SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)

Applied Science (Physics)

Semester/Year		I/II	Program		B.Tech
Subject Category	BS	Subject Code:	PYB101	Subject Name:	**Applied Physics**

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work		L	T	P	
60	20	10	10	30	20	150	3	0	1	4

Prerequisites:

Intermediate Physics (Theory and Lab)

Course Objective:

This course is designed to impart fundamental knowledge about some areas of physics which are to the core of emerging technologies. It is planned to provide knowledge about Quantum mechanics, Lasers , Fiber Optics, Hologhphy, Superconductor, Nano materials, Dielectric and piezoelectric materials. Laboratory sessions are also designed which are blended with experiments on the fundamental and advanced areas of physics.

Course Outcomes:

After completion of the course, students will be able

CO1	To understand basic quantum physics and apply it to the behaviour of a system at the microscopic level and solve the problems.
CO2	To understand process of lasers and explain the requirements, properties, classification of various lasers. They will also develop an understanding of optical fibers and and holography and can explin the characteristics, various losses, dispersion in optical fibers and procsees of construction and reprocuction of holograms.
CO3	To understand the basic concepts and theory of semiconductor for devices application.
CO4	To understand and know the principle of superconductors and nanomaterils. The sdunednt will be able to explain types of superconductors, their properties and applications, nano technology and its applications.
CO5	To understand the characteristic of Dielectrics and Piezoelectric materials in terms of their applications .
CO6	To perform experiments related to the course contents.

UNITs	Descriptions	Hrs.	CO's
I	**Quantum mechanics:** Planck's quantum hypothesis, Wave-particle duality of radiation, de-Broglie matter waves, Davisson and Germer's electron diffraction experiment, Compton effect, Phase and group velocity, Heisenberg uncertainty principle and its applications, wave function and its significance, Eigen value and Eigen function, Schrödinger wave equations, particle in one dimensional potential box.	8	
II	**Lasers:** Properties of lasers, the basic process of lasers, Population-inversion, classification of lasers, working of He-Ne, Ruby, Nd: YAG and CO_2 lasers, Applications of Lasers in Communication, Medical and Industry. **Optical fibers:** Light guidance through optical fibres, the qualitative idea of critical and acceptance angle, types of fibers, numerical aperture, V-Number, intermodal & material dispersions in fiber. **Holography:** Basic principle of holography, Construction and reconstruction of Image on hologram and applications of holography.	8	
III	**Basic of semiconductors**: Density of energy states, Energy-band formations, direct and indirect band gap, Effective mass, Fermi energy	8	

	levels. Mobility and carrier concentrations (intrinsic). Radiative and non - radiative recombination mechanisms in semiconductors . **Semiconductor Devices**: Properties of PN junction and I-V diode equation, Photovoltaic cell, LED Materials for fabrication, LED Structures and Characteristics; Injection Laser Diode (ILD) - Laser action in semiconductors , structures and efficiency.		
IV	**Superconductors**: Free electrons theory of metals, Temperature dependence of resistivity in superconducting Metals , Effect of magnetic field (Meissner effect) , Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High-temperature superconductors and Applications of superconductors. **Nanomaterials**: Basic principle of nanoscience and technology, structure, properties ad uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.	8	
V	**Dielectrics Materials**: Polar and Non-Polar Dielectrics, Dipole moment and Polarization, Dielectric constant& Polarization, Gauss law in Dielectric, the relation between electric field vector E, Pand D. **Piezoelectric materials**- Ferroelectric materials , Piezoelectric effect, direct and converse parameter definitions, Piezoceramics, Piezopolymers, Piezoelectric materials as sensor and transducers.	8	
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. To determine the width of a single slit from the study of Fraunhoffer diffraction pattern using a He-Ne Laser.
2. To determine the frequency of A.C. mains using an electrical - vibrator.
3. Determination of Planck's constant.
4. To determine the frequency of A.C. mains using a sonometer
5. To study the nature of polarization of light using the half-wave plate.
6. To find the numerical aperture of the given fibre.
7. To determine the refractive indices μ_0 and μ_e of Quartz prism for ordinary and extraordinary rays using the spectrometer.
8. To determine the wavelength of monochromatic source of light by Fresnel's biprism.
9. To study the V-I characteristics of semiconductor diode
10. To study V-I Characteristics of LED
11. To study the V-I characteristics of tunnel diode
12. To determine the radius of curvature of a given plano-convex lens by Newton's rings method.
13. To determine the absorption coefficient of a glass plate by "LUMMER_ BRODHUM" photometer.
14. To determine the resolving power of a telescope.
15. To determine the wavelength of light emitted by mercury vapour lamp using a diffraction grating.

Text Book-

- Concepts of Modern Physics, Arthur Beiser, Tata McGraw-Hill,6th edition,2009.
- Optics, A.Ghatak, McGraw Hill, 2012.
- Engineering Physics , Hitendra K Malik& A.K. Singh, Mc Graw Hill Education Private Limited
- Elements of Modern Physics, S.H Patil
- Kiruthiga Sivaprastha, Modern Physics, S Chand
- A Textbook of Engineering Physics, Gaur and Gupta, Dhanpat Rai Publishers, New Delhi,8th edition,.2011.

Electrical Engineering Materials by A.J. Dekker, PHI publication

Reference Books_

- Lasers and non-linear optics, B.B.Laud, New Age international,3rd edition,2011

- Solid State Physics, S.O.Pillai , New Age International Ltd, publishers
- Electromagnetic Theory for Telecommunications, C.S.Liu and V.K.Tripathi, Foundation Books, New Delhi,2007
- Quantum Mechanics by L.I. Schiff, Mc Graw Hill Co.
- A Textbook of Quantum Mechanics by Piravonu Mathews, K. Venkatesan (Tata McGraw Hill)
- Cady, W. G., Piezoelectricity, Dover Publication
- Piezoelectric Materials & Devices: Application in Engineering And Medical Sciences By M.S. Vijiya .CRC Press.
- Electrical Engineering Materials Physics Properties by SP A Seth, Dhanpat Rai Publications.

Modes of Evaluation and Rubric

Assignments, Quiz, Tests & exams

Criteria	Excellent (3 points)	Good (2 points)	Fair(1 point)
Quiz	> 80%	60-80%	40-60%
Test & exam	>75%	60 -75%	< 60%
Assignment	Assignment is coherently organized and the logic / solution to all the problems provided. Writing is clear and concise and persuasive.	Assignment is generally well organized and logic / solution to maximum of the problems provided barring few inaccuracies.	Assignment is poorly organized and difficult to follow. Does not flow logically from one part to another with lots of mistakes

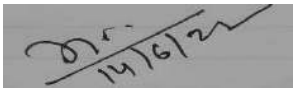
List/Links of e-learning resource

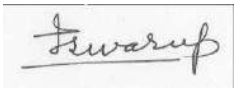
- https://nptel.ac.in/courses/122107035/#
- https://nptel.ac.in/course.html
- http://www.tndte.gov.in/site/wp-content/uploads/2016/08/Engineering-physics.pdf
- https://physicstoday.scitation.org
- Barbastathis, G. and Sheppard C., Optics, https://ocw.mit.edu/courses/mechanical-engineering/2-71-optics-spring-2009/

Recommendation by Board of studies on	14.06.2022
Approval by Academic council on	
Compiled and designed by	Jetendra Parashar
Subject handled by department	Applied Science (Physics)









SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P
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Computer Science and Engineering

Semester/Year		Program		B.Tech.	
Subject Category	ESC	Subject Code:	CSA101	Subject Name:	Introduction to Computer Science and Engineering

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Course Objective:

The objective of this course is to introduce the Computer Science and Engineering and Basic concepts of computers. To understand the component of computer and generation of computer. To familiarize students with the programming and problem-solving concepts using C Programming language. The course will help student to solve the problem using computer programming.

Course Outcomes:

Upon completion of this course, the student will be able to:

- CO1: Familiarize the importance of computer science and engineering Understand the concept of generation of computer and learn about component of computer system.
- CO2: Understand the concept of Problem-solving using C and Implement the flowchart and program for solving Mathematical and Engineering problems.
- CO3: Articulate the Modular Programming Concept and Solve the Engineering Problem using Modular Programming.
- CO4: Articulate the Advance C Programming Concept to Solve the Engineering Problem using Structure, Union and File Management.
- CO5: Describe the various Computer Science disciplines and their applications.

UNITs	Descriptions	Hrs.	CO's
I	**Introduction to Computer Science and Engineering**: Computer: Definition, Classification, Generation, Organization i.e. CPU, register, Bus architecture, Instruction set, Memory & Storage Systems, I/O Devices, and System & Application Software.	6	CO1
II	**Problem Solving using C**: Programming solving using computer concept, flowchart.Rules/ conventions of coding, documentation, naming variables, History of C, Structure of a C Program; Data types, Constant & Variable, naming variables, Operators (arithmetic, logical, bitwise, relational, ternary, Pointers - & and * operators) & expressions, Control Constructs – if-else, for, while, do-while, Case switch statement,Special constructs – Break, continue, exit(), goto& labels,Type conversion & type casting, Priority & associatively of operators; Type modifiers.	10	CO2
III	**Modular Programming:** Arrays; storage classes, Functions; Arguments; Return value; Parameter passing – call by value, call by reference; Return statement; Scope, visibility and life-time rules for various types of variables; Calling a function; Recursion – basics, comparison with iteration, types of recursion- direct, indirect, tree and tail recursion, when to avoid recursion.	9	CO3
IV	**Advance C Programming:** Structure – basic, declaration, membership operator, pointer to structure, referential operator, self-referential structures, structure within structure, array in structure, array of structures. Union – basic, declaration; Pre-processor Directives: C pre-processor – basics, #Include, #define, Enumerated data type; Typedef; File Handling in C- concepts, functions.	8	CO4
V	**Introduction to Computer Science disciplines and their applications**: Networking, Security, Operating System, Data Science, Machine Learning, Cloud Computing, Block chain, web development.	7	CO5
Guest Lectures (if any)		May be arranged as required	
Total Hours		**40**	

List of Experiments

1. Make a Poster on Component of Computer Systems/Generation of Computer System with their working (CO1)
2. Write a program to determine given number is Armstrong number or not.(CO2)

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3. Write a program to determine the roots of quadratic equation $ax^2+bx+c=0$(CO2)
4. Write a program to calculate the factorial of an integer quantity. (CO2)
5. Write a program to print diamond shape using star. (CO2)
6. Write a Program to find and print the sum of first N Prime Numbers.(CO2)
7. Write a program to convert binary to decimal and decimal to binary.(CO3)
8. Write a Program in C to read two arrays, add them and to print the resultant array. Use read_mat(),add_mat() and print_mat() functions. Array should not be declared as global variables. (CO3)
9. Write a program to read two matrix and apply addition, subtraction, multiplication, transpose operation and display result. (CO3)
10. Write a C Program to calculate area of triangle, rectangle, circle using function. (CO3)
11. Write a program using recursive function to output in reverse the sequence of characters input from the keyboard. The input is terminated by new line. Your output should be on a new line. Write an iterative solution for the same.
12. Write a Program to store data about 10 books. Which contain book title, price and number of copies of the book. After reading the data about books your program should display the data of all the book which cost more than Rs 200. (CO4)
13. Write a program using structure to accept the current time in (Hr:min:sec) , update it by one second and to print it. (CO4)
14. Write a program to count characters, spaces and new lines in a file. The name of the file should be entered through command line. (CO4)
15. Create a Poster on any one latest computer science and engineering disciplines. (CO5)

Text Book-

- Let us C By YashwantKanetkar, BPBPublication
- Programming in C, SchaumOutline,McGraw-Hill

Reference Books-

- Programming in ANSI-C By E. Balagurusami, TMHPublication
- C Programming language By Kernighan, Brian, W, Retchie, Dennis,PHI Publication
- Information Technology: Theory and Practice y PRADEEP K. SINHA (Author), PRITI SINHA (Author)

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

List/Links of e-learning resource

List and Links of e-learning resources:

1. https://nptel.ac.in/courses/108/105/108105132/
2. https://de-iitr.vlabs.ac.in/

Recommendation by Board of studies on	June-2022
Approval by Academic council on	June-2022
Compiled and designed by	CS & IT
Subject handled by department	CS & IT

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SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS

Semester/Year		I/I	Program		B.Tech – Internet of Things				
Subject Category	ESC	Subject Code:	IOA 103	Subject Name:	Basic Electrical Engineering				
Maximum Marks Allotted									
Theory			Practical		Total Marks	Contact Hours			Total Credits
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
60	20	20	30	20	150	3	0	2	04

Prerequisites:

Course Objective:

1. Familiarize with the basic concept of AC-DC Circuits and Machines
2. Impart the knowledge of Transformer and Rotating Machines
3. Concept of number system.
4. To explain the basic concepts of electronic devices.

Course Outcomes:

On successful completion of this course student should be able to:

CO 1: Understanding of AC & DC circuits and its analysis using various theorems.

