following comprehensions using python programming:

   a) List Comprehensions b) Dictionary Comprehensions

   c) Set Comprehensions d) Generator Comprehensions

5. Create a program to implement the binary search tree.

6. Develop a program that implements the Bubble Sort and Selection Sort algorithms.

7. Write a program to implement Merge sort and Quick sort.

8. Write a program to implement Stacks and Queues.

9. Write a program to implement Singly Linked List.

10. Write a program to implement Doubly Linked list.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECST3002				
Category	Engineering Science Course				
Course Title	Electronic Devices and Circuits				
Scheme and credits	L	T	P	Credits	Semester
	3	0	0	3	III

Course Outcomes

On successful completion of the course, students will be able to:

1. Identify the region of operation of PN Junction Diode, BJT and MOSFET.
2. Design rectifier, clipper, clamper, and voltage regulator using diodes.
3. Apply the mathematical models of BJT and MOS transistors for circuits and systems design.
4. Examine the effect of negative feedback on gain, bandwidth, input and output impedance sand the stability of the amplifier.
5. Design, test and analyze operational amplifier-based circuits/systems.

Syllabus

Module I

Diode Models and Circuits: Terminal Characteristics of Junction Diodes, Models of P-N Junction Diode, SmallSignal Model. Operation in the Reverse Breakdown Region—Zener Diodes, Zener as a Shunt Regulator, Applications of PN junction diode ─ Rectifier, Clipper, Clamper, DC power supply, Diode Logic Gates

Module II

Bipolar junction Transistor: Device structure and Physical Operation, Current Components in BJT, Transistor configurations and Input, Output characteristics, Load line concept, Biasing of BJT, Applications of BJT as a switch and single stage voltage amplifier.

Module III

MOS Field Effect Transistor: Device structure and physical operation, Current –Voltage Characteristics, MOSFET circuits at DC, MOSFET in Amplifier Design: The Voltage-Transfer Characteristic (VTC), biasing the MOSFET to Obtain Linear Amplification, Small-Signal Voltage Gain, Small-Signal Operation and Model.

Module IV

Feedback amplifier and Op-amp fundamentals: General Feedback amplifier Structure, Properties of Negative Feedback, Characteristics of operational amplifier, open loop Op-amp, basic Inverting and Non-inverting Op-amp amplifiers with negative feedback, Op-amp parameters & their analysis.

Module V

Op-amp linear and nonlinear applications: Voltage follower, summing amplifiers, integrators and differentiators, difference amplifiers & instrumentation amplifiers, Comparators, Schmitt trigger circuits, Sample/Hold circuits,

Module VI

Oscillators and Active filters design: Precision rectifiers, oscillators: basic concept, Op-amp based sinusoidal oscillators, design of Active filters. Digital to analog converters, Analog to digital converters.

Textbooks

1. Adel S. Sedra, Kenneth C. Smith, Arun N. Chandorkar: Microelectronic Circuits: Theory and Applications: Seventh Edition, Oxford University Press, 2017.

2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits” Fourth Edition, McGraw-Hill Education, 2014.

Reference Books

1. Donald Neamen “Electronic Circuits: Analysis and Design” Third Edition, McGraw-Hill Publication,
2. Ramakant Gayakwad, ” OP-AMPS and linear integrated circuits” 4th Edition, PHI
3. Jacob Millman, Christos Halkias, Chetan Parikh: “Millman's Integrated Electronics” Second edition, McGraw Hill Education, 2017.
4. Coughlin Driscoll, “Operational Amplifiers and Linear Integrated Circuits” 4th Edition: PHI.
5. D. Roy Choudhary, Shail Jain “Linear Integrated Circuits”, 4th Edition, New Age International.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECSP3002				
Category	Engineering Science Course				
Course Title	Electronic Devices and Circuits Lab				
Scheme and credits	L	T	P	Credits	Semester
	0	0	2	1	III

List of Experiments

1. PN Junction Diode characteristics and its applications.
2. Design Full wave rectifier with and without Filters and compute its ripple factor.
3. Zener (Avalanche) Diode characteristics and its application.
4. Analyse and verify BJT input & output characteristics.
5. Analyse and verify MOSFET drain & transfer characteristics.
6. Design Inverting operational amplifier with negative feedback and plot its frequency response.
7. Design Non-Inverting operational amplifier with negative feedback and plot its frequency response.
8. Design an Integrator circuit using op-amp IC and analyse its output response for sinusoidal and square wave inputs.
9. Design of Comparator circuit using operational amplifier.
10. Implement Digital to Analog converter (DAC) using operational amplifier.
11. A mini project using discrete electronic components.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECST3003				
Category	Programme Core Course				
Course Title	Digital System Design				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	III

Course Outcomes
On successful completion of the course, students will be able to:

1. Utilize/Apply the knowledge of digital circuits to design basic combinational and sequential blocks and hierarchical implementation of digital systems
2. Make use of dataflow, structural and behavioral modelling styles of verilog HDL for simulating the combinational/sequential circuits and systems
3. Understand, design and analyse the functionality of digital systems
4. Modelling of FSM, Data path and control unit.
5. Use of EDA tools and FPGA development platform for digital system design, verification, testing and implementation.

Syllabus

Module I (6 Hrs)
Digital System Design Flow, FPGA Architecture, Introduction to FPGA Development Board, Introduction to HDL, Basic Language Elements, Syntax and Semantics of HDL

Module II (8 Hrs)
Gate level, Dataflow and Behavioral Modeling for combinational circuits like Multiplexer, De-multiplexer, Encoder-Decoder, Flip-Flop, Counter, Writing Test Benches and Handling Text files to test the Circuits.

Module III (6 Hrs)
Design and Analysis of Standard Combinational Blocks, Algorithm to Architectural Translation for Arithmetic Circuits-Adders, Subtractor, Multiplier, Divider, Shifter, ALU and Comparator

Module IV (6 Hrs)
Design and analysis of standard sequential blocks, Finite State Machine Design.

Module V (6 Hrs)
Design of Data Path and Control unit with Case Studies.

Module VI (6 Hrs)
Logic Synthesis and Optimization Techniques for Area, Power and Delay, Timing analysis-Setup and Hold Violations, Synthesis of HDL code on FPGA platforms, Concepts of Critical Path Delay

Text Book

1. Verilog HDL: A Guide to Digital Design and Synthesis; Samir Palnitkar, Prentice Hall PTR; 2nd Edition
2. Fundamentals of Digital Logic with Verilog; Stephen Brown and ZvonkoVranesic; McGraw Hill, 2nd Edition

Reference Books

1. Digital Systems Design Using Verilog; Charles Roth, Lizy K. John, ByeongKil Lee; Cengage Learning 2nd Edition
2. A Verilog HDL Primer: J Bhaskar; Star Galaxy Publishing; 2nd Edition.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECSP 3003				
Category	Programme Core Course				
Course Title	Digital System Design Lab				
Scheme &Credits	L	T	P	Credits	Semester
	0	0	2	1	III

List of Experiments

1. Design the following combinational circuits using Verilog HDL. Write a functional simulation test bench to test these designs. Generate all combinations of test inputs with a delay of 5 ns between the set of each test input. Observe the output in the console window.

a. Full adder using operators b. Full adder using two Half adders c . 4:1 Mux using 2:1 Mux
Synthesize the design and count the number of LUT. Plan a pin constraint for any one design for implementation on FPGA.