CO 2: Understanding of Laws of electromagnetism, basic concepts and construction features of transformer.

CO 3: Basic understanding of working and detail of DC machine, induction machine & synchronous machine.

CO 4: Understanding of various electrical networks and finding its appropriate solution.

UNITs	Descriptions	Hrs.	CO's
I	**Unit-I:** DC Circuits- Electrical circuit elements (R, L and C), voltage and current sources, Kirchhof and Voltage laws, source conversion, DC circuits analysis using mesh & nodal method, Thevenin, Norton's, Maximum Power Transfer and Tellegen's Theorm, time domain analysis of first order RL and RC circuits.	8	CO1
II	**Unit-II:** AC Circuits- Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.	8	CO1
III	**Unit-III:** Transformers- Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.	8	CO2
IV	**Unit-IV:** Rotating Electric machines- Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss	8	CO3

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Dr. Divyarishi Sahu Prof. Shalla Chugh Prof. C. S. Sharma Dr. Ashutosh Datar Dr. Jyotsna V Ogale

	components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.		
V	**UNIT V:** Introduction to Network: second order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response. Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Introduction to two port network.	8	CO4
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. To verify Kirchhoff's voltage law and Kirchhoff's current law.
2. To verify Thevenin's, Norton's, Superposition and Maximum power transfer theorems in AC circuits.
3. To verify Tellegin's theorem in AC circuits.
4. To perform polarity test on single phase transformer.
5. To determine the transformation ratio of single phase transformer.
6. To conduct open circuit test on single phase transformer and calculate iron losses.
7. To conduct short circuit test on single phase transformer and calculate copper losses.
8. To perform load test on single phase transformer and determine voltage regulation and efficiency. To determine active power, reactive power, of single phase R-L series circuit.
9. To determine the armature circuit resistance series field winding resistant shunt field winding resistance of DC machines.
10. To determine line of 3 phase balanced and unbalanced Star.

Text Book-

- D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", TMH, 2010.
- Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition
- D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
- M. E. Van Valkenburg, —Network Analysis‖, Prentice Hall, 2006
- D. Roy Choudhury, —Networks and Systems‖, New Age International Publications, 1998.

Reference Books-

- Millman, Halkias & Parikh, Integrated Electronics, Mc Graw Hill, II Edition
- Hughes, Electrical and Electronic Technology, Pearson Education IX Edition

Modes of Evaluation and Rubric

List/Links of e-learning resource

- https://nptel.ac.in/courses/108105053

Dr. Dhananjay V Gadre | Dr. N. P. Patidar | Mr. Satish Asani | Mr. Sudesh Morey | Prof. Vipin Tatait

Dr. Divyarishi Sahu | Prof. Shaila Chugh | Prof. C. S. Sharma | Dr. Ashutosh Datar | Dr. Jyotsna V Ogale

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Computer Science and Engineering

Semester/Year			Program		B.Tech							
Subject Category	ESC	Subject Code:	CSA102	Subject Name:	Digital Electronics							
Maximum Marks Allotted									Contact Hours			Total Credits
Theory				Practical								
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz	Total Marks		L	T	P	
60	20	10	10	–	–	--	100		3	0	0	3

Prerequisites:

Basics of Physics

Course Objective:

The objective of this course is to provide the fundamental concepts associated with the digital logic and circuit design. To familiarize students with the different number systems, logic gates, minimization of logic circuits and combinational and sequential circuits utilized in the different digital circuits and systems. The course will help student to design and analyze the digital circuits and systems.

Course Outcomes:

Upon completion of this course, the student will be able to:

- CO1: Convert different number systems and codes used in digital circuits and systems.
- CO2: Simplify and analyze the digital logic circuits using Boolean algebra and other mapping techniques.
- CO3: Analyse and design different combinational logic circuits using different mapping techniques and mathematical tools.
- CO4: Compare different types of sequential circuits viz. counters in the domain of analysis.

UNITs	Descriptions	Hrs.	CO's
I	**Introduction to Digital Electronics:** Review of number system and conversions; Binary Arithmetic, Signed and Unsigned representation, Binary codes, Gray Code, Code Conversions, Error detection and correction codes - parity check codes and Hamming code.	8	CO1
II	**Boolean Algebra and Switching Functions -** Study of basic logic gates, Basic postulates and fundamental theorems of Boolean algebra; Standard representation of logic functions - SOP and POS forms; Simplification of switching functions - K-map and Quine-McCluskey tabular methods.	8	CO2
III	**Combinational Logic Modules and their applications**: Adders, Subtractors, Code Converters, parity generators and comparators, Encoders & Decoders, BCD to seven-segment decoder, Multiplexers & Demultiplexers and their applications.	9	CO3
IV	**Sequential Circuits and Systems:** Set-Reset latches and flip flops, D-flipflop, R-S flip-flop, J-K Flip-flop, Master slave Flip flop, edge	7	CO4

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	triggered flip-flop, T flip-flops, Shift registers, classification of shift registers.		
V	**Counters classification**: asynchronous counters, synchronous counters, counters design, BCD counter, MOD counters, ripple counter, Introduction to finite state machines.	8	CO4
Guest Lectures (if any)		--	
Total Hours		40	

List of Experiments

Text Books-

- M. Mano, "Digital Logic and Computer Design", Pearson Education.
- T. L. Floyd, "Digital Fundamentals", Pearson Education.
- A. Anand Kumar, "Fundamentals of Digital Circuits", PHI.

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

List/Links of e-learning resource

List and Links of e-learning resources:

3. https://nptel.ac.in/courses/108/105/108105132/

https://de-iitr.vlabs.ac.in/

Recommendation by Board of studies on	June-2022
Approval by Academic council on	June-2022
Compiled and designed by	CS & IT
Subject handled by department	CS & IT

Dr. Kanak Saxena
Chairperson

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Applied Science

Semester/Year		First Sem	Program		B.Tech.
Subject Category	Departmental Core	Subject Code:	MAB101	Subject Name:	Linear Algebra and Calculus

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work		L	T	P	
60	20	10	10	-	-	100	3	1	-	4

Prerequisites:

Basic of Differentiations, Integrations and Matrices.

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

This course is to develop students abilities to:

1. Apply Differential Calculus to Notions of Curvature. Apart from some other Applications they will have a Basic Understanding of Taylor's Theorem, Maxima and Minima.
2. The Fallouts of Partial Differentiation that is Fundamental to Application of Analysis to Engineering Problems.
3. Finding area and Volume using Double and Triple Integrals.
4. The Essential Tool of Matrices and Linear Algebra in a Comprehensive Manner. Student will understand Matrices and their Application to Solve System of Linear Simultaneous Equations.
5. Students will Gain Experience with Problem Solving in Boolean Algebra and Graph Theory.

UNITs	Descriptions	Hrs.	CO's
I	**Differential Calculus:** Lebnitz Theorem, Expansion of functions by Maclaurins and Taylors theorem (one variable), Maxima & Minima of two variables, Curvature: Radius and Centre of Curvature for Cartesian Coordinates.	8	1
II	**Partial Differentiation:** Partial Derivatives of Higher Order, Homogeneous Functions, Euler's Theorem, Total differentiation, Errors and Approximations.	8	2
III	**Integral Calculus :** Definite Integral as a Limit of the Sum, Application in Summation of Series, Multiple Integrals, Change of order of Integration, Application of Double and Triple Integrals (Area & Volume).	8	3
IV	**Matrix :** Definition, Types & Properties of Matrices, Elementary Transformation, Rank of Matrix, Consistency of Linear System of Equations and their solutions, Eigen Values and Eigen Vectors, Cayley Hamilton Theorem and its Application to find the Inverse.	8	4

V	**Boolean Algebra & Graph Theory:** Algebra of logic, Principal of Duality and basic theorem, Boolean expression and Boolean functions, Definition of Graph, Types of Graphs, Sub Graphs, Walk, Path and Circuits,.	8	5
TOTAL HOURS		40	

Reference Books:

1. Engg. Mathematics: By B.S. Grewal
2. Boolean Algebra: R.S. Agrawal
3. Engg. Mathematics: by H.K. Dass
4. Engg. Mathematics : By B. V. Rammanna

Recommendation by Board of studies on	14-06-2022
Approval by Academic council on	16-06-2022
Compiled and designed by	Applied Maths Board of Studies, Chairman Dr. Shailesh Jaloree

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Humanities and Management

Semester/Year	II Year	Program	B. Tech All Branches
Subject Category: MAC	Subject Code: MAC101	Subject Name:	**Universal Human Values**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work	Quiz		L	T	P	
00	00	00	00	60	20	20	100	-	-	2	Grade

Prerequisites:

During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

Course Objective:

At the end of the course, the students will be able to:

1. Develop a holistic perspective based on exploration about others and themselves.
2. Develop clarity, importance of harmony and humanity towards family, society and nature/existence.
3. Strengthen self-reflection.
4. Develop commitment and courage to act.

Course Outcomes:

1. By the end of the course, students will become aware of themselves, and their surroundings (family, society, nature)
2. They would have better critical ability.
3. They would become more responsible in life; and keeping human relationships and human nature in mind will be able to handle problems with sustainable solutions.
4. They would also become sensitive to their commitment towards nature and existence.
5. They would be able to apply what they have learnt to their own selves in different day-to-day real-life scenarios, at least a beginning would be made in this direction.

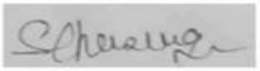
UNITs	Descriptions	Hrs.	CO's
I	Introduction - Need, Basic Guidelines, Content and Process for Value Education 1. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration 2. Continuous Happiness and Prosperity- A look at basic Human Aspirations 3. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority 4. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario	8	1

	5. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility.		
II	Understanding Harmony in the Human Being - Harmony in Myself! 1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body' 2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility 3. Understanding the characteristics and activities of 'I' and harmony in 'I' 4. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail 5. To ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods. Identifying from one's own life. Differentiate between prosperity and accumulation.	6	2
III	Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship 1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness. 2. Understanding the meaning of Trust; Difference between intention and competence. 3.Understanding the meaning of Respect, Difference between Respect and differentiation; the other salient values in relationship. 4.Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. 5. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Gratitude as a universal value in relationships. Elicit examples from students' lives.	4	3
IV	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence 1. Understanding the harmony in the Nature. 2. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature. 3. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. 4. Holistic perception of harmony at all levels of existence. 5. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.	8	4
V	Implications of the above Holistic Understanding of Harmony on Professional Ethics 1. Natural acceptance of human values. 2. Definitiveness of Ethical Human Conduct. 3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order 4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop	9	5

	appropriate technologies and management patterns for above production systems. 5. Strategy for transition from the present state to Universal Human Order: a. as socially and ecologically responsible engineers, technologists b. At the level of society: as mutually enriching institutions and organizations.		
		5	
Total Hours		40	
Suggestive list of experiments:			
Guest Lectures (if any)			
Text Book- Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010			
Reference Books- . JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak 1999. 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.			
Modes of Evaluation and Rubric			
Questionnaire,Quiz,Presentation and standard procedure will be followed			
List/Links of e-learning resource			
https://fdp-aicte-india.org https://vvce.ac.in			

Recommendation by Board of studies on	26/02/2022
Approval by Academic council on	
Compiled and designed by	Dr. Manorama Saini and Dr. VeenaDatar
Subject handled by department	Humanities and Management






SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Applied Science

Syllabus For EE,CSE, EI, EC, IT, BC, IoT and AIADS Programs

Subject Category	BSC	Subject Code:	CHB101	Subject Name:	Applied Chemistry

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
End Sem	Mid-Sem	Quiz/Assignment	End Sem	Lab-Work		L	T	P	
60	20	20	30	20	150	3	-	2	4

Prerequisites:

Students who have completed 12th with Science stream or Chemistry of 12th standard or equivalent

Course Objective:

The main aim of Engineering Chemistry is to make Students familiar with basic concepts of Chemistry, the students face in industry and engineering field. With this background the Students will be able to explain Scientifically the various chemistry related problems in industry/engineering field.

Course Outcomes:

Student after successful completion of course shall possess skills to think critically and analyse chemistry problems in engineering field. Students are expected to solve the chemistry problems with an engineering purview. Laboratory work is intended for students to learn conducting experiments and analyse experimental data.

CO's	CO's Description
CO1	Differentiate hard & soft water, solve the related numerical on water treatment and have knowledge regarding its Significance in industry and daily life.
CO2	Apply their knowledge regarding various types of fuels including petroleum fuels, Fuels Cells, Electrical Vehicle Batteries
CO3	Acquire basic knowledge of various types of Corrosion, its harmful effects and preventive methods.
CO4	To know basic concept of polymers and its properties.To have knowledge about advanced electroactive polymers and their applications. To know preliminary understanding of Nanomaterials and their applications.
CO5	Analyze the need of instruments. Identify and estimate about the unknown/new compounds with the help of spectroscopy/ chromatography.

UNIT	Descriptions	Hrs	CO's	Remarks
I	**WATER TECHNOLOGY:** Sources, Availability, impurities in Water, Types of hardness, Units of hardness. Concentration expression: Normality, Molarity, Molality. Water analysis techniques – Hardness determination by EDTA method, Alkalinity determination. Defects in boiler due to Hard water. External Treatment (Lime-soda, Zeolite & Ion exchange resin method) & Internal Treatment of Boiler feed water. Numerical Problems.	8	1	
II	**ELECTROCHEMISTRY & ENERGY STORAGE SYSTEMS:** Electrochemistry: Introduction, EMF of cell, Single electrode potential-Derivation of Nernst equation, Numerical problems based on Nernst Equation (E, E_o&E_{cell}). Energy Storage Systems: Introduction, Classification of batteries (primary, secondary and reserved batteries). Construction, working, and applications of Li-ion batteries. Advantages of Li-ion battery as an electrochemical energy system for electric vehicles. Recycling of Lithium-ion batteries by direct cycling Method. Introduction of Na- ion battery, graphene battery. Recycling, disposal and second use of batteries.	8	2	
III	**CORROSION, METHODS OF PREVENTION OF CORROSION** Introduction, Types of Corrosion, Disadvantages of corrosion, Theories of corrosion, Factors influencing the rate of corrosion. Methods of Prevention of Corrosion, Control of Environment, Alloying, Surface coatings, Metal coatings, Electroplating, Galvanization and Tinning, Inorganic coating, Anodizing, Cathodic Protection, Sacrificial Anode Method etc	8	3	

IV	**ENGINEERING MATERIALS:** Polymers: Nomenclature & classification of polymers. Electrically active polymers, Conducting polymers, **Liquid-crystal polymers (LCP),** Photoactive polymers, Photovoltaic materials: solar cells and dye sensitized solar cells-principle and applications, Conducting Polymers: Methods of synthesis and properties of polyaniline (PANi), polypyrrol (PPy) and polythiophene (PTh); applications of these polymers in advanced technologies. Nanomaterials: Synthesis, characterization and applications of nano materials (Eg. fullerene, graphene, carbon nanotubes and quantum dots) in electronic and nano devices. Introduction to Optical Fibres.	8	4	
V	**INSTRUMENTAL METHODS OF ANALYSIS:** Importance of Instrumental techniques. Classification of Instrumental techniques. Introduction to Electroanalytical and Spectroscopic Methods. Principle, Instrumentation, Working and applications of following techniques: Colorimetry, IR Spectroscopy, Conductometry, pH metry, Chromatography and Gas Chromatography.	8	5	
Guest Lectures (if any)				
Total Hours		40		

Suggestive list of experiments:

LABORATORY EXPERIMENTS:(Any 10 experiments to be performed)

1. To determine strength of unknown Ferrous Ammonium Sulphate $FeSO_4.(NH_4)_2SO_4.6H_2O$ (Mohr's Salt) solution by titrating it against intermediate Potassium Dichromate ($K_2Cr_2O_7$) solution using Di Phenyl Amine(DPA) as internal indicator.[Redox Titration]
2. To determine Temporary, Permanent and Total Hardness in given sample of water by E.D.T.A. method.[Complexometric Titration]
3. To determine strength of Sodium Carbonate and Sodium Bicarbonate in given alkaline solution by titrating with standard HCl using phenolphthalein and Methyl Orange indicators.
   Or
   To determine alkalinity in given water sample using Phenolphthalein and Methyl Orange indicators.[Acid Base Titration]
4. To determine strength of unknown $CuSO_4$ solution by titrating it against intermediate sodium thiosulphate (Hypo) solution using starch as final indicator.[Iodometric Titration]
5. To determine the chloride content of the given sample of water using silver nitrate solution with potassium chromate solution as an indicator.[Precipitation Titration]
6. To separate mixture of pigments by Thin Layer Chromatography [Instrumental Methods].
7. To separate mixture of pigments by Paper Chromatography [Instrumental Methods].
8. To verify Beer Lambert's law of colorimetry [Instrumental Methods].
9. To determine amount of Iron by colorimetry [Instrumental Methods].
10. To estimate amount of Iron by UV spectrophotometer.[Instrumental Methods]
11. To determine pH of given solution using pH meter. [Instrumental Methods]
12. To determine strength of acid/base by conductometric titrations. [Instrumental Methods]
13. To determine Moisture content in given sample of coal.[Proximate Analysis]
14. To determine Ash content in given sample of coal.[Proximate Analysis]
15. To determine the Viscosity Index of give lubricating oil by Redwood Viscometer No.1 and Redwood Viscometer 2.[Lubricating Oil Analysis]
16. To determine the Flash Point and Fire Point of lubricating oil by Abel's Apparatus.[Lubricating Oil Analysis]
17. To determine the Flash Point and Fire Point of lubricating oil by Pensky Martin's Apparatus.[Lubricating Oil Analysis]
18. To determine S.E.N. of given lubricating oil[Lubricating Oil Analysis].

TEXT BOOKS:

- Engineering Chemistry – Jain & Jain – Dhanpat Rai &Company Pvt. Ltd, New Delhi.
- A Text Book of Engineering Chemistry – S.S. Dara – S. Chand Publication, Delhi.
- Engineering Chemistry- Shashi Chawla, Dhanpat Rai &Company Pvt. Ltd, Delhi.
- Engineering Chemistry – Uppal – Khanna Publishers.
- A Text book of Engg. Chemistry- Agarwal, C.V, Murthy C.P, Naidu, BS Publication, Hyderabad.
- B. Sivasankar, Engineering Chemistry 1 st Edition, Mc Graw Hill Education (India), 2008
- O.G. Palanna, McGraw Hill Education (India) Private Limited, 9 th Reprint, 2015

REFERENCE BOOKS:

- Chemistry in Engineering and Technology, Kuriacose J.C. and Rajaram J.,Tata McGraw Hill.
- Applied Chemistry- Theory and Practice, O.P. Viramani, A.K. Narula, New Age International Pvt. Ltd. Publishers, New Delhi.
- Chemistry of Engineering Material-C.V. Agarwal, Andranaidu C. Parameswara Moorthy -B.S. Publications.
- William Kemp, Organic Spectroscopy, 3 rd edition, Palgrave, New York, 2005.

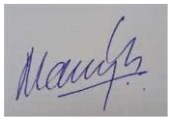
Modes of Evaluation and Rubric

Evaluation will be continuous as an integral part of the class as well through external assessment. Laboratory assessment will be based on assignments, presentations, and viva of each candidate.

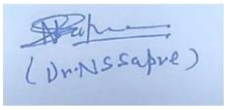
List/Links of e-learning resource

- Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan
- https://nptel.ac.in/course.html
- https://iln.ieee.org/resources/e-learning
- https://www.researchgate.net/publication/221928462_ELearning_Usage_During_Chemical_Engineering_Courses
- https://learncheme.com/
- https://www.anits.edu.in/elearn_c.php

Recommendation by Board of studies on	14.6.2022 (Tuesday)
Approval by Academic council on	16.6.2022 (Thursday)
Subject handled by department	Applied Science (Chemistry)



Dr Manju Singh
Prof & Head, Chemistry
UIT, RGPV, Bhopal



Dr Nitin Sapre
Prof & Head, Chemistry
SGSITS, Indore

Dr J Parashar
Dean, Academics
SATI, Vidisha

Dr Manoj Datar
Prof & Head, Chemistry
SATI, Vidisha

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)

Computer Science and Engineering

Semester/Year			Program		B.Tech.
Subject Category	ESC	Subject Code:	CSA103	Subject Name:	Problem Solving using Data Structures

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Logical thinking and Computer Fundamentals

Course Objective:

Introduce the fundamentals of data structures and how these concepts are useful in problemsolving.

Course Outcomes:

CO-1Understand- Problem solving using of data structure and various searching and sortingmethods.
CO-2 Apply- Apply different concepts of data structures to solve different computing problems.
CO-3 Analyse- Analyze the access pattern of various data structure and understand theirapplicability.
CO-4 Evaluate-Evaluate and Compare the performance of different data structures on real worldproblems.
CO-5 Discuss- Graph and Tree structure with their operations and applicability

UNITs	Descriptions	Hrs.	CO's
I	Problem solving concepts: top-down, bottom-up design, Concept of datatype, variable, constant and pointers. Dynamic memory allocation. Algorithm: Definition and complexity Analysis. Introduction to data structure: Linear, Nonlinear, Primitive and Nonprimitive. **Arrays-**Concepts of Arrays, Single dimensional array, two- dimensional array- Representation and Address Calculation, Operations on arrays with algorithms (traversing, searching, inserting, deleting) and analysis.	08	
II	**List-**Singly linked lists: Representation in memory, Operations on singly linked list with algorithms (traversing, searching, insertion, deletion)Doubly linked list-Operations with algorithms and analysis. Circular linked lists-Operations with algorithms and analysis. Representation & manipulations of polynomials/sets using linked lists.	06	
III	**Stack-** Introduction to Stack and its operations, Implementation of stack using array and linked list with comparison. Application of stacks (Polish Notations, converting infix to postfix notation, evaluating postfix notation, Parenthesis balancing, Recursion). **Queue-** Introduction to Queue and its operations. Implementation of queue using array and linked list. De-queue, circular queue, priority queue. Applications of queue.	09	
IV	**Tree-** Definition and terminology, concept of binary tree and representation, Traversing binary tree (pre order, post order, in order) Operation with algorithm -insertion and deletion. Binary Search Trees and Concept of balance tree (AVL). **Graph-** Definition and terminology, Types of graphs, Representation of graph. Traversing of graph- Breadth First Traversing and Depth First Traversing.	09	

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Chairperson

V	**Searching-** Search methods- Linear search, Binary search and Hashing (collision, chaining and probing) with their algorithms and analysis. **Sorting-**Sorting Methods-Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort, Radix sort, Shell sort with their algorithms and analysis.	08	
Guest Lectures (if any)		--	
Total Hours		40	

List of Experiments

1. Write program to implement pointers and structure in C to understand the concepts ofDynamic memory allocation.
2. Write a program to implement concept of linear array with following operations:
   i. Traverse an array.
   ii. Find minimum item, maximum item, and average of an array items.
   iii. Insert a new item at beginning, end and middle position within an array.
   iv. Delete an item from an array.
3. Write a program to implement singly linked list with following operations
   i. Insert a new item at beginning, end and middle position within a single linked list.
   ii. Delete an item from single linked list.
   iii. Traverse a single linked list.
4. Modify the singly linked list program to make it for doubly linked list.
5. Write a program to implement Stack with its operations (Push, Pop, Peek, IsEmpty) using:
   i. Using array
   ii. Using linked list
6. Write a program to evaluate postfix notation using stack.
7. Write program to implement queue with its operations (enqueue, dequeue) using:
   i. Using array
   ii. Using linked list
8. Modify the queue program to implement circular queue with its operations.
9. Write a program to implement binary search tree with insert and delete operations.
10. Write a program to implement depth first traverse and breadth first traverse on a graph.
11. Write program to implement linear search and binary search on a given array.
12. Write a program to sort a given list of 10000 random integers and compare their executiontime using:
    i. Bubble sort
    ii. Insertion sort
    iii. Merge sort
    iv. Quick sort
    v. Radix sort

Reference Books-

- Data Structure- Schaum's Series- McGraw Hill Publication
- Data Structure- Horwitz and Sartaj Sahni
- Data Structure through C, Yashwant Kanekar, BPB Publication.

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, termwork, end-semester examinations, and end-semester practical examinations.

List/Links of e-learning resource

Recommendation by Board of studies on	June-2022
Approval by Academic council on	June-2022
Compiled and designed by	Dr. Sandeep Raghuwanshi
Subject handled by department	Computer Science & Engineering

Dr. Kanak Saxena
Chairperson

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)

Computer Science and Engineering

Semester/Year			Program		B.Tech.
Subject Category	ESC	Subject Code:	ITC101	Subject Name:	Python Programming

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

- High School Level Mathematics
- Elementary Knowledge of Computer

Course Objective:

This course introduces core programming basics—including data types, control structures, algorithm development, and program design with functions via the Python programming language. The course discusses the fundamental principles of Object-Oriented Programming.

Course Outcomes:

Upon completion of this course, the student will be able to:

CO-1: Ability to install python and its different packages.
CO-2: Implement solution logic of problem and draw it in the form of algorithm.CO-3: Design and write a python program for given algorithm.
CO-4: Understand and apply the list logics to problem solution.
CO-5: Understand Object Oriented with reference to python programming.