2. Compare the designs of a 16 bit ripple carry adder circuit and carry select adder. Write a post implementation simulation test bench to test these designs. Generate random combinations of test inputs with a delay more than critical path delay between the set of each test input. Observe the output in the console window.
Synthesize the design and count the number of LUT. Find the critical path delay. Plan a pin constraint for any one design for implementation on FPGA.

3. Model the 4 bit counter with following specifications:

a. Reset synchronous to clock positive edge.
b. Counter has a 4 bit load terminal to count Up or down from this user loaded value.
Write a test bench to test this design and implement it on FPGA.

4. Design a 4 bit sequence detector using verilog HDL. Write a test bench to test this design.
5. Create a Verilog RAM module with 8 bit wide data and 16 locations, initialize it with data, and perform a read operation to verify data retrieval. Find the average of the retrieved data in the console window.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECST3004				
Category	Engineering Science Course				
Course Title	Discrete Mathematics				
Scheme &Credits	L	T	P	Credits	Semester
	2	0	0	2	III

Course Outcomes

On successful completion of the course, students will be able to

1. Comprehend modular arithmetic to solve problems.
2. Understand a given problem of graph network and solve with techniques of graph theory.
3. Realize the lattice as algebraic structure and use it for pattern recognition in cryptography.
4. Apply groups and fields in coding theory.

Syllabus

Module I (7Hrs) Modular Arithmetic

Modular Arithmetic, Euclid's Algorithm, Primes, Fermat's Algorithm, Euler's Theorem, Linear Congruences, Chinese Remainder Theorem, Application to Cryptography.

Module II (7Hrs) Graph Theory

Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub-Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Coloring, Coloring maps and Planar Graphs, Perfect Graph.

Module III (7Hrs) Lattice theory

Lattices as partially ordered set, Definitions and Examples, some properties of Lattices, Lattices as algebraic system, sub lattices, direct product, homomorphism, some special Lattices.

Module IV (8Hrs) Groups and Fields

Group definitions and examples, cyclic group, permutation groups, subgroups and homomorphism, co-sets, Lagrange's theorem, Finite field, Galois field.

Text Books

1.J. P.Tremblay and R. Manohar; Discrete Mathematical Structures with Applications to Computer Science; TataMcGraw-hill Publication.
2. Seymour Lipschutz and Marc Lars Lipson Adapted by Varsha H. Patil, Discrete Mathematics, Revised 3rd edition Schaum'soutlines, Tata McGraw-hill Publication

Reference Books

1.Kenneth H. Rosen, Discrete Mathematics and its Applications, 8th edition Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications, 4th edition, Wadsworth Publishing Co.Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw –Hil

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECST 3005				
Category	HSSM-VEC				
Course Title	Cyber Laws and Ethics in IT				
Scheme & Credits	L	T	P	Credits	Semester
	2	0	0	2	III

Course Outcomes

On successful completion of the course, students will be able to

1. Understand statutory, regulatory, constitutional, and organizational laws for awareness amongst the software professional

2. Classify Ethics and Laws with respect to legal dilemmas in the Information Technology Act

3. Illustrate Privacy and Intellectual property rights related practices

4. Categorize business ethics and roles applicable to IT users, IT professional Malpractice, IT organization workers

Syllabus

Module I

Cyber laws and rights in today's digital age; IT Act, Intellectual Property Issues connected with use and management of Digital Data, Emergence of Cyberspace, Cyber Jurisprudence.

Module II

Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber terrorism, Cyber Defamation, Different offences under IT Act, 2000, Cyber Torts.

Module III

Ethics in business world, Ethics in IT, Ethics for IT professionals and IT users, IT professional malpractices, communications eavesdropping, computer break-ins, denial-of-service, destruction and modification of data, distortion and fabrication of information, Types of Exploits and Perpetrators.

Module IV

Intellectual Property: Copy rights, Patents, Trade Secret Laws, Key Intellectual property issues, Plagiarism, Competitive Intelligence, Cyber-squatting, Information warfare policy and ethical Issues.

Module V

Privacy: The right of Privacy, Protection, Key Privacy and Anonymity issues, Identity Theft, Consumer Profiling, Defamation, Freedom of Expression, Anonymity, National, Security Letters, Defamation and Hate Speech

Module VI

Ethics of IT Organization: Contingent Workers H-IB Workers, Whistle-blowing, Protection forWhistleBlowers, Handling Whistle-blowing situation, Digital divide.

Text Books

1. George Reynolds, “Ethic s in information Technology”,5th edition, Cengage Learning
2. Hon C Graff, Cryptography and E-Commerce - A Wiley Tech Brief, Wiley Computer Publisher, 2001.

Reference Books

1. Michael Cross, Norris L Johnson, Tony Piltzecker, Security, Shroff Publishers and Distributors Ltd.
2. Debora Johnson,” Computer Ethics”, 3rd Pearson Education.
3. Sara Baase, “A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet,” PHI Publications.
4. Chris Reed & John Angel, Computer Law, OUP, New York, (2007)

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECST2980				
Category	Open Elective				
Course Title	Basics of Linux Operating System				
Scheme & Credits	L	T	P	Credits	Semester
	2	0	0	2	III

Course Outcomes

On successful completion of the course, students will be able to

1. Acquire a working knowledge of Linux fundamentals and Linux distributions.
2. Apply knowledge to comprehend system configurations and Linux graphical interfaces.
3. Independently perform fundamental command line operations in Linux.
4. Effectively employ common Linux applications for specific tasks and functionalities

Syllabus

Module I: The Linux Foundation: Linux Philosophy and Concepts, Linux Basics and System Startup.

Module II: Graphical Interface, System Configuration from the Graphical Interface, Common Applications, Command Line Operations, Finding Linux Documentation.

Module III: Processes, File Operations, Text Editors, User Environment, Manipulating Text, Network Operations.

Module IV: The Bash Shell and bash Scripting, Introduction, Features and Capabilities, Syntax, Constructs.

Module V: Printing, Local Security Principles, Understanding Linux Security, root Privileges, sudo, Process Isolation, Limiting Hardware Access and Keeping Systems Current, Working with Passwords, Securing the Boot Process and Hardware Resources.

Module VI: Remote access and managing processes through remote login

Text books

1) Linux BIBLE, Christopher Negus, Tenth Edition, Wiley 2020.

2) Linux for Beginners: An Introduction to the Linux Operating System and Command Line, Jason Cannon, O'Reilly, 2014.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECSTH3100				
Course Title	Fundamentals of Artificial Intelligence and Edge computing				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	III

Course Outcomes:

1. Understand the fundamentals of Artificial intelligence and edge computing
2. Apply techniques in edge computing architecture to achieve the best performance of AI training and inference
3. Analyze AI applications on edge under the multiple constraints of networking, communication, computing power, and energy consumption
4. Summarize the principles of Problem solving, quantitative and/or qualitative decision making in complex situations on AI
5. Implement edge integration applications

Syllabus

Module I:(5 Hours)
Introduction to Edge Computing: Need, Key Techniques, Benefits, Systems Paradigms of Edge computing, Edge Computing Frameworks, Value Scenarios for Edge Computing. Edge computing system architectures. Industrial Applications of Edge Computing, Intelligent Edge and Edge Intelligence, Challenges and opportunities in Edge Computing.