UNITs	Descriptions	Hrs.	CO's
I	Introduction to computer science, algorithms, data representation in computers, hardware, software and operating system. Installation of python-interactive shell, IDLE, saving, editing, and running a script. The concepts of datatypes: variables, immutable variables, numerical types, operators, expressions, Indentation and comments in the program.	8	CO1
II	Conditional Statements- Conditions, Boolean Logic, Logical operators and Ranges. Control Statements- Break, Continue and Pass. Flow Control-if, if-else, nested if-else, Loop statements- for loop, while loop, Nested loops.	8	CO2
III	String: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Strings and text files, manipulating files and directories, os and sys modules, text files: reading/writing text and numbers from/to a file, creating and reading a formatted file (csv or tab-separated).	9	CO3
IV	Lists, tuples, and dictionaries. Basic list operators, replacing, inserting, removing an element, searching and sorting lists, dictionary literals, adding and removing keys, accessing and replacing values, traversing dictionaries.	7	CO4
V	Classes and OOP: Classes, objects, attributes and methods, defining classes, design with classes, Inheritance, Overloading, Overriding, and Data hiding. Exception: Exception Handling, except clause, Try finally clause, User Defined Exceptions.	8	CO5
Guest Lectures (if any)		--	
Total Hours		40	

List of Experiments

1. Write a program in python to check a number whether it is prime or not.
2. Write a program to check a number whether it is palindrome or not.
3. Write a function to swap the values of two variables through a function.

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Chairperson

4. Write a python program to Read a file line by line and print it.
5. Write a program to display the number of lines in the file and size of a file in bytes.
6. Write a program to calculate the factorial of an integer using recursion.
7. Write a program to print Fibonacci series using recursion.
8. Write a program for binary search.
9. Python Program for Sum of squares of first n natural numbers.
10. Python Program to find sum of array.
11. Python program to read character by character from a file.
12. Python Program to print with your own font.
13. Python program to print even length words in a string.
14. Python program to check if a string is palindrome or not.
15. Program to print ASCII Value of a character.
16. Python program to find smallest and largest number in a list.
17. Python program to find the size of a Tuple.

Text Books-

- M. Mano, "Digital Logic and Computer Design", Pearson Education.
- T. L. Floyd, “Digital Fundamentals”, Pearson Education.
- A. Anand Kumar, “Fundamentals of Digital Circuits”, PHI.

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, termwork, end-semester examinations, and end-semester practical examinations.

List/Links of e-learning resource

List and Links of e-learning resources:

4. https://nptel.ac.in/courses/108/105/108105132/
5. https://de-iitr.vlabs.ac.in/

Recommendation by Board of studies on	June-2022
Approval by Academic council on	June-2022
Compiled and designed by	CS & IT
Subject handled by department	CS & IT

Dr. Kanak Saxena
Chairperson

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Humanities

Semester	III	Program	B.Tech.
Subject Category	HUM	Subject Code	HUB 101
Subject Name	Communication and Report Writing		

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work		L	T	P	
60	20	10	10	-	-	100	2	-	2	3

Prerequisites:

In this era of globalization and information technology, English has a special and predominant role in the communicative sphere, and thus English commands the most prestigious position in the world in the exchange of information across geographical boundaries. The syllabus has been designed to develop the linguistic and communicative competence of engineering students.

Course Objective:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively, relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

Course Outcomes:

After completion of the course student will be able

CO1	To learn the proper meaning of communication in the corporate world.
CO2	To understand real life situations in business by acquiring soft skills and also learn how to excel in an interview.
CO3	To draft reports and present their views effectively.
CO4	To interpret communication situation and communicate effectively with peers in official context as well as socialize equitably.
CO5	To write critically and communicate effectively to nurture understanding and trust.

UNITS	Descriptions	Hrs.	CO's
I	**Significance of Communication**: Process of Communication, The importance of Effective Communication in Business, Verbal and Non-Verbal Communication, Oral and Written Communication, Barriers to Communication.	10	1
II	**Soft Skills**: Goal Setting, Qualities of a good leader, Time Management, Time Wasters, Problem Solving.	8	2
III	**Report Writing**: Definition, Importance, Types of Reports, Structure and Layout.	8	3
IV	**Business Writing**: Types of Letters, Structure and Layout of Letters, E-mail writing, Memo, Notices, Circulars, Agenda, Minutes of meeting.	8	4
V	**Grammar and Vocabulary development**: Parts of speech, Subject-verb agreement, Sentence structure, Synonyms, Antonyms, Homonyms.	6	5

Guest Lectures (if any)		
Total Hours	40	

1.NA

Text Book-
1.A.J.Thomason and A.V.Martinet, A Practical English Grammar, Oxford IBH Pub Sanjay Kumar Pushp Lata, English for Effective Communication, Oxford.

Reference Books-

- Language and Life: A Skills Approach Board of Editors, Orient Black Swan Publishers, India.2018.
- Business Correspondence and Report Writing- By R.C. Sharma; TMH.
- Living English Structure -By W.S. Allen; Longmans.
- English Grammar- Ehrlich, Schaum Series; TMH.
- Spoken English for India -By R.K. Bansal and IB Harrison Orient Longman.
- New International Business English- By Joan sand Alexander; OUP.
- Effective Technical Communication - Rizvi; TMH

Body Language - Vinay Mohan Sharma

Modes of Evaluation and Rubric

Two mid-semester tests, Quizzes for continuous evaluation, Sessional and an end-semester examination.

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in
- https://www.classcentral.com(swayam)

Recommendation by Board of Studies on	13/06/2024
Approval by Academic council on	
Compiled by	Dr. Amitosh Singh/ Aditi Dwivedi
Subject handled by department	Department of Humanities

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Applied Science

Semester/Year		Second/First	Program		B. Tech.
Subject Category	Departmental Core	Subject Code:	MAB 102	Subject Name:	Statistics : Probability Distributions and Differential Equations

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
60	20	20	-	-	100	3	1	-	4

Prerequisites:

Basics of Differentiations, Integrations and Statistics.

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in Differential equations and Statistics. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

This course primarily contributes to applied mathematics program outcomes that develop students abilities to:

1. Acquire the basic knowledge of Statistics: Probability Distributions with their applications and fitting of curves using method of least squares.
2. Learn the principal concepts about sampling and its advantages and also categorized the sampling methods.
3. The Effective Mathematical Tools for the Solutions of Differential Equations that Model Physical Processes.
4. Differential Equation for Solving Engineering Problems
5. Partial Differential Equations are very much useful for Solving Various Boundary Value Problems

UNITs	Descriptions	Hrs.	CO's
I	Binomial, Poisson and Normal distributions and their Mean and Variance, Methods of Least Squares and curve fitting.	8	1
II	Sampling distributions: t, F, χ^2 distributions and their applications.	8	2
III	Differential Equations: Differential Equations of first order and first degree, first order and higher degree, Linear Differential Equation, Non-linear Differential Equation, Linear Differential of Higher orders with constant coefficient. Method of Variation of Parameters.	8	3
IV	Differential Equation of other Types: Homogeneous Linear Differential Equations, Legendre Linear Equation, Simultaneous Linear Differential Equation.	8	4
V	Partial Differential Equations: Definition and formation of Partial Differential Equations, Lagrange's Linear PDE, Non-linear PDE, Linear Partial Differential Equation of Second Order with Constant Coefficients. Applications of PDE (Wave equation and Heat Equations)	8	5
Total Hours		40	

Reference Books:

1. Higher Engineering Mathematics by B. S. Grewal 2. Engineering Mathematics by B. V. Rammana
3. Advance Engineering Mathematics by E. Kreyszig 4. Veerarajan T, Statistics, Probability and Random Process, 2nd Edition, Tata McGraw Hill Publishing company Ltd., New Delhi

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)

Computer Science and Engineering

Semester/Year			Program		B.Tech.
Subject Category	ESC	Subject Code:	CSL110	Subject Name:	Computer Workshop

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
--	--	--	--	60	20	20	100	--	--	2	2

Prerequisites:

Course Objective:

1. To teach principles of operating system including File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking Commands, Basic Linux commands, Scripts and filters.
2. To familiarize fundamentals of the Bourne again shell (bash), shell programming, pipes, input and output redirection Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts.
3. To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's).
4. To facilitate students in understanding Inter process communication.
5. To facilitate students in understanding semaphore and shared memory.
6. To facilitate students in understanding process.

Course Outcomes:

Upon completion of this course, the student will be able to:

CO1. Ability to use various Linux commands that are used to manipulate systemoperations at admin level and a prerequisite to pursue job as a Network administrator.
CO2. Ability to write Shell Programming using Linux commands.
CO3. Ability to design and write application to manipulate internal kernel level Linux FileSystem.
CO4. Ability to develop IPC-API's that can be used to control various processes for synchronization.
CO5. Ability to develop Network Programming that allows applications to make efficient use of resources available on different machines in a network.

UNITs	Descriptions	Hrs.	CO's
I	**INTRODUCTION TO LINUX AND LINUX UTILITIES**: A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, Text Processing utilities and backup utilities	4	CO1
II	**Introduction to Shells**: Linux Session, Standard Streams, Redirection, Pipes, Command-Line Editing, Options, Shell/Environment Customization. **Filters:** Filters and Pipes, Concatenating files, Display Beginning and End of files, Operations on Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.	4	CO2
III	**Grep:** Operation, grep Family, Searching for File Content. **Sed**: Scripts, Operation, Addresses, commands, Applications, grepand sed. UNIX FILE STRUCTURE: Introduction to UNIX file system, inode (Index Node), file descriptors, system calls and device drivers. **File Management**: File Structures, System Calls for File Management, Directory API.	4	CO3
IV	**PROCESS AND SIGNALS**: Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, zombie processes, orphan process, unreliable	4	CO4

Dr. Kanak Saxena
Chairperson

	signals, interrupted system calls. **File locking**: creating lock files, locking regions, use of read and writewith locking, competing locks, other lock commands, deadlocks.		
V	**INTER PROCESS COMMUNICATION**: Pipe, process pipes, the pipecall, parent and child processes, and named pipes, semaphores, message queues, shared memory. **INTRODUCTION TO SOCKETS**: Socket, socket connections - socket attributes, socket addresses.	4	CO5
Guest Lectures (if any)		--	
Total Hours		20	

List of Experiments

1. Write a program using echo, printf, script, passwd, uname, who, date, stty, pwdcommands.
2. Write a program using unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger,arp, ftp commands.
3. Write a program using telnet, rlogin.Text Processing utilities and backup utilities , tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk commands.
4. Write a shell script that accepts a file name, starting and ending line numbers asarguments and displays all the lines between the given line numbers.
5. Illustrate by writing script that will print, message "Hello World, in Bold and Blink effect,and in different colours like red, brown etc using echo commands?
6. Write a shell script that deletes all lines containing a specified word in one or more filessupplied as arguments to it.
7. Illustrate by writing script using for loop to print the following patterns?
8. Write a shell script that displays a list of all the files in the current directory to which theuser has read, write and execute permissions.
9. Write a program inter-process communication.
10. Write a program to communicate using sockets.

Text Books-

1. W. Richard. Stevens (2005), Advanced Programming in the UNIX Environment, 3rd edition,Pearson Education, New Delhi, India.
2. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson

REFERENCES Books-:

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, PearsonEducation.
3. UNIX Network Programming, W.R. Stevens, PHI. UNIX for Programmers and Users, 3rd Edition, Graham Glass, King Ables, Pearson Education

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Quiz/ Assignments, term work, and end-semesterpractical examinations.

List/Links of e-learning resource

Recommendation by Board of studies on	June-2022
Approval by Academic council on	June-2022
Compiled and designed by	CS & IT
Subject handled by department	CS & IT

Dr. Kanak Saxena
Chairperson

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Humanities and Management

Semester/Year	II Year	Program		B.Tech All Branches
Subject Category	MAC	Subject Code:	MAC102	Subject Name:	**Professional Ethics and Social Responsibility**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work	Quiz		L	T	P	
00	00	00	00	30	10	10	50	0	0	2	Grade

Prerequisites:

To enable the students to instill moral, to create an awareness of professional ethics, human values, loyalty and social responsibility.

Course Objective:

At the end of the course, the students will be able to:

1. To learn the importance of values and ethics in personal life and professional careers.
2. To gain knowledge of ethical behavior.
3. To acquire the basics of social responsibility.

Course Outcomes:

1. To imbibe and internalize the basic purpose of human values.
2. To appreciate professional rules and codes of conduct in personal life and professional careers.
3. To know the importance of values and ethics in professional behavior.
4. To impart norms of professional ethics in life through **rationality**, **consistency** and **impartiality**.
5. To inculcate the sense of social responsibility.