Module II:(7 Hours)
Paradigms of Edge Computing : Cloudlet and Micro Data Centers, Fog Computing, Mobile and Multi-Access Edge Computing, Edge Computing Terminologies, AI Hardware for Edge Computing, Edge Computing Frameworks, Virtualizing the Edge.

Module - III: (7 Hours)
AI applications on Edge : Fundamentals of Artificial Intelligence: Artificial Intelligence and Deep Learning, Neural Networks in Deep Learning, Deep Reinforcement Learning, Distributed DL Training, Potential DL Libraries for Edge.Hybrid hierarchical architecture at three levels: end, edge and cloud; Case studies of Real time video analytics, Autonomous Internet of Vehicles,Intelligent Manufacturing, Smart Home and City.

Module - IV: (7 Hours)
Artificial Intelligence Inference in Edge: Optimization of AI Models in Edge: General methods, Edge device, Segmentations of AI models, Early Exit of Inference (EEoI) , Sharing of AI Computation

Module V: (7 Hours)
Artificial Intelligence Training at Edge: Distributed Training at Edge, Federated Learning(FL) at Edge, Communication-Efficient FL, Resource-Optimized FL, Security-Enhanced FL Case studies based on training at edge

Module - VI: (7 Hours)
Artificial Intelligence Applications on Edge: Real-time Video Analytic, Autonomous Internet of Vehicles (IoVs), Intelligent Manufacturing, Smart Home and City, Urban Healthcare, Urban Energy Management, Manufacturing, Transportation and traffic.

Text books:
1.Edge AI: Convergence of Edge Computing and AI, Xiaofei Wang, YiwenHan , Victor C. M. Leung, Dusit Niyato , Xueqiang Yan Xu Chen

Reference Book

1. Recent Research Papers from Reputed Journals and Conferences such as DATE, TEST, CVPR, ICLR,NIPS, ICML etc.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECSTM3100				
Category	Engineering Science Course				
Course Title	IoT fundamentals				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	III

Course Outcomes

After learning the course, the student will be able to:

1. Understand the basics of networking
2. Gain the knowledge about iot standards
3. Realize the basic applications using arduino and raspberry pi
4. Illustrate different real world applications syllabus

Syllabus

Module - I: (7Hrs)

Basics of Networks, TCP/IP model,IP Addresses, application layer protocols, HTTP, MQTT, WWW, constraint application protocol,stacks.

Module - II: (7Hrs)

Introduction to IoT, evolution of IoT, IoT and SCADA, Big Data, IoT Standards, requirement, Platforms, relevance of IoT, security

Module - III: (7Hrs)

Interoperability in IoT, Machine-to-Machine Communications, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino, Sensing, Actuation, Sensor Networks

Module - IV: (7Hrs)

Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi.

Module - V: (7Hrs)

Introduction to SDN, Fog Computing, IoT application case studies: Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT, Agriculture, Healthcare, Activity Monitoring, IoT in India: Smart India projects, Challenges in IoT

Text Books

1. Computer Networks: A Top-Down Approach; Behrouz A Forouzan, Firouz Mosharraf, McGraw Hill Education. Special Indian Edition 2012

2. Arduino Cookbookby Michael Margolis, O'Reilly Media, Inc., 1st edition
3. Raspberry pi Cookbook by Simon Monk, O'Reilly Media, Inc., 3rd edition.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECST4001				
Category	Engineering Core Course				
Course Title	Computer Architecture and Organization				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

On successful completion of the course, students will be able to:

1. Illustrate common principles of computer organization and multiprocessing
2. Translate the C code into MIPS assembly code
3. Design and test the data and control path of the MIPS processor on FPGA
4. Apply the concept of cache and virtual memory management in computer system.
5. Analyse different arithmetic algorithms, control unit and processor datapath with and without pipelining.

Syllabus

Module I(4Hrs)

Introduction to computer system and its sub modules, Introduction to RISC and CISC paradigm, Performance Equation, Common Principles of Computer organization: Amdahl's Law, Principle of Locality.

Module II(5 Hrs)

Processor organization, instruction set (MIPS), instruction formats, Arithmetic for Computers: Addition and Subtraction, Multiplication, Division, IEEE 754 floating point format.

Module III(6 Hrs)

Processor Design-Introduction, Datapath and control unit design, Performance Considerations, Multi-cycle design, Micro Programmed control design, Exception Handling.

Module IV(5 Hrs)

Motivation for Pipelining, Clock period and CPI, Pipelined datapath, graphical representation, Pipelining Hazards.

Module V(5 Hrs)

Memory organization, concepts of semiconductor memory, memory management, concept of cache and associative memories, virtual memory.

Module VI(5 Hrs)

Parallel processing concepts, multiprocessors and its characteristics, Input/OutputSubsystem:-Interfaces and BUS, I/O Operations, Designing I/O Systems, Case study: Application of RISC and CISC as Data Centers perspective.

Text Books

1. Computer Organization and Design - The Hardware/Software Interface, David A. Patterson, John L. Hennessy, Fifth Edition, 2014.

Reference Books

1.Computer Architecture and Organization; J. P. Hayes; Third Edition (Fifth Reprint), McGraw Hill, 2012.

2. Computer Architecture and Parallel Processing; Kai Hawang, Faye A. Briggs, McGraw Hill, 2012

3.Computer Organization; Safwat G. Zaky, Zvonko G. Vranesic, Carl Hammacher ;FifthEdition, McGraw Hill, 2002.

4. Structured Computer Organization; Andrew. S. Tanenbum; Fifth Edition, Pearson, 2005.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECSP4001				
Category	Engineering Core Course				
Course Title	Computer Architecture and Organization Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	IV

List of Experiments:

1. Integrate ALU and ALU control unit of MIPS processor together and test it using a test bench. Encode the instructions to be executed by ALU and generate these encoded test vectors to control the ALU operations. Supply random test vectors from test bench to check the results using Vivado and FPGA.

2. Integrate register Files, ALU control, ALU together. Write a top module to connect these modules using wires in Verilog HDL. Demonstrate any one R type MIPS instruction. Ensure the register files are getting initialized with the correct data and encoded instructions. Uses test bench to generate the relevant test vectors.

3. Write a top module to connect the instruction memory, data memory, register files, ALU and ALU control together. Encode one logical and one arithmetic instruction in the instruction memory. Initialize the data memory fields with the data. Verify the ability to fetch instructions from instruction memory. Write a Verilog test bench with arithmetic and logical instruction cases for testing these components.

4. Write a control path in Verilog HDL to control the execution of the data path of MIPS instructions in experiment 3. Analyze the control signals for J type, R type and I type instructions using a suitable test bench,

5. Encode the assembly program in instruction memory with at least 1 R-type, 1 immediate type and 1 branch-type instruction in the memory. Demonstrate the execution of this program usingVivado tool and FPGA.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECST4002				
Category	Programme Core Course				
Course Title	Design and Analysis of Algorithms				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes
On successful completion of the course, students will be able to:

1. Understand mathematical formulation, complexity analysis and methodologies to solve the recurrence relations for algorithms.
2. Apply Divide and Conquer algorithms and use them in examples
3. Formulate Greedy Methodology and use them in real life examples.
4. Design Dynamic programming and Backtracking Paradigms to solve real-life problems.
5. Design solutions using standard approaches comprehending NP class problems.

Syllabus

Module I
Mathematical foundations for arithmetic and geometric series, Principles of designing algorithms and complexity calculation, Asymptotic notations for analysis of algorithms, worst case and average case analysis, amortized analysis and it's applications.

Module II
Divide and Conquer- Introduction to Divide and Conquer, Min Max Problem, Maximum sub-array problem, Closest pair of points problems, Convex hull problem.

Module III
Greedy method – basic strategy, fractional knapsack problem, Minimum cost spanning trees, activity selection problem,find maximum sum possible equal to sum of three stacks.

Module IV
Dynamic Programming -basic strategy, Bellmen ford algorithm, all pairs shortest path, multistage graphs, optimal binary search trees, traveling salesman problem, Longest Common Subsequence problem.

Module V
Basic Traversal and Search Techniques, connected components, Backtracking basic strategy, 8-Queen's problem, sum of subset problem, Introduction to Approximation algorithm.

Module VI
NP-hard and NP-complete - basic concepts, non-deterministic algorithms, NPhard and NP complete decision and optimization problems, polynomial reduction,vertex cover problem, clique cover problem.

Text Books

1. Thomas H. Cormen et.al; “Introduction to Algorithms”; 3 Edition; Prentice Hall, 2009.
2. Horowitz, Sahani and Rajasekaram; “Computer Algorithms”, Silicon Press, 2008.
3. Brassard and Bratley; “Fundamentals of Algorithms”, 1 Edition; Prentice Hall, 1995.

Reference Books

1. Parag Himanshu Dave, Balchandra Dave, “Design and Analysis of Algorithms” Pearson Education, O'relly publication
2. Richard Johnsonbaugh, “Algorithms”, Pearson Publication, 2003.

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECST 4003				
Category	Programme Core Course				
Course Title	Software Engineering				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes
On successful completion of the course, students will be able to:

1. Understand generic processes of software development and learn different techniques and methodologies used in development of software systems.

2. Apply learned concepts to effectively use software testing methodologies in various software development scenarios.

3. Learn to evaluate and develop comprehensive project plans in alignment with project goals and stakeholder needs.

4. Develop comprehensive plans for resource allocation and project monitoring

5. Apply quality management techniques to ensure process and product quality in software development.

Syllabus

Module I
Introduction to Software Engineering, Exploratory style versus Software Engineering, Shortcoming of exploratory style, Basic principles to hadle complexity, Some basic issues: Types of software projects, software services, Emergence of software engineering principles, Evolution of design techniques.

Module II

Software Process Models, Basic concepts of classical Waterfall Model, Stages of Waterfall Model, Iterative Waterfall Model, V-Model and Prototyping Model, Incremental Model, Evolutionary Model, Agile Model, Extreme Programming and Scrum, Scrum Life Cycle Model,Case Study onsoftware development life cycle (SDLC)

Module III
Basic testing concepts, levels of testing, Errors, Faults and Failure, Unit, Integration and System Testing, Software Testing fundamentals, Black Box Testing, White Box Testing, Web Testing, Test case design,. Path Testing,Case Study on Software Testing Life Cycle (STLC)

Module IV

Software Project management- Plans, Methods and Methodology, The Business Case, Project Success and Failure, Project Evaluation, Cost-benefit evaluation technique, Project Planning-stepwise project Planning, Software Effort Estimation- Albrecht Function Point Analysis, COSMIC Function Point, Cost Estimation, Project Scheduling.

Module V

Resource allocation: Introduction, Nature of Resources, Identifying Resource Requirement, scheduling Resourses,Project Monitoring and Control, Project Control Cycle, Configuration Management, Process, Configuration Management Tool, Project Management Tools.Contract Management: Managing Contracts, Project Close out, Project Closure process and report.

Module VI

Software Quality Management: Introduction to Software Quality, Evolution of quality systems, Quality Control, Quality Assurance, Total Quality Management,Process Improvement, Process and Product Quality, CMM (Capability Maturity Model), Personal Software Process (PSP) Software Reliability, Risk management

Text Books

1. Software Engineering-A Practitioner's Approach; Roger Pressman; Sixth Edition, MaGraw Hill,2010
2. Project Management by Clifford F. Gray, Erik W. Larson, McGraw Hill

Reference Books

1. Software Engineering;Ian Somerville; Seventh Edition; Pearson Education. 2008.
2. Ethics in Information Technology, George W. Reynalds, 4th Edition, Cengage Leraning Publication
3. Software Engineering;DavidGustafsan, Schaum'sSeries,Tata McGraw Hill,2002
4. Software Project Management, Sanjay Mohapatra; First Edition, Cengage Learning, 2011.
5. Software Project Management,Rajib Mall, 5th Edition, McGrawHill

Course Code	ECSP 4003				
Category	Programme Core Course				
Course Title	Software Engineering Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	IV

List of Experiments:

[1] a. Explore the perspectives and notations of the Unified Modeling Language (UML) in Star UML.

b. Study the IEEE SRS standard and prepare SRS for the conceptualization of the identified systems.

[2] Create a Use-Case diagram to depict the user's perspective of the system, demonstrating user interactions and system functionalities.

[3] Develop a Class Diagram to articulate the structural aspects of the system

[4] Construct State Diagram to depict the structural view of the system.

[5] Construct a Sequence Diagram to represent the dynamic view or behavior of the system, illustrating the chronological flow of interactions among different components or entities within the system.

[6] Create Data Flow Diagram to illustrate the system's behavioural perspective.

[7] Perform White-Box Testing to test the functionalities using JUnit testing tool.

[8] Mini Project: Based on real-time modeling of software on a testbed and in a production environment, with case studies on SDLC and STLC

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECST4004				
Category	Engineering Science Course				
Course Title	Statistics for Data Analytics				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

On successful completion of the course, students will be able to

1. Apply statistical techniques effectively to solve complex problems in the context of data analytics.
2. Apply data cleaning, visualization, and feature engineering for effective exploratory data analysis.
3. Formulate and test hypotheses, construct confidence intervals, and apply statistical inference techniques.
4. Apply statistical inference techniques, queuing theory principles and analyze the structure and behavior of queuing systems.
5. Apply predictive modeling in data analytics through case studies and real-world applications

Syllabus

Module 1: Foundations of Statistics (6 Hrs)

Introduction to Descriptive and Inferential Statistics, Measures of Central Tendency and Dispersion, Data Visualization Techniques

Module 2: Distributions and Probability Theory (6 Hrs)

Probability theory and Probability Distributions, Sampling and Sampling Distributions

Module 3: Exploratory Data Analysis (EDA) (7 Hrs)

Data Cleaning and Preprocessing, Exploratory Data Visualization, Outlier Detection and Handling, Correlation and Covariance Analysis, Feature Engineering Basics (with R Programming)

Module 4: Statistical Inference (7 Hrs)

Hypothesis Testing (Parametric and Non-Parametric), Confidence Intervals, Analysis of Variance (ANOVA), Chi-Square Tests, Power Analysis and Sample Size Determination

Module 5: Queuing Theory (6 Hrs)

Structure of a queuing system – Operating characteristics of queuing system – Transient and steady states – Terminology of queuing systems – Arrival and service processes – Pure Birth-Death process Deterministic queuing models – M/M/1 Model of infinite queue – M/M/1 model of finite queue.