UNITs	Descriptions	Hrs.	CO's
I	Principles of professional ethics: honesty, trustworthiness, loyalty, being law-abiding, no sinister motives, socially responsible, respect, accountability and fairness to all	8	1
II	Codes of conduct: public, clients, professional community, profession, workplace rights and responsibilities, other stakeholders.	6	2
III	Factors necessitating professional ethics: advisory responsibilities, contractual duties; The importance of ethical behavior in business.	4	3
IV	Personal ethics: impartiality, rationality, consistency and reversibility Norms of professional ethics in our life.	8	4
V	Corporate social responsibility: environmental, philanthropic, ethical,	9	5

	and economic responsibility.		
Guest Lectures (if any)		2	
Total Hours		40	

Suggestive list of experiments:

1. N.A

1. Text Book- Professional ethics includes Human values, R. Subramanian, Oxford higher education.

Reference Books-

2. Professional Ethics and Social Responsibility, Daniel E. Wueste, Rowman and Littlefield Publication, INC
3. Professional ethics and human values, R. S. Naagarazan, New age international (P) limited ,New Delhi,2006.
4. Human values and professional ethics,Jayshree Suresh, B. S. Raghvan,S. Chand
5. http://www.slideword.org/slidestag.aspx/human-values-and-Professional-ethics.

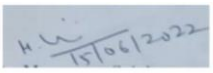
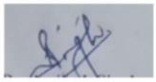
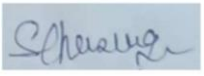
Modes of Evaluation and Rubric

Questionnaire,Quiz,Presentation and standard procedure will be followed .

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in
- https://www.classcentral.com (swayam)

Recommendation by Board of studies on	26/02/2022
Approval by Academic council on	
Compiled and designed by	Dr. Manorama Saini and Dr. VeenaDatar
Subject handled by department	Humanities and Management


SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF CS & IT

Semester/Year		III/II		Program		B.Tech – Internet of Things					
Subject Category	DC	Subject Code:		IO 302	Subject Name	Electronic Devices and Circuits					
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

w.e.f. July 2024

Prerequisites:

Applied Physics

Course Objective:

- The purpose of the course is to teach the fundamental principle of electronics.
- The material covers a variety of topics including various types of diodes, transistor, amplifiers and application.

UNITs	Descriptions	Hrs.
I	Semiconductor Diodes: Basics of semiconductor theory, Introduction to PN junction diode, Special function diode, Zener diode, PIN, Varactor, Tunnel, Schottky, LED & Photo diode and its applications. Design circuits using diodes. Half wave & Half Wave rectifier, Clampers and clippers.	8
II	Bipolar Junction Transistors (BJTs): Transistor construction and operation, CB configuration, transistor amplifying action, CE & CC configuration, Limits of operation, BJT Biasing.	8
III	Field Effect Transistor (FET): Junction Field-Effect Transistor (JFET) - Construction, Operation and Biasing, Depletion-type MOSFET, Enhancement-type MOSFET: structure and physical operation, current-voltage characteristics, D.C. operation, Biasing, configuration: common source, gate and drain types.	8
IV	Compound Configurations: Cascade and cascade connection, Darlington connection, CMOS circuit, current source circuit, current mirror circuits, differential amplifier circuits.	8
V	Operational Amplifier and Application: Differential and common mode operations, Op-amp basics, practical Op-amp circuits, Op-amp Specification- DC offset parameters & frequency parameters, Op-amp unit specifications. Op-amp Applications: Constant gain multiplier, voltage summing, voltage buffer, comparator.	8
Total Hours		40

Course Outcomes:

CO1: Identify and understand the fundamental principle and working of Diodes.

CO2: Analyze the behavior of BJT and its biasing.

CO3: Analyze the behavior of FET and its biasing.

CO4: Examine the various configurations of BJT and FET.

CO5: Analyze and synthesize the Op-amps.

Text Book

1. Electronic Devices & circuits – Boyelstad & Neshelsky – PHI
2. Intuitive Analog Circuit Design- Marc T. Thompson

Reference Books

1. A Text of electronic" 2nd edition S.Chand-R.S Sedha
2. Integrated Electronics. – Millman Halkias
3. Electronic Devices & Circuits – David A. Bell – PHI

4. Principles of Electronic Devices – Malvino
5. Starting Electronics (Fourth Edition)-Keith Brindley
6. Microelectronics & circuit 5th edition - Sandra & Smith.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-ee80/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	1										1	1
CO-2	2	1	2	1	1								2	1
CO-3	2	1	2	1	1								2	1
CO-4	2	2	2	1									2	1
CO-5	2	2	2	1									1	1

Suggestive list of experiments:

1. Design voltage regulator using Zener diode and verify its characteristics.
2. To draw the output waveform of Full wave rectifier. Calculate PIV, Ripple Factor, Form Factor and Efficiency.
3. Analysis of common base PNP bipolar junction transistor and verify input and output characteristics.
4. Analysis of common emitter NPN bipolar junction transistor and verify input and output characteristics.
5. To draw the static characteristics of JFET and find out its parameters.
6. To design the power supply of +5V and -5V using IC regulator.
7. To design a positive clipper circuit using a 1 kHz square wave with a 10 volt peak-to-peak magnitude as the input signal.
8. To design a negative clamper circuit using a 1 kHz square wave with a 10-volt peak-to-peak magnitude as the input signal.
9. To draw the frequency response of two stages RC coupled class A amplifier using transistor.
10. To draw the frequency response of two stages Direct coupled class A amplifier using transistor.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF CS & IT

Semester/Year		III/II		Program		B.Tech – Internet of Things				
Subject Category	DC	Subject Code:	IO 303	Subject Name	Object Oriented Programming with Java					

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

w.e.f. July 2024

Prerequisites:

Fundamentals of Programming Skills

Course Objective:

- Enable students to understand concepts and principles of object oriented programming methodologies using JAVA as a vehicle.
- Also learn software development and problem solving using this JAVA technology.

UNITs	Descriptions	Hrs.
I	Introduction: Procedural Paradigms of programming, Object Oriented Paradigm for programming, Procedural vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP. OOP Concepts: Data Abstraction, Encapsulation, Inheritance and Polymorphism. Introduction of Java, Features of Java, Byte Code and Java Virtual Machine, Java Development Kit (JDK). Basics of objects and classes in Java, tokens, keywords, identifiers, variables, data types, and operators in java, Type casting, strict keyword.	8
II	Control Statements — If, else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. Command Line Argument, Classes and Objects, Encapsulation, Tightly Encapsulated classes, Nested class, Inner class, and Anonymous inner class. Inbuilt classes: Object, String, String Buffer, Array, Vector. Wrapper classes. Data members, member Function, Data Hiding: Visibility modifiers in java.	8
III	Is-A relationship, Has-A relationship, Inheritance in Java, types of inheritance, Super and sub class, Method Signature. Overloading, Constructor Overloading, Method Overloading, this and static keyword, finalize () method, Casting objects, Instance of operator, Overriding, covariant return type. Super, final keyword, overloading vs. overriding. Static control flow, instance control flow.	8
IV	Abstraction: Abstract class, Interface in Java, differences between classes and interfaces. Defining an interface, implementing interface, applying interfaces, variables in interface, extending interfaces. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages. Coupling, Cohesion.	8
V	Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes. Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface. Synchronization, threads priorities,	8

	inter thread communication, daemon threads, deadlocks, thread groups. Introduction of Java Micro services.	
Total Hours		40

Course Outcomes:

CO-1 Define classes, objects, members of a class and relationships among them needed for a specific program.
CO-2 Write the java application programs using OOPs principles.
CO-3 Write java application on constructors, overloading.
CO-4 Demonstrate package creating and accessing members of a packages.
CO-5 Understand and develop collection frame work and its application programs.

Text Book

1. Naughton & Schildt, "The Complete Reference Java 2", TataMcGraw Hill
2. E Balaguruswamy, "Programming in Java", TMH Publications

Reference Books

1. Deitel "Java-How to Program:" Pearson Education, Asia
2. Horstmann & Cornell, "Core Java 2" (Vol I & II), Sun Microsystems
3. Ivan Bayross, "java 2.0", BPB publications
4. Java Programming for the absolute beginners By Russell, PHI Learning
5. Java Programming by Hari Mohan Pandey, Pearson.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105153/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1									3	3	3	2
CO-2	1		1	2							2	1	3	2
CO-3	2	1									2	2	1	2
CO-4	3	2	3	2	1			1	2		3		3	1
CO-5	3	3	2	1				2		2	2	3	1	1

Suggestive list of experiments:

1. Write a java program to find the Fibonacci series using recursive and non-recursive functions.
2. Write a java program to multiply two given matrices.
3. Write a java program for Method overloading and Constructor overloading.
4. Write a java program to display the employee details using Scanner class.
5. Write a java program that checks whether a given string is palindrome or not.
6. A. Write a java program to represent Abstract class with example.
   B. Write a java program to implement Interface using extends keyword.
7. A. Write a java program to create inner classes.
   B. Write a java program to create user defined package.
8. A. Write a java program for creating multiple catch blocks.
   B. Write a java program for producer and consumer problem using Threads.
9. Write a Java program that implements a multi-thread application that has three threads.
10. A. Write a java program to display File class properties.
    B. Write a java program to represent ArrayList class.

C. Write a Java program loads phone no, name from a text file using hashtable.

11. Write an applet program that displays a simple message.
12. A. Write a Java program computes factorial value using Applet.
    B. Write a program for passing parameters using Applet.
13. A. Write a java program for handling Mouse events and Key events.
    B. Write a java program for handling Key events.
14. Write a java program that connects to a database using JDBC.
15. A. Write a java program to connect to a database using JDBC and insert values into it.
    B. Write a java program to connect to a database using JDBC and delete values from it.

16. Write a java program that works as a simple calculator. Use a Grid Layout to arrange Buttons for digits and for the + - * %operations. Add a text field to display the result	
Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF CS & IT

Semester/Year		III/II		Program		B.Tech – Internet of Things				
Subject Category	DC	Subject Code:	IO 304	Subject Name		Analysis and Design of Algorithms				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

w.e.f. July 2024

Prerequisites:

Fundamentals of Data Structures

Course Objective:

- Determine different time complexities of a given algorithm
- Demonstrate algorithms using various design techniques.
- Develop algorithms using various design techniques for a given problem.

UNITs	Descriptions	Hrs.
I	**Algorithms:** Definition and characteristics. Analysis: Space and Time Complexity, Asymptotic Notations, Time Complexity Analysis of algorithms (Linear Search, Insertion Sort etc.)Recursive algorithms and recurrence relations. Solutions of recurrence relations. **Divide** and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, quick sort, merge sort, Heap Sort, Strassen's matrix multiplication with their complexity analysis.	8
II	**Greedy Algorithms:** Knapsack problem, Job sequencing with deadlines, optimal merge patterns, Huffman coding, Dynamic Programming: Multistage Graph, all pairs shortest paths, 0-1 Knapsack, Chained matrix multiplication, Longest common subsequence, Travelling salesperson problem.	8
III	**Graph and Tree Algorithms**: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms- Dijkstra's Algorithms and Complexity Analysis, Transitive closure, Minimum Spanning Tree- Prim's and Kruskal's Algorithm and their complexity analysis, Union Find Data Structure, Topological sorting, Network Flow Algorithm.	8
IV	**Branch &Bound technique**: Definition and application to solve 0/1 Knapsack Problem, 8-puzzle problem, travelling salesman problem. Back tracking concept and its examples like 8 Queens's problem, Hamiltonian cycle, Graph Coloring problem.	8
V	**Tractable and Intractable Problems:** Computability of Algorithms- P, NP, NP-complete and NP-hard. Introduction to Approximation Algorithms, NP-complete problems and Reduction techniques. Lower bound theory and its use in solving algebraic problem.	8
Total Hours		40

Course Outcomes:

CO1: Analyze and justify the running time complexity of algorithms
CO2: Articulate the effectiveness of divide and conquer methods to solve searching, sorting and other

problems.

CO3: Understand the combinatorial problems and justify the use of Greedy and Dynamic Programming techniques to solve them.

CO4: Model graph or tree **f**or a given engineering problem, and write the corresponding algorithm to solve it.

CO-5: Able to analyses the NP-complete

Text Book

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, "Introduction to Algorithms", PHI, 3rd edition.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press.