Module 6: Advanced Topics in Statistics for Data Analytics (4 Hrs)

Predictive modeling in Data analytics,Case Studies and Real-world Applications

Text Books

1. Gupta.S.C. and Kapoor.V.K. (2014): Fundamentals of Applied Statistics , Sultan Chand and sons. 2.
2. Agarwal.B.L (2007): Basic statistics, 3/e, New Age International (P) Ltd

Reference Books

1. Practical Statistics for Data Scientists –Peter Bruce and Andrew Bruce, O'Reilly Media, Inc.
2. Mood, A. M., Graybill, F. A. And Boes, D.C.: Introduction to the Theory of Statistics, McGraw Hill.
3. "An Introduction to Statistical Learning" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, Springer

Syllabus of Semester III B.Tech.
Department of Electronics and Computer Science

Course Code	ECSP4005				
Category	Engineering Core Course				
Course Title	Software Lab-I				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	IV

Course Outcomes

On successful completion of the course, students will be able to

1) Understand Processes, Tools, and Methodologies in Software Development Lifecycle.
2) Implement Agile Software Development Life Cycle.
3) Integrate Software Development and its Operations.
4) Use Cloud Environment and its Services

List of Experiments:

1.Introduction to Dev Ops and SDLC.
2.Git and Git Hub: Creating repository and committing the changes.
3.Executing following tasks using Python FLASK app

i. Writing and checking endpoints.
ii. Port Forwarding.
iii. Adding new endpoint.
iv. Writing unit tests.
v. Write a failing unit test.

4.To-do app using FLASK app (CRUD function).
5.Organization and team using GitHub.
6.Docker (Containerization) Part 1:

i. Create a code space using Flask template.
ii. Use Linux and Docker commands for different operations
iii. Read docs from docs.docker.com
iv. Run commands using nginx
v. Write and run a “Hello world” python program in Docker.

7.Docker Compose

i. Fork Repo
ii. Create Codespaces
iii. Create and check docker container
iv. Open Dockerfile and check the contents
v. Run Docker Compose commands
vi. Understanding Docker run test suit.

8. Mini Project

This mini project assessment will primarily focus on your usage of GitHub, with specific emphasis on collaboration and organization, Use Cloud Environment and its Services

Reference Books

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations by by Gene Kim, Patrick Debois, John Willis, Jez Humble, 2016.
2. Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale by Jennifer Davis.
3. Python for DevOps: Learn Ruthlessly Effective Automation by Noah Gift , Kennedy Behrman, Alfredo Deza, GrigGheorghiu.
4. Building Microservices: Designing Fine-Grained Systems by Sam Newman.
5. Effective DevOps with AWS: Ship faster, scale better, and deliver incredible productivity by Nathaniel Felsen

Course Code	ECST2990				
Category	Open Elective				
Course Title	Designing with Raspberry Pi				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes
On successful completion of the course, students will be able to

1. Wire Raspberry Pi and create a fully functional computer
2. Use Python-based IDE and trace and debug Python code on the device
3. Measure physical parameter using sensors
4. Implement various communication protocols for wired and wireless communication
5. Interfaces different motors and create robots

Syllabus

Module I
Getting started with Raspberry Pi: Basic functionality of the Raspberry Pi and its Processor, setting and configuring the board, differentiating Raspberry Pi from other platform like arduino, begal, asus thinker etc. Overclocking, Component overview.

Module II
Introduction to Linux: Implications of an operating system on the behavior of the Raspberry Pi, Overview of Linux and its terminal command, aptget-update, aptget-upgrade, navigating the file system and managing processes, text-based user interface through the shell, overview of graphic user interface.

Module III
Programming the Raspberry Pi: Python: Introducing to Python programming language; Python Programming Environment, Python Expressions, Strings, Functions, Function Arguments, Lists, List Methods, Control Flow, Numpy, PIP (Python Installation Package) and customized libraries. C++ programming: Basic C++ programming approach, header file structure and library organization, Cross Compiler and its configuration.

Module IV
Exploring Electronics with the Raspberry Pi: Communication facilities on raspberry Pi (I2C, SPI, UART), working with RPil. GPIO library, Interfacing of Sensors and Actuators.
Project 2: Set UP a Pi motion detector
Project 3: Set UP a Pi ADC/DAC
Project 4: CONSTRUCT a digital weather station
Project 5: CONSTRUCT a Traffic Light Controller

Module V
Communication using Raspberry Pi: Wired and Wireless communication, TCP, IP configurations, SSH,

Putty terminal usage.
Project 6: Set UP file server
Project 7: Network YOUR keyboard and MOUSE
Project 8: Create a portable wireless access point
Project 9: COMMUNICATE with ARDUINO
Project 10: CONSTRUCT a digital server based weather station

Module VI

Robotic Motion PI: DC, Servo, Stepper, Motor Drivers, Motor Shields, Camera Interfacing, remote data logging.
Project11:Keyboard Control Robot
Project 12: Wireless Robot

Text Books

1. Raspberry Pi 3: An introduction to using with Python Scratch, Javascript and more, Gary Mitnick, CreateSpaceIndependentPublishingPlatform, 2017.
2. Raspberry Pi for Python Programmers Cookbook, Tim Cox, Packt Publishing Limited; 2nd Revised edition, 2016.
3. Raspberry Pi User Guide, EbenUptonand GarethHalfacree, John Wiley& Sons, 2016.

Syllabus of Semester IV B.Tech.
Department of Electronics and Computer Science

Course Code	ECST4001				
Category	Engineering Core Course				
Course Title	Computer Architecture and Organization				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

On successful completion of the course, students will be able to:

6. Illustrate common principles of computer organization and multiprocessing
7. Translate the C code into MIPS assembly code
8. Design and test the data and control path of the MIPS processor on FPGA
9. Apply the concept of cache and virtual memory management in computer system.
10. Analyse different arithmetic algorithms, control unit and processor datapath with and without pipelining.

Syllabus

Module I(4Hrs)

Introduction to computer system and its sub modules, Introduction to RISC and CISC paradigm, Performance Equation, Common Principles of Computer organization: Amdahl's Law, Principle of Locality.

Module II(5 Hrs)

Processor organization, instruction set (MIPS), instruction formats, Arithmetic for Computers: Addition and Subtraction, Multiplication, Division, IEEE 754 floating point format.

Module III(6 Hrs)

Processor Design-Introduction, Datapath and control unit design, Performance Considerations, Multi-cycle design, Micro Programmed control design, Exception Handling.

Module IV(5 Hrs)

Motivation for Pipelining, Clock period and CPI, Pipelined datapath, graphical representation, Pipelining Hazards.

Module V(5 Hrs)

Memory organization, concepts of semiconductor memory, memory management, concept of cache and associative memories, virtual memory.

Module VI(5 Hrs)

Parallel processing concepts, multiprocessors and its characteristics, Input/OutputSubsystem:-Interfaces and BUS, I/O Operations, Designing I/O Systems, Case study: Application of RISC and CISC as Data Centers perspective.

Text Books

1. Computer Organization and Design - The Hardware/Software Interface, David A. Patterson, John L. Hennessy, Fifth Edition, 2014.

Reference Books

1.Computer Architecture and Organization; J. P. Hayes; Third Edition (Fifth Reprint), McGraw Hill, 2012.