Reference Books

1. Gilles Brassard and Paul Bratley, "Fundamentals of Algorithmics", PHI.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/106/106106131/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

1. Implement Algorithm to calculate factorial of given number using iteration method and recursive Method.
2. Implement logic to swap two integer numbers using three different approaches.
3. Implement Algorithm to determine if a given number is divisible by 5 or not without using % Operator.
4. Implement Algorithm to convert binary number to decimal number without using array and Power function.
5. Implement Algorithm to print reverse of string using recursion and without using character Array.
6. Implement Linear Search Algorithm.
7. Implement Binary Search Algorithm (By using Iterative Approach)
8. Implement Binary Search Algorithm (By using Recursive Approach)
9. Implement Insertion Sort Algorithm
10. Implement Quick Sort Algorithm (By using Recursive Approach)
11. Implement Quick Sort Algorithm (By using Non Recursive Approach).
12. Implement Merge Sort Algorithm.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF CS & IT

Semester/Year		III/II		Program		B.Tech –Internet of Things					
Subject Category	DC	Subject Code:		IO 305	Subject Name	Computer System Organization					
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

w.e.f. July 2024

Prerequisites:

Fundamental knowledge of Digital Electronics

Course Objective:

- Understand the organization and architecture of computer systems and electronic computers.
- Study the assembly language program execution, instruction format, and instruction cycle.
- Design a simple computer using hardwired and microprogrammed control methods.
- Study the basic components of computer systems besides computer arithmetic.
- Understand input-output organization, memory organization and management, and pipelining

UNITs	Descriptions	Hrs.
I	Introduction: Function and structure of a computer, Functional components of a computer, Interconnection of components, Performance of a computer, Register Transfer language : Register Transfer, Bus and Memory Transfers, Three-Stare Bus Buffers, Memory Transfer, Arithmetic Microoperations Binary Adder, Binary Adder-Subtractor, Binary incremenrer, Arithmetic Circuit, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit, List of Logic Microoperations, , Shift Micro operations, Arithmetic Logic Shift Unit	7
II	Control unit: Control memory, address sequencing, micro program example, Microinstruction Format, Symbolic Microinstructions, The Fetch Routine, Symbolic Micro program and design of the control unit, Microprogram Sequencer.	7
III	CPU design: Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer, and manipulation, and program control. Computer arithmetic: Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.	7
IV	Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory; Input or output organization: Input or output Interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access.	7
V	Pipeline: Parallel processing, pipelining-arithmetic pipeline, instruction pipeline; Multiprocessors: Characteristics of multiprocessors, interconnection structures, inter-processor arbitration, inter-processor communication, and synchronization.	7
Total Hours		35

Course Outcomes:

CO1: Understand the organization and levels of design in computer architecture and understand the concepts of Register transfer languages.

CO2: Describe arithmetic micro-operations, logic micro-operations, shift micro-operations address sequencing, microprogram example, and design of control unit

CO3: Understand the Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer, and manipulation, program control. Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.

CO4: Knowledge about Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory Input or output Interface, asynchronous data transfer, modes of transfer, Priority interrupt, and direct memory access.

CO5: Explore the Parallel processing, pipelining-arithmetic pipeline, instruction pipeline Characteristics of multiprocessors, interconnection structures, inter-processor arbitration, inter-processor Communication, and synchronization.

Text Book

1. M. Morris Mano, "Computer Systems Architecture", Pearson, 3rd edition.

Reference Books

1. John D. Carpinelli, "Computer Systems Organization and Architecture", Pearson, 1st Edition.
2. Patterson, Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Morgan Kaufmann.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-cs15/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid-semester Tests. Quiz/Assignments, term work.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2										1	2
CO-2	2	2	2										1	2
CO-3	2	1	2										1	2
CO-4	2	1	2											2
CO-5	2	2	1										1	2

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF CS & IT

Semester/Year	III/II	Programme	B.Tech – Internet of Things
Subject Category: DLC	Subject Code: IO 306	Subject Name	Web Application Development

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
				30	10	10	50	0	0	4	2

w.e.f. July 2024

Prerequisites:

Fundamental Knowledge of Programming

Course Objective:

Understand Static and Dynamic Web Pages.

UNITs	Descriptions	Hrs.
I	WEBSITE BASICS, Web Essentials: Clients, Servers and Communication, The Internet, Basic Internet protocols, World wide web.	8
II	HTTP Request Message, HTTP Response Message, Web Clients, Web Servers, HTML5, Tables, Lists, Image, HTML5 control elements, Semantic elements, Drag and Drop, Audio , Video control	8
III	CSS3, Inline, embedded and external style sheets, Rule cascading, Inheritance, Backgrounds, Border Images, Colors Shadows, Text, Transformations, Transitions, Animations.	8
IV	Java Script: An introduction to JavaScript, JavaScript DOM Model-Date and Objects, function, Regular Expressions.	8
V	Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript. XML- Elements, attributes, parser, DOM, query.	8
Total Hours		40

Course Outcomes:

CO1: To understand and interpret the basic concepts of the Internet, tools.
CO2: To understand, analyse CSS components and apply them web page design tools like HTML,CSS.
CO3: To know and analyse client side scripting language concepts.
CO4: Design and Develop Internet applications with the help of Java script.
CO5: Understand the concept of exceptional handling

Text Book & Reference Books-

1. Achyut Godbole, Atul Kahate & quot ;Web Technologies: TCP/IP, Web/Java Programming, and Cloud Computing", Third Edition, McGraw Hill Education.

1. Deitel, Deitel, Goldberg, & quot; Internet & World Wide Web How to Program & quot, Third Edition,Pearson Education.
2. Raj Kamal, "Internet and Web Technologies", Tata McGraw-Hill.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid-semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO1	2	1	2										1	1
CO2	2	1	2										1	1
CO3	2	1	2										1	2
CO4	2	2	2										1	2
CO5	1	2	2	1	2								2	1

Suggestive list of experiments:
1. Design a web page to display your CV. 2. Design a web page using HTML tags to take the input in a form and display it in another page/frame. 3. Design a web page to isolate a part of the text that might be formatted in a different direction from other text outside it 4. Create a Zebra Striping a Table and make an image rounded with CSS3. 5. Create speech bubble shape and Image cross effect with CSS3 transition. 6. Using HTML, CSS create a styled checkbox with animation on state change. 7. Using HTML, CSS create display an image overlay effect on hover. 8. Using HTML, CSS create a list with floating headings for each section. 9. Using HTML, CSS, JavaScript create a typewriter effect animation. 10. Using HTML, CSS create an animated underline effect when the user hovers over the text. 11. Write a JavaScript program to set paragraph background colour. 12. Write a JavaScript function to add rows to a table. 13. Write a JavaScript function that accepts a row, column (to identify a particular cell) and a string to update the cell and the cell's content. 14. Write a JavaScript program to highlight the bold words of the following paragraph, on mouse over a certain link. 15. Write a JavaScript program to get the window width and height (any time the window is resized).

Recommendation by Board of studies on	
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Subject handled by department	Department of CS & IT

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DEPARTMENT OF IT

Semester/Year	**IV/II**	**Program**	**B.Tech – Internet of Things**
Subject Category	**DC**	**Subject Code:**	**IO 401**	**Subject Name**	**Microprocessors and Microcontrollers**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
60	**20**	**10**	**10**	**30**	**10**	**10**	**150**	**3**	**0**	**2**	**4**

w.e.f. July 2024

Prerequisites:

Basic Computing and Logical reasoning.

Course Objective:

- To make students familiar with the basic blocks of 8 bit Microcontroller & 16 bit microprocessor device in general.
- To provide comprehensive knowledge of the architecture, features and interfacing with peripheral devices.
- To use assembly and high level languages to interface the microcontroller to various devices.

UNITs	**Descriptions**	**Hrs.**
I	Introduction to 16 bit Microprocessor-Introduction to 8086 Microprocessor family Architecture, Pin diagram, Instruction set, Assembler directive, Addressing modes, Maximum and Minimum Mode operation, Elementary 8086 Programming.	8
II	Microcontrollers and Embedded processors, overview of 8051 family. 8051 microcontroller hardware, oscillator and clock, CPU registers, Register banks and stack, flags, PSW, SFR's, I/O ports, internal memory, 8051 pin description. 8051 programming model, Assembly, Language programming, Data types, directives. Addressing modes of 8051, memory access using various addressing modes, Bit addresses for I/O and RAM, I/O port programming.	8
III	Arithmetic Operations with 8051: Arithmetic instructions, signed number concepts and arithmetic operations. Branch Instructions: Jump Loop and Call Instructions, Time delay calculations. Logical Operations & Bit manipulation instructions: Logic and compare instructions rotate and swap instructions, data serialization, single bit instructions, operations with carry, reading input pins.	8
IV	Timers: Programming, Counter programming, Serial communication, RS232, 8051 programming for serial port, Serial Port programming, 8051 Interrupts, programming timer interrupts, external hardware interrupts, serial communication interrupts, interrupt priority in 8051, Interrupt programming.	8
V	Interface 8051, LCD Interfacing, memory address decoding, interfacing with external ROM, data memory space, accessing external memory in C, Interfacing 8255, programming 8255, modes of 8255, 8255 connection to stepper motor, LCD,& ADC, 8051 programming for 8255.	8
Total Hours		40

Course Outcomes:

CO 1: Acquire and demonstrate fundamental knowledge of microprocessors or interfacing and programming
CO 2: Understanding the fundamentals of 8051 microcontroller.
CO 3: Apply the arithmetic and logical operations with the help of instructions.
CO 4: Analyze the concept of Timer, Serial Communication and interrupt.
CO5: To understand the interfacing of 8051 microcontroller with peripheral devices.

Text Book

1. A K Ray & K M Bhurchandi, Advanced Microprocessor and Peripheral, Tata McGraw-Hill Publishing Company Limited.
2. M A Mazidi, J G Mazidi and R D McKinley, The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Pearson.

Reference Books

1. Ramesh S Goankar, Microprocessor Architecture, Programming & Applications with the 8085, Penram International Publishing (India) Pvt. Ltd., Fourth Edition, 2002.
2. Douglas V. Hall, Microprocessors and interfacing programming and hardware Gregg Division, McGraw-Hill, 1986

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/108/105/108105102/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**2**	**2**	**1**										**1**	**2**
CO-2	**2**	**2**	**2**										**1**	**2**
CO-3	**2**	**2**	**2**	**1**									**1**	**2**
CO-4	**3**	**2**	**2**	**1**									**1**	**2**
CO-5	**2**	**2**	**1**	**1**									**1**	**2**

Suggestive list of experiments:

1. WAP to add a data byte located at the offset address 0500H in the segment 2000H to another data byte located at the offset address 0600H in the segment 3000H.
2. WAP to move 0500H to register BX and CX, add 05H to each of them and store the result in 0700H. Segment address: 5000H.
3. WAP to add the contents of 2000H: 0500H to the contents of 3000H: 0600H and store the result in 5000H: 0700H.
4. WAP to find the square of a given number.
5. WAP to find the 2's compliment of a given number.
6. WAP to find the square root of a given number.
7. WAP to arrange the given set of bytes in ascending order.
8. WAP to arrange the given set of bytes in the descending order.
9. WAP to find out the largest number in the given set of 8-bit number stored at memory location 0500H in the segment 2000H.
10. WAP to find out the even and odd numbers from the given set of 10 data bytes stored at memory location 4000H: 0400H.

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DEPARTMENT OF IT

Semester/Year		**IV/II**		**Program**		**B.Tech – Internet of Things**
Subject Category	**DC**	**Subject Code:**	**IO 402**	**Subject Name**		**Database Management System**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
60	**20**	**10**	**10**	**30**	**10**	**10**	**150**	**3**	**0**	**2**	**4**

w.e.f. July 2024

Prerequisites:

Basic Knowledge of Mathematics and Programming

Course Objective:

- To understand the different issues involved in the design and implementation of a database system.
- To represent a database system using ER diagrams and to learn normalization techniques
- To learn the fundamentals of data models, relational algebra, and SQL.
- To understand the basic issues of transaction processing and concurrency control.
- To become familiar with database storage structures and access techniques

UNITs	**Descriptions**	**Hrs.**
I	Introduction: Purpose of Database System –– Views of data – data models, database management system, three-schema architecture of DBMS, components of DBMS. E/R Model - Conceptual data modeling - motivation, entities, entity types, attributes relationships, relationship types, E/R diagram notation, examples.	8
II	Relational Model: Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators, SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL, notion of aggregation, aggregation functions group by and having clauses.	8
III	Database Design: Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, 4NF, and 5NF.	8
IV	Transactions: Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.	8
V	Implementation Techniques: Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.	8
Total Hours		40

Course Outcomes:

CO-1: Understand the basic concepts, principles and applications of database systems.

CO-2: Discuss the components of DBMS, data models, Relational models.

CO-3: Use knowledge to find the functional dependencies and differentiate between different normal forms.

CO-4: Execute transaction concepts and concurrency protocols

CO-5: Articulate the basic concept of storage and access techniques.

Text Book

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems , Pearson Education
2. Silberschatz, Korth, "Data base System Concepts", 7th ed., McGraw hill.