2. Computer Architecture and Parallel Processing; Kai Hawang, Faye A. Briggs, McGraw Hill, 2012

3.Computer Organization; Safwat G. Zaky, Zvonko G. Vranesic, Carl Hammacher ;FifthEdition, McGraw Hill, 2002.

4. Structured Computer Organization; Andrew. S. Tanenbum; Fifth Edition, Pearson, 2005.

Syllabus of Semester IV B.Tech.
Department of Electronics and Computer Science

Course Code	ECSP4001				
Category	Engineering Core Course				
Course Title	Computer Architecture and Organization Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	IV

List of Experiments:

1. Integrate ALU and ALU control unit of MIPS processor together and test it using a test bench. Encode the instructions to be executed by ALU and generate these encoded test vectors to control the ALU operations. Supply random test vectors from test bench to check the results using Vivado and FPGA.

2. Integrate register Files, ALU control, ALU together. Write a top module to connect these modules using wires in Verilog HDL. Demonstrate any one R type MIPS instruction. Ensure the register files are getting initialized with the correct data and encoded instructions. Uses test bench to generate the relevant test vectors.

3. Write a top module to connect the instruction memory, data memory, register files, ALU and ALU control together. Encode one logical and one arithmetic instruction in the instruction memory. Initialize the data memory fields with the data. Verify the ability to fetch instructions from instruction memory. Write a Verilog test bench with arithmetic and logical instruction cases for testing these components.

4. Write a control path in Verilog HDL to control the execution of the data path of MIPS instructions in experiment 3. Analyze the control signals for J type, R type and I type instructions using a suitable test bench,

5. Encode the assembly program in instruction memory with at least 1 R-type, 1 immediate type and 1 branch-type instruction in the memory. Demonstrate the execution of this program usingVivado tool and FPGA.

Syllabus of Semester IV B.Tech.
Department of Electronics and Computer Science

Course Code	ECST4002				
Category	Programme Core Course				
Course Title	Design and Analysis of Algorithms				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

On successful completion of the course, students will be able to:

1. Understand mathematical formulation, complexity analysis and methodologies to solve the recurrence relations for algorithms.
2. ApplyDivide and Conquer algorithms and use them in examples
3. Formulate Greedy Methodology and use them in real life examples.
4. Design Dynamic programming and Backtracking Paradigms to solve real-life problems.
5. Design solutions using standard approaches comprehending NP class problems.

Syllabus

Module I

Mathematical foundations for arithmetic and geometric series, Principles of designing algorithms and complexity calculation, Asymptotic notations for analysis of algorithms, worst case and average case analysis, amortized analysis and it's applications.

Module II

Divide and Conquer- Introduction to Divide and Conquer, Min Max Problem, Maximum sub-array problem, Closest pair of points problems, Convex hull problem.

Module III

Greedy method – basic strategy, fractional knapsack problem, Minimum cost spanning trees, activity selection problem,find maximum sum possible equal to sum of three stacks.

Module IV

Dynamic Programming -basic strategy, Bellmen ford algorithm, all pairs shortest path, multistage graphs, optimal binary search trees, traveling salesman problem, Longest Common Subsequence problem.

Module V

Basic Traversal and Search Techniques, connected components, Backtracking basic strategy, 8-Queen's problem, sum of subset problem, Introduction to Approximation algorithm.

Module VI

NP-hard and NP-complete - basic concepts, non-deterministic algorithms, NPhard and NP complete decision and optimization problems, polynomial reduction,vertex cover problem, clique cover problem.

Text Books

1. Thomas H. Cormen et.al; “Introduction to Algorithms”; 3 Edition; Prentice Hall, 2009.
2. Horowitz, Sahani and Rajasekaram; “Computer Algorithms”, Silicon Press, 2008.
3. Brassard and Bratley; “Fundamentals of Algorithms”, 1 Edition; Prentice Hall, 1995.

Reference Books

1. Parag Himanshu Dave, Balchandra Dave, “Design and Analysis of Algorithms” Pearson Education, O'relly publication
2. Richard Johnsonbaugh, “Algorithms”, Pearson Publication, 2003.

Syllabus of Semester IV B.Tech.
Department of Electronics and Computer Science

Course Code	ECST 4003				
Category	Programme Core Course				
Course Title	Software Engineering				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes
On successful completion of the course, students will be able to:

6. Understand generic processes of software development and learn different techniques and methodologies used in development of software systems.

7. Apply learned concepts to effectively use software testing methodologies in various software development scenarios.

8. Learn to evaluate and develop comprehensive project plans in alignment with project goals and stakeholder needs.

9. Develop comprehensive plans for resource allocation and project monitoring

10. Apply quality management techniques to ensure process and product quality in software development.

Syllabus

Module I
Introduction to Software Engineering, Exploratory style versus Software Engineering, Shortcoming of exploratory style, Basic principles to hadle complexity, Some basic issues: Types of software projects, software services, Emergence of software engineering principles, Evolution of design techniques.

Module II

Software Process Models, Basic concepts of classical Waterfall Model, Stages of Waterfall Model, Iterative Waterfall Model, V-Model and Prototyping Model, Incremental Model, Evolutionary Model, Agile Model, Extreme Programming and Scrum, Scrum Life Cycle Model,Case Study onsoftware development life cycle (SDLC)

Module III
Basic testing concepts, levels of testing, Errors, Faults and Failure, Unit, Integration and System Testing, Software Testing fundamentals, Black Box Testing, White Box Testing, Web Testing, Test case design,. Path Testing,Case Study on Software Testing Life Cycle (STLC)

Module IV

Software Project management- Plans, Methods and Methodology, The Business Case, Project Success and Failure, Project Evaluation, Cost-benefit evaluation technique, Project Planning-stepwise project Planning, Software Effort Estimation- Albrecht Function Point Analysis, COSMIC Function Point, Cost Estimation, Project Scheduling.

Module V

Resource allocation: Introduction, Nature of Resources, Identifying Resource Requirement,scheduling Resourses,Project Monitoring and Control, Project Control Cycle, Configuration Management, Process, Configuration Management Tool, Project Management Tools.Contract Management: Managing Contracts, Project Close out, Project Closure process and report.

Module VI

Software Quality Management: Introduction to Software Quality, Evolution of quality systems, Quality Control, Quality Assurance, Total Quality Management,Process Improvement, Process and Product Quality, CMM (Capability Maturity Model), Personal Software Process (PSP) Software Reliability, Risk management

Text Books

3. Software Engineering-A Practitioner's Approach; Roger Pressman; Sixth Edition, MaGraw Hill,2010
4. Project Management by Clifford F. Gray, Erik W. Larson, McGraw Hill

Reference Books

6. Software Engineering;Ian Somerville; Seventh Edition; Pearson Education. 2008.
7. Ethics in Information Technology, George W. Reynalds, 4th Edition, Cengage Leraning Publication
8. Software Engineering;DavidGustafsan, Schaum'sSeries,Tata McGraw Hill,2002
9. Software Project Management, Sanjay Mohapatra; First Edition, Cengage Learning, 2011.
10. Software Project Management,Rajib Mall, 5th Edition, McGrawHill

Syllabus of Semester IV B.Tech.
Department of Electronics and Computer Science

Course Code	ECSP 4003				
Category	Programme Core Course				
Course Title	Software Engineering Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	IV

List of Experiments:

[9] a. Explore the perspectives and notations of the Unified Modeling Language (UML) in Star UML.
b. Study the IEEE SRS standard and prepare SRS for the conceptualization of the identified systems.

[10] Create a Use-Case diagram to depict the user's perspective of the system, demonstrating user interactions and system functionalities.

[11] Develop a Class Diagram to articulate the structural aspects of the system

[12] Construct State Diagram to depict the structural view of the system.

[13] Construct a Sequence Diagram to represent the dynamic view or behavior of the system, illustrating the chronological flow of interactions among different components or entities within the system.

[14] Create Data Flow Diagram to illustrate the system's behavioural perspective.

[15] Perform White-Box Testing to test the functionalities using JUnit testing tool.

[16] Mini Project: Based on real-time modeling of software on a testbed and in a production environment, with case studies on SDLC and STLC

Syllabus of Semester IV B.Tech.
Department of Electronics and Computer Science

Course Code	ECST4004				
Category	Engineering Science Course				
Course Title	Statistics for Data Analytics				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

On successful completion of the course, students will be able to

6. Apply statistical techniques effectively to solve complex problems in the context of data analytics.
7. Apply data cleaning, visualization, and feature engineering for effective exploratory data analysis.
8. Formulate and test hypotheses, construct confidence intervals, and apply statistical inference techniques.
9. Apply statistical inference techniques, queuing theory principles and analyze the structure and behavior of queuing systems.
10. Apply predictive modeling in data analytics through case studies and real-world applications

Syllabus

Module 1: Foundations of Statistics (6 Hrs)

Introduction to Descriptive and Inferential Statistics, Measures of Central Tendency and Dispersion, Data Visualization Techniques

Module 2: Distributions and Probability Theory (6 Hrs)

Probability theory and Probability Distributions, Sampling and Sampling Distributions

Module 3: Exploratory Data Analysis (EDA) (7 Hrs)

Data Cleaning and Preprocessing, Exploratory Data Visualization, Outlier Detection and Handling, Correlation and Covariance Analysis, Feature Engineering Basics (with R Programming)

Module 4: Statistical Inference (7 Hrs)

Hypothesis Testing (Parametric and Non-Parametric), Confidence Intervals, Analysis of Variance (ANOVA), Chi-Square Tests, Power Analysis and Sample Size Determination

Module 5: Queuing Theory (6 Hrs)

Structure of a queuing system – Operating characteristics of queuing system – Transient and steady states – Terminology of queuing systems – Arrival and service processes – Pure Birth-Death process Deterministic queuing models – M/M/1 Model of infinite queue – M/M/1 model of finite queue.

Module 6: Advanced Topics in Statistics for Data Analytics (4 Hrs)

Predictive modeling in Data analytics,Case Studies and Real-world Applications

Text Books

1. Gupta.S.C. and Kapoor.V.K. (2014): Fundamentals of Applied Statistics , Sultan Chand and sons.
2. Agarwal.B.L (2007): Basic statistics, 3/e, New Age International (P) Ltd

Reference Books

1. Practical Statistics for Data Scientists –Peter Bruce and Andrew Bruce, O'Reilly Media, Inc.
2. Mood, A. M., Graybill, F. A. And Boes, D.C.: Introduction to the Theory of Statistics, McGraw Hill.
3. "An Introduction to Statistical Learning" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, Springer

Syllabus of Semester IV B.Tech.
Department of Electronics and Computer Science

Course Code	ECSP4005				
Category	Engineering Core Course				
Course Title	Software Lab-I				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	IV

Course Outcomes
On successful completion of the course, students will be able to:

1) Understand Processes, Tools, and Methodologies in Software Development Lifecycle.
2) Implement Agile Software Development Life Cycle.
3) Integrate Software Development and its Operations.
4) Use Cloud Environment and its Services

List of Experiments:

1Introduction to Dev Ops and SDLC.
2Git and Git Hub: Creating repository and committing the changes**.**
3**Executing following tasks using Python FLASK app**

vi. Writing and checking endpoints.
vii. Port Forwarding.
viii. Adding new endpoint.
ix. Writing unit tests.
x. Write a failing unit test.

4To-do app using FLASK app (CRUD function).
5Organization and team using GitHub.
6**Docker (Containerization) Part 1:**

vi. Create a code space using Flask template.
vii. Use Linux and Docker commands for different operations
viii. Read docs from docs.docker.com
ix. Run commands using nginx
x. Write and run a “Hello world” python program in Docker.

7**Docker Compose**
vii. Fork Repo
viii. Create Codespaces
ix. Create and check docker container
x. Open Dockerfile and check the contents
xi. Run Docker Compose commands
xii. Understanding Docker run test suit.

8**Mini Project**

This mini project assessment will primarily focus on your usage of GitHub, with specific emphasis on collaboration and organization, Use Cloud Environment and its Services

Reference Books

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations by by Gene Kim, Patrick Debois, John Willis, Jez Humble, 2016.
2. Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale by Jennifer Davis.
3. Python for DevOps: Learn Ruthlessly Effective Automation by Noah Gift , Kennedy Behrman, Alfredo Deza, GrigGheorghiu.
4. Building Microservices: Designing Fine-Grained Systems by Sam Newman.
5. Effective DevOps with AWS: Ship faster, scale better, and deliver incredible productivity by Nathaniel Felsen

Syllabus of Semester IV B.Tech.
Department of Electronics and Computer Science

Course Code	MBT4006				
Category	Humanities Social Science and Management				
Course Title	Business Management and Entrepreneurship				
Scheme & Credits	L	T	P	Credits	Semester
	2	0	0	2	IV

Course Outcomes:
At the end of this course students will demonstrate the ability to

1. Understanding of the evolution of management, its history and the development of important concepts.
2. Exposure to the practice of management in contemporary organization
3. Ability to analyze and understand management as well as exploring and developing their own personal philosophy of management.
4. To provide an introduction to entrepreneurship and its development process.

Syllabus

Module I:
Introduction to Business Management: Nature – Function – Definition – Importance of Management – Scope of Management – Is management a science or art? – Management Functions and skills – Development of Management Thought (Contribution of Taylor, Fayol, Hawthorne experiments).

Module II:
Planning: Concept – Nature – Importance – Types of Planning – Strategic and Operational Plans (Policy, Procedures, Methods, Rules, Budget, Mission, Objectives), Planning Premises.

Module III:
Organizing: Concept – Principles involved – Types of organization structure - Combining Jobs: Departmentation, Span of Control, Delegation of Authority.
Decision Making: Concept – Types - Steps involved– methods of decision making – Committee Decision Making.

Module IV:
Entrepreneurship – Meaning, Types, Qualities of an Entrepreneur, Classification of Entrepreneurs, Factors influencing Entrepreneurship, Entrepreneurship Development Programmes (EDP), Business Idea: Sources & Evaluation. Entrepreneurship E-Business, Networking: Starting & Managing a Network, Infrastructure, Best Practices, Growth Strategies: Stages of Growth, Global Expansion, Relocation, Financing Growth, Business Cases

Text Books

1. Principles and Practice of Management: L M Prasad, Sultan Chand & Sons educational.
2. Entrepreneurship: Rajeev Roy, Oxford Publication.