Reference Books

1. C. J. Date, "An Introduction to Database Systems", 8th ed., Pearson.
2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems McGraw Hill.
3. Peter Rob and Carlos Coronel, Database System- Design, Implementation and Management , Cengage Learning.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106/104/106104135/
- https://nptel.ac.in/courses/106/106/106106220

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**1**	**1**	**2**										**1**	**2**
CO-2	**3**	**2**	**2**										**1**	**2**
CO-3	**2**	**1**	**2**		**2**								**1**	**2**
CO-4	**2**	**1**	**2**											**2**
CO-5	**2**	**2**	**2**											**1**

Suggestive list of experiments:

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key , Foreign key, NOT NULL to the tables
3. Write a sql statement for implementing ALTER,UPDATE and DELETE
4. Write the queries to implement the joins
5. Write the query for implementing the aggregate functions
6. Write the query to implement the concept of Integrity constraints
7. Write the query to create the views
8. Perform the queries with group by and having clauses
9. Perform the following operation for demonstrating the insertion , updation and deletion using the referential integrity constraints
10. Write the query for creating the users and their role

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Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		**IV/II**		**Program**		**B.Tech – Internet of Things**
Subject Category	**DC**	**Subject Code:**	**IO 403**	**Subject Name**		**Signals and Systems**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
60	**20**	**10**	**10**	**30**	**10**	**10**	**150**	**3**	**0**	**2**	**4**

w.e.f. July 2024

Prerequisites:

Engineering Mathematics

Course Objective:

- Understand the fundamentals of the Signals and systems.
- Understand linear time invariant systems and able to obtain mathematical modelling of the system.
- Apply the concepts of frequency domain representations to analyze continuous and discrete time signals/systems
- Understand and apply the Z-Transform, to the analysis and description of LTI discrete-time systems.
- Able to apply the knowledge to model a system

UNITs	**Descriptions**	**Hrs.**
I	An Introduction to Signals and Systems: Definition of signal and systems, Classification of signals: continuous time and discrete time signal, even and odd, periodic and non-periodic, deterministic and non-deterministic, energy and power. Elementary signals/Functions: exponential, sine, unit impulse, unit step and its properties, ramp, rectangular, triangular, signum. Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shifting, and time folding. System properties: linearity, additively and homogeneity, causality, stability, reliability. Introduction to different types of systems like causal & non causal systems, static& dynamic, stable &unstable, linear& nonlinear, time variant &time invariant systems.	8
II	Linear Time- Invariant Systems: Introduction, Convolution: impulse response representation for LTI systems, properties of the impulse response representation for LTI systems, differential and difference equation for LTI Systems, Singularity functions.	8
III	The response of LTI system to complex exponential, Fourier series(FS) representation of continuous time periodic signals, convergence of Fourier series, Properties of CT-FS, FS representation of Discrete Time(DT) periodic Signal, Properties of DT-FS.	8
IV	Representation of periodic signals: the continuous time Fourier Transform (CT-FT), FT for periodic signals, Properties of CT-FT, the convolution property. Representation of DT-FT (for periodic and aperiodic signals), properties of DT-FT, Sampling Theorem, and Representation of CT signals by its samples, reconstruction of a signal from its samples, aliasing.	8
V	The z transform Basic principle of z-transform, definition, region of convergence, system functions, poles and zeros of systems and sequences, properties of ROC, properties of z-transform, inverse z-transform using, Analysis and characterization of LTI system using Z-transform.	8
Total Hours		40

Course Outcomes:

CO 1: Acquire knowledge of basics, fundamentals of signal

CO 2: Understanding the fundamentals for LTI system.

CO3: To know the concept of Fourier Series.

CO4: To know the concept of Fourier Transform.

CO5: Apply the fundamentals of Z-Transform.

Text Book & Reference Books-

1. T. K. Rawat, Signals and Systems, Oxford University Press.
2. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall.

1. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press.
2. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition.
3. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", Tata McGraw Hill Publishing Company Ltd., New Delhi

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/108/104/108104100/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**3**	**2**	**1**										**1**	**2**
CO-2	**2**	**2**	**1**	**1**									**1**	**2**
CO-3	**3**	**1**	**2**	**1**									**1**	**2**
CO-4	**3**	**1**	**2**	**1**									**1**	**2**
CO-5	**3**	**2**	**1**										**1**	**2**

Suggestive list of experiments:

1. Introduction to MATLAB
2. Generation of continuous time signals.
3. Basic operations on the signals.
4. Systems and their properties.
5. Convolution of signals.
6. Transformation of signals into time and frequency domains.

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SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		**IV/II**		**Program**		**B.Tech – Internet of Things**
Subject Category	**DC**	**Subject Code:**	**IO 404**	**Subject Name**		**Foundation of IoT**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
60	**20**	**10**	**10**	**-**	**-**	**-**	**100**	**3**	**1**	**0**	**4**

w.e.f. July 2024

Prerequisites:

NA

Course Objective:

- To make students know the IoT ecosystem.
- To provide an understanding of the technologies and the standards relating to theInternet of Things.
- To develop skills on IoT technical planning.

UNITs	**Descriptions**	**Hrs.**
I	Introduction & concepts: definition and characteristics of IoT, physical design of IoT, Logical Design of IoT, IoT enabling technologies, IoT levels and development templates, IoT and M2M, IoT design Methodology.	8
II	IoT Networking: Connectivity Technologies, Gateway Prefix Allotment, Impact of Mobility on Addressing, Multihoming, Deviations from Regular Web, IoT identification and Data Protocols(IPv4, IPv6, MQTT, CoAP, XMPP and AMQP)	8
III	Connectivity Technologies: Introduction, IEEE 802.15.4, ZigBee, 6LoWPAN, RFID, HART and Wireless HART, NFC, Bluetooth, Z-Wave, ISA 100.11A.	8
IV	Wireless Sensor Network: Introduction, Components of Sensor Node, Modes of Detection, Challenges in WSN. UAV Network: Introduction, UAV Network (Feature, Challenges and Topology) FANET: Introduction, FANET design consideration.	8
V	Application of IoT: Smart Homes – Introduction, Origin of Smart Homes, Smart Home Technologies. Smart Cities – Characteristics of Smart Cities, Smart City Framework, Challenges in Smart Cities. Connected Vehicles – Introduction, levels of Automation, Vehicle to Everything(V2X) Paradigm, Vehicular Ad-hoc Network (VANETs)	8
Total Hours		40

Course Outcomes:

CO1: To understand the Fundamentals of IoT.

CO2: To know about the networking concepts of IoT.

CO3: To know about the different connectivity technologies.

CO4: To know about the WSN and UAV network.

CO5: To know about the various applications of IoT.

Text Book

1. Arshdeep Bagha and Vijay Madisetti, “Internet of Things – A hands-on approach”, Orient Blackswan Private Limited - New Delhi.
2. Dr. Jeeva Jose, Internet of Things, Khanna Publishing House.
3. Nitesh Dhanjani, Abusing the Internet of Things, Shroff Publisher/O’Reilly Publisher.

Reference Books

1. Internet of Things, RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, John Wiley and Sons.
2. Internet of Things, Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, John Wiley & Sons.
3. Cuno Pfister, “Getting Started with the Internet of Things”, Shroff Publisher/MakerMedia.
4. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1 st Edition, Apress Publications.

5. Massimo Banzi, Michael Shiloh Make: Getting Started with the Arduino, Shroff Publisher/Maker Media Publishers.

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc19_cs65/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**2**	**1**	**2**										**1**	**2**
CO-2	**2**	**1**	**1**										**1**	**2**
CO-3	**2**	**1**	**1**										**1**	**2**
CO-4	**2**	**1**	**1**	**1**									**1**	**2**
CO-5	**2**	**1**	**1**	**1**									**1**	**2**

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Subject handled by department	Department of IT

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DEPARTMENT OF IT

Semester/Year		**IV/II**		**Program**		**B.Tech – Internet of Things**					
Subject Category	**DC**	**Subject Code:**		**IO 405**		**Subject Name**	**Communication Systems**				
Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
60	**20**	**10**	**10**	**-**	**-**	**-**	**100**	**3**	**1**	**0**	**4**

w.e.f. July 2024

Prerequisites:

NA

Course Objective:

- The purpose of the course is to teach the fundamental principle of Communications.
- To equip students with various issues related to analogue communication such as modulation,demodulation, transmitters and receivers and noise performance.

UNITs	**Descriptions**	**Hrs.**
I	Signals Analysis: Review of Fourier Transformation, signal transformation and its properties through linear system, signal distortion in transmission, bandwidth and rise time, energy and power density and Parseval's theorem for energy and power signals, convolution &correlations.	8
II	Linear Modulation: Necessity of modulation, principal of amplitude modulation generation and detection of DSB-SC, SSB-SC and VSB-SC, AM-LC, Comparison of various AM systems, FDM and TDM.	8
III	Angle Modulation - Definition and relationship between PM ad FM frequency deviation, Bessel's function , spectrum and transmission BW of FM , NBFM,WBFM , phase diagram of FM signals in FM system s, comparison of AM and FM systems. Digital Modulation: Block diagram of PCM system, Inter-symbol Interference, Compounding, Delta Modulation (DM), Limitation of DM, ADM, Comparison between PCM & DM, DPCM.	8
IV	Radio transmitter and receiver: Different type of AM and FM transmitters and receivers,AM and FM standard broadcast calculation of noise for signal and cascaded stages. Noise-performance of analog communication systems: SNR, Noise figure. Line Codes. Data Transmission: Generation and Detection of ASK, FSK, PSK, DPSK, QPSK.	8
V	Information Theory: Unit of Information, Entropy, Rate of Information, Joint & Conditional Entropy, Mutual Information, Channel Capacity, Shawn's Theorem, Shannon Harder Theorem, Coding Efficiency, Shannon Fano Coding, Hoffman Coding, Blocks Codes.	8
Total Hours		40

Course Outcomes:

CO-1: Explain the fundamentals of analog and digital Signals and Communication System
CO-2: Apply Fourier Transform to communication signals and derive the power spectral density of signals.
CO-3: Define, formulate and analyze various techniques for amplitude and angle modulation.
CO-4: Analyze different techniques for digital data transmission and analyze the performance of spread spectrumcommunication systems.
CO-5: Understand the fundamentals of Information Theory.

Text Book

1. Taub and Schilling: Principles of Communication System, TMH.
2. Simon Haykin: Digital Communication, John Wiley.

Reference Books

1. G. Kennedy: Electronic Communication System, TMH.
2. J. G. Proakis: Digital Communications, MGH.

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc19_cs65/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**1**	**1**	**2**										**1**	**2**
CO-2	**2**	**2**	**2**										**1**	**2**
CO-3	**2**	**1**	**2**										**1**	**2**
CO-4	**2**	**1**	**2**											**2**
CO-5	**2**	**2**	**1**										**1**	**2**

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Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF CS & IT

Semester/Year		**IV/II**		**Program**		**B.Tech – Internet of Things**
Subject Category	**DLC**	**Subject Code:**	**IO 406**	**Subject Name**		**Advanced Java Programming**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
				60	**20**	**20**	**100**	**0**	**0**	**4**	**2**

w.e.f. July 2024

Prerequisites:

Concepts of Object Oriented Programming and core Java

Course Objective:

- To introduce and understand students to programming concepts and techniques using the Java language and programming environment, class and objects.
- To learn about lifetime, scope and the initialization mechanism of variables and improve the ability general problem solving abilities in programming.
- Be able to use the Java SDK environment to create, debug and run simple Java program

UNITs	**Descriptions**	**Hrs.**
I	Basic Java Features - C++ vs JAVA, JAVA virtual machine, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes .	**6**
II	Java Collective Frame Work - Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: sort, shuffle, reverse, fill, copy, max and min ,binary Search, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Unmodifiable Collections.	8
III	Advance Java Features - Multithreading: Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC.	8
IV	Advance Java Technologies - Servlet: Overview and Architecture, Handling HTTP & HTTPS, get Requests, JDBC, Using JDBC from a Servlet, Java Server Pages (JSP): First JSP Example, JSP elements, JSP tag library, Session tracking, , Java Cryptographic Architecture (JCA).	10
V	Advance Web/Internet Programming (Overview): Struts- Basics of MVC, architecture, action class, interceptors, tag library, validations, Hibernate- basics, architecture, CRUD, Spring- framework introduction.	8
Total Hours		40

Course Outcomes:

CO1: Use the syntax and semantics of java programming language and basic concepts of OOP.

CO2: Write basic Java applications and use arrays.

CO3: Develop reusable programs using the concepts of RMI and JDBC.

CO4: Apply the concepts of Servlet and JSP using advanced tools.

CO5: Design event driven GUI and web related applications which mimic the real word scenarios.

Text Book

1. E. Balaguruswamy, “Programming In Java”; TMH Publications
2. The Complete Reference: Herbert Schildt, TMH

Reference Books

1. Deitel & Deitel, ”JAVA, How to Program”; PHI, Pearson
2. Cay Horstmann, Big JAVA, Wiley India
3. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105191/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**2**	**2**	**2**										**1**	**2**
CO-2	**2**	**2**	**2**										**1**	**2**
CO-3	**2**	**1**	**2**	**1**									**1**	**2**
CO-4	**2**	**1**	**2**	**1**										**2**
CO-5	**2**	**2**	**1**	**1**									**1**	**2**

Suggestive list of experiments:

1. Installation of JDK.
2. Write a program to show Scope of Variables
3. Write a program to show Concept of CLASS in JAVA
4. Write a program to show Type Casting in JAVA
5. Write a program to show How Exception Handling is in JAVA
6. Write a Program to show Inheritance
7. Write a program to show Polymorphism
8. Write a program to show Access Specifiers (Public, Private, Protected) in JAVA
9. Write a program to show use and Advantages of CONSTRUCTOR
10. Write a program to show Interfacing between two classes
11. Write a program to Add a Class to a Package
12. Write a program to show Life Cycle of a Thread
13. Write a program to demonstrate AWT.
14. Write a program to Hide a Class
15. Write a Program to show Data Base Connectivity Using JAVA
16. Write a Program to show “HELLO JAVA ” in Explorer using Applet
17. Write a Program to show Connectivity using JDBC
18. Write a program to demonstrate multithreading using Java.
19. Write a program to demonstrate applet life cycle.
20. Write a program to demonstrate concept of servlet.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Internet of Things				
Subject Category	DC	Subject Code:	IO 501	Subject Name	Artificial Intelligence & Machine Learning					

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

w.e.f. July 2024

Prerequisites:

1. Data Structures
2. Knowledge on statistical methods

Course Objective:

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.
- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.