Reference Books

1. Management Theory and Practice: P SubbaRao, Himalaya Publishing House
2. Principles of Management: Dr. NeeruVasishth, Taxmann's Publication
3. Management Principles, Processes and Practices: Anil Bhat&Arya Kumar, Oxford Publications
4. Vasanta Desai: Dynamics of entrepreneurial development and management, Himalaya Publishing House
5. Innovation and development: Peter F. Drucker.

Syllabus of Semester IV B.Tech.
Department of Electronics and Computer Science

Course Code	ECST2990				
Category	Open Elective				
Course Title	Designing with Raspberry Pi				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

On successful completion of the course, students will be able to

1. Wire Raspberry Pi and create a fully functional computer
2. Use Python-based IDE and trace and debug Python code on the device
3. Measure physical parameter using sensors
4. Implement various communication protocols for wired and wireless communication
5. Interfaces different motors and create robots

Syllabus

Module I

Getting started with Raspberry Pi: Basic functionality of the Raspberry Pi and its Processor, setting and configuring the board, differentiating Raspberry Pi from other platform like arduino, begal, asus thinker etc. Overclocking, Component overview.

Module II

Introduction to Linux: Implications of an operating system on the behavior of the Raspberry Pi, Overview of Linux and its terminal command, aptget-update, aptget-upgrade, navigating the file system and managing processes, text-based user interface through the shell, overview of graphic user interface.

Module III

Programming the Raspberry Pi: Python: Introducing to Python programming language; Python Programming Environment, Python Expressions, Strings, Functions, Function Arguments, Lists, List Methods, Control Flow, Numpy, PIP (Python Installation Package) and customized libraries. C++ programming: Basic C++ programming approach, header file structure and library organization, Cross Compiler and its configuration.

Module IV

Exploring Electronics with the Raspberry Pi: Communication facilities on raspberry Pi (I2C, SPI, UART), working with RPil. GPIO library, Interfacing of Sensors and Actuators.
Project 2: Set UP a Pi motion detector
Project 3: Set UP a Pi ADC/DAC
Project 4: CONSTRUCT a digital weather station
Project 5: CONSTRUCT a Traffic Light Controller

Module V

Communication using Raspberry Pi: Wired and Wireless communication, TCP, IP configurations, SSH, Putty terminal usage.
Project 6: Set UP file server
Project 7: Network YOUR keyboard and MOUSE
Project 8: Create a portable wireless access point
Project 9: COMMUNICATE with ARDUINO
Project 10: CONSTRUCT a digital server based weather station

Module VI

Robotic Motion PI: DC, Servo, Stepper, Motor Drivers, Motor Shields, Camera Interfacing, remote data logging.
Project11:Keyboard Control Robot
Project 12: Wireless Robot

Text Books

1. Raspberry Pi 3: An introduction to using with Python Scratch, Javascript and more, Gary Mitnick, CreateSpaceIndependentPublishingPlatform, 2017.
2. Raspberry Pi for Python Programmers Cookbook, Tim Cox, Packt Publishing Limited; 2nd Revised edition, 2016.
3. Raspberry Pi User Guide, EbenUptonand GarethHalfacree, John Wiley& Sons, 2016.

Syllabus of Semester IV B.Tech.
Department of Electronics and Computer Science

Course Code	ECSTH4100				
Category	Honors Course				
Course Title	Single dimension signal processing on Edge				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

On successful completion of the course, students will be able to:

1. Analyze and Interpret Signals.
2. Apply Digital Signal Processing Techniques.
3. Process Sensor Data on Edge Devices.
4. Develop Signal Processing Algorithms on Edge Platforms.
5. Solve Practical Problems Using Edge Devices

Module I: (5 Hrs)

Introduction to Signals Processing: Types of signals, Continuous-time and discrete-time domains, sampling theorem, quantization, analog to digital conversion, understanding discrete signals in time domain and frequency domain.

Module II: (5 Hrs)

Basics of Digital Signal Processing:

Representing discrete signals and systems in Z domain, basic operations on signals, algorithms for convolution, correlations, basic average and difference filter for single dimension signals

Module III: (5 Hrs)

Sensor Data Processing on Edge: Sensor data acquisition systems and protocols, collecting sensor data using Raspberry Pi, Feature extraction like mean, standard deviation, energy, and entropy, normalization, scaling, case studies for Edge applications – Driverless cars, Health monitoring, Smart City

Module IV: (5 Hrs)

Programming for Signal Processing: programming basic signal processing algorithms on edge platform: Raspberry pi, using signal processing libraries, implementing 1D convolution and cross-correlation, implementing average and difference filter on sensor data set for noise removal.

Module V: (10 Hrs)

Programming for Practical applications on Raspberry pi: Setup Raspberry pi for single dimension signal processing application, Case studies: Implementation of Heart Rate Monitoring using peak detection, Detect noise levels in an environment using signal's RMS value, Temperature Trend Analysis, Real-Time Respiratory Rate Monitoring, obstacle detection system, Motor Speed Control Based on Sensor Data

Text Book:

1. Digital Signal Processing, Nagoor Kani, 2nd Edition Mc-Graw Hill
2. Digital Signal Processing A Practitioner's Approach, Kaluri Venkata Rangarao, Ranjan K Mallik, John Wiley & Sons Ltd, 2005

Reference Books:

1. **Digital Signal Processing: Principles, Algorithms, and Applications"** by John G. Proakis and Dimitris G. Manolakis, 4e Pearson Education India
2. The Scientist and Engineer's Guide to Digital Signal Processing, Steven W. Smith, California Technical Pub, First Edition
3. Make: Sensors: A Hands-On Primer for Monitoring the Real World with Arduino and Raspberry Pi , Tero Karvinen , Kimmo Karvinen , Ville Valtokari, 1st Edition , Make Community Publication.

Course Code	ECSTM4100				
Category	Minor Course				
Course Title	Sensor Interfacing with Arduino and ESP8266				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

Upon successful completion of the course, students will be able to:

1. Code in Arduino IDE that works with open source hardware platforms like Arduino and ESP
2. Measure physical parameters using sensors and control various actuator4 s
3. Interface devices with serial communication protocols

Syllabus

Module I:
Introduction to Arduino Prototyping Platform: Arduino IDE, Arduino C, Setting up the Arduino board, creating sketches, using Libraries, using example codes, Debugging using the Serial Monitor.

Module II:
Sensor interfacing with Arduino: Analog and digital sensors, Temperature sensors, Humidity sensors, Proximity sensors, Ultrasonic sensor, Accelerometer and gyro, etc.

Module III:
Serial Communication in Arduino: Serial and parallel communication, Serial communication protocols, UART, I2C, SPI, Wired and Wireless communication, Interfacing Communication Modules with Arduino.

Module IV:
Interfacing Displays and Actuators: 16x2 LCD, Graphical LCD, Graphical OLED, Relay, Speed and direction control of DC, Servo and, Stepper Motor.

Module V:
Introduction to ESP8266: ESP8266 development board, Programming ESP8266 through Arduino IDE, connecting to the internet, sending and receiving data on internet.

Module VI:
Interfacing sensors and actuators with ESP8266: LDR, Temperature sensor, Humidity sensor, RGB LED, Relay, etc.

Text Book

1. Arduino Cookbookby Michael Margolis, O'Reilly Media, Inc., 1st edition
2. Beginning C for Arduino By Jack Purdum (ebook)
3. Arduino for Beginners: Essential Skills Every Maker Needs, John Baichtal, Pearson Education, Inc., 1st edition