UNITs	Descriptions	Hrs.
I	INTRODUCTION Machine-Learning Paradigms: Introduction. Machine Learning Systems, Forms of Learning: Supervised and Unsupervised Learning, reinforcement – theory of learning – feasibility of learning – Data Preparation– training versus testing and split. Supervised Learning: Regression: Linear Regression, multi linear regression, Polynomial Regression, logistic regression, Non-linear Regression, Model evaluation methods.	**8**
II	Classification: – support vector machines – soft margin SVM – going beyond linearity – generalization and over fitting – regularization – validation-Naïve Bayes classification, Ensemble Learning: BOOSTING - AdaBoost –Stumping Gradient Boosting Machines and XGBoost -BAGGING -Subagging -Different Ways to Combine Classifiers-Random forest Classifier	8
III	Unsupervised learning Nearest neighbor models – K-means – clustering around medoids – silhouettes – hierarchical clustering – k-d trees – locality sensitive hashing – non-parametric regression. Clustering trees – learning ordered rule lists – learning unordered rule lists – descriptive rule learning – association rule mining – first-order rule learning.	8
IV	Neural Networks - The Perceptron -The Perceptron Learning Algorithm - LINEAR SEPARABILITY: The Perceptron Convergence Theorem - The Exclusive or (XOR) Function BACK-PROPAGATION OF ERROR : The Multi-layer Perceptron Algorithm -Different Output Activation Functions -Sequential and Batch Training - Local Minima - Picking Up Momentum- Minibatches and Stochastic Gradient Descent- A Regression Problem - Classification with the MLP.	8
V	The AI Problems, The Underlying Assumption, AI Techniques, Level of the Model, Criteria for Success, Some general references, one Final Word. Problems and State Space Search, Defining Problems as a State Space Search, Production Systems, Production Characteristics, Production System Characteristics, and issues in the design of Search Programs, additional problems. Generate-and-Test, Hill Climbing, Best-First Search, Problem	8

	Reduction, Constraint Satisfaction, Means-Ends Analysis.	
Total Hours		40

Course Outcomes:

CO-1 Understand the concepts of computational intelligence like machine learning.
CO-2 Ability to get the skill to apply machine learning techniques to address the real time problems in different areas.
CO-3 Understand the Neural Networks and its usage in machine learning application.
CO-4 Describe various searching methods and reasoning in AI.
CO-5 Uses of Knowledge Representation Techniques.

Text Book & Reference Books-

3. Machine Learning – Tom M. Mitchell, - MGH
4. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
5. Artificial Intelligence -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill
6. "PROLOG Programming For Artificial Intelligence" -By Ivan Bratko(Addison-Wesley

List/Links of e-learning resource

- https://nptel.ac.in/courses/106102220

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2	1									1	2
CO-2	2	1	1	1	2								1	2
CO-3	2	1	2	1			1						1	1
CO-4	2	1	2	1										2
CO-5	2	1			1								1	

List of Experiments:

1. Implementation of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
2. Implementation of Python Libraries for ML application such as Pandas and Matplotlib.
3. Creation and Loading different datasets in Python
4. Write a python program to compute Mean, Median, Mode, Variance, Standard Deviation using Datasets
5. Write a Python program to implement Simple Linear Regression and plot the graph.
6. Implementation of Multiple Linear Regression for House Price Prediction using sklear
7. Implementation of Logistic Regression for iris using sklearn
8. Implementation of random forest algorithm
9. Implementation of navie bayes classifier algorithm and plot the graph.
10. Implementation of SVM classification and plot the graph.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

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DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Internet of Things				
Subject Category	DC	Subject Code:		IO 502	Subject Name	Operating Systems for IoT				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

w.e.f. July 2024

Prerequisites:

Course Objective:

- Knowledge on Various Operating Systems of IoT.

UNITs	Descriptions	Hrs.
I	Processes, Tools, Tool chains and Hardware: Design to Code -A Practical Approach, The Stm32cube Software Tool, The Practical Tool Set, The Stm32 Graphical Tool- Stm32cube Mx Details, The Stm32cubehal, Free RTOS Configuration in A Cube Project, The Stm32cube Cubeide Development Platform.	**8**
II	Introducing Micropython: Micropython Features, Micropython Limitations, What Does Micropython Run On? Experimenting With Python On Your Pc, How Micropython Works, Off And Running With Micropython.	8
III	Micropython Hardware: Getting Started with Micropython Boards, Micropython-Ready Boards, Networking with The Pyboard, Getting Started with Wipy, Connecting to Your Wifi Network, Micropython-Compatible Boards, Other Boards, Breakout Boards and Add-Ons.	8
IV	How To Program In Micropython: Basic Concepts, Basic Data Structures, Statements, Modularization; Modules, Functions, And Classes, Learning Python By Example.	8
V	Introducing the Windows 10 Iot Core: Windows 10 Iot Core Features, Things You'll Need, Getting Started with Windows 10 Iot Core.	8
Total Hours		40

Course Outcomes:

CO-1 Understanding Free RTOS Techniques of Cube Software Tool.
CO-2 Knowledge on Micro Python Features.
CO-3 Understand and Acquire Knowledge on Micropython Hardware.
CO-4 Apply Basic Data Structures and Functions of Micro Python.
CO-5 Knowledge on Windows 10 For Iot Operating System.

Text Book & Reference Books-

1. Jim Cooling, Real-Time Operating Systems Book 2 - The Practice: Using Stm Cube, Freertos And the Stm32 Discovery Board (Engineering of Real-Time Embedded Systems) Jim Cooling, Isbn-10: 1973409933, Isbn-13: 978-1973409939.
2. Charles Bell, Micropython For the Internet of Things, A Beginner's Guide to Programming with Python on Microcontrollers, Apress, Isbn-13 (Pbk): 978-1-4842-3122-7, Isbn-13 (Electronic): 978-1-4842-3123-4.
3. Charles Bell Windows 10 For the Internet of Things 1st Edition, Apress, Isbn-13 (Pbk): 978-1- 4842-2107-5 Isbn-13, (Electronic): 978-1-4842-2108-2.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106102220

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_{10}	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2	1									1	2
CO-2	2	1	1	1	2								1	2
CO-3	2	1	2	1			1						1	1
CO-4	2	1	2	1										2
CO-5	2	1			1								1	

Suggestive List of Experiments

Writing Micropython code for:

1. LED blinking.
2. LCD Display unit.
3. PIR Sensor.
4. Potentiometer unit.
5. Relay unit.
6. Wi-Fi enabling.
7. Smoke Detector.
8. Thermister.
9. Traffic lights.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year	V/III	Program	B.Tech – Internet of Things
Subject Category: DC	Subject Code: IO 503	Subject Name	Ad-hoc & Sensor Networks for IoT

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

w.e.f. July 2024

Prerequisites:

Computer Networks, Mobile Computing

Course Objective:

- To understand the concepts of sensor networks.
- To understand the MAC and transport protocols for ad hoc networks.
- To understand the security of sensor networks.
- To understand the applications of adhoc and sensor networks.

UNITs	Descriptions	Hrs.
I	Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs. Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topologybased routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-Location Services-DREAM, Quorum-based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.	8
II	Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.	8
III	Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc	8
IV	Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.	8
V	Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.	8
Total Hours		40

Course Outcomes:

CO1: Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
CO2: Ability to solve the issues in real-time application development based on ASN.
CO3: Ability to conduct further research in the domain of ASN
CO4: Ability to understand layers
CO5: Understanding the concept of dynamic nature of WSNs.

Text Book & Reference Books-

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.

2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105160/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	2	2										1	2
CO-2	3	2	2	2									2	1
CO-3	3	2	2	2									2	1
CO-4	3	2	2	2									2	1
CO-5	2	2	1	1									1	2

Suggestive list of experiments:

Note: Implement Experiment No: 1 to 5 using NS2/NS3 Simulation Tool. Implement Experiment No: 6 to 10 using MATLAB Tool.

1. Create a sample wireless topology using Simulation Tool.
2. Create a mobile Ad-hoc networks using Simulation Tool.
3. Implement an Ad-hoc On-demand Distance Vector protocol using Simulation Tool.
4. Implement a Transmission Control Protocol using Simulation Tool.
5. Implement an User Datagram Protocol using Simulation Tool.
6. Implement a Low Energy Adaptive Hierarchy protocol using Simulation Tool.
7. Implement a Power Efficient Gathering in Sensor Information System using Simulation Tool.
8. Implement a Sensor Protocol for Information via Negotiation (SPIN) using Simulation Tool.
9. Implement a Power Efficient and Delay Aware MAC protocol using Simulation Tool
10. Implement a Scheduling based protocol for WSNs using Simulation Tool.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year	V/III	Program	B.Tech – Internet of Things
Subject Category: DE	Subject Code: IO 504 DE-I (A)	Subject Name	IoT Communication Protocols

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	0	0	3

w.e.f. July 2024

Prerequisites:

Course Objective:

- In this course, learners will be going to learn about various protocols designed for the implementation of the Internet of Things (IoT) applications.

UNITs	Descriptions	Hrs.
I	Introduction: IoT architecture outline, standards - IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics.	8
II	Iot Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant Architectural views. Real-World Design Constraints- Introduction, Technical Design constraints.	8
III	IoT Data Link Layer: PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7	8
IV	Network Layer Protocols: Network Layer-IPv4,IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.	8
V	IOT Transport & Session Layer Protocols: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)- (TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT.	8
Total Hours		40

Course Outcomes:

CO1: Understand fundamentals of IoT architecture outline and standards
CO2: Understand and analyze different architectural views.
CO3: Understand the importance of IoT Data Link Layer & Network Layer Protocols.
CO4: Understand the importance of Iot Transport.
CO5: Understand the importance of Session Layer Protocols.

Text Book & Reference Books-

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications ,2016
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",1st Edition, Academic Press, 2015
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106105166

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	2	2										1	2
CO-2	3	2	2	2									2	1
CO-3	3	2	2	2									2	1
CO-4	3	2	2	2									2	1
CO-5	2	2	1	1									1	2

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year	V/III	Program	B.Tech – Internet of Things
Subject Category: DE	Subject Code: IO 504 DE-I (B)	Subject Name	5G and IoT Technologies

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	0	3

w.e.f. July 2024

Prerequisites:

Course Objective:

- Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IoT Devices.

UNITs	Descriptions	Hrs.
I	Overview of 5G Broadband Wireless Communications: Evolution of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro), An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G.	8
II	The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mmWave MIMO Systems, 3GPP standards for 5G, IEEE 802.15.4	8
III	Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.	8
IV	IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANGNETCONF, YANG, SNMP NETOPEER	8
V	IoT Physical Devices and Endpoints - Introduction to Raspberry PI - Interfaces (serial, SPI, I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.	8
Total Hours		40

Course Outcomes:

CO1: Able to understand the application areas of IoT.
CO2: Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.
CO3: Able to understand building blocks of Internet of Things and characteristics.
CO4: Understand IoT and M2M.
CO5: Understanding the concept Raspberry PI with focus of interfacing external gadgets.

Text Book & Reference Books-

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

List/Links of e-learning resource

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	2	2										1	2
CO-2	3	2	2	2									2	1
CO-3	3	2	2	2									2	1
CO-4	3	2	2	2									2	1
CO-5	2	2	1	1									1	2

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year	V/III	Program	B.Tech – Internet of Things
Subject Category: DE	Subject Code: IO 504 DE-I (C)	Subject Name	Wireless network

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	0	0	3

w.e.f. July 2024

Prerequisites:

Wireless Sensor Networks.

Course Objective:

- To study the fundamentals of wireless Ad-Hoc Networks.
- To study the operation and performance of various Ad Hoc wireless network protocols.
- To study the architecture and protocols of Wireless sensor networks.

UNITs	Descriptions	Hrs.
I	Wireless LANs and PANs: Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF. Ad-Hoc Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks.	8
II	MAC Protocols: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.	8
III	Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table – Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.	8
IV	Transport Layer Protocols: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.	8
V	Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.	8
Total Hours		40

Course Outcomes:

CO1: Students will be able to understand the basis of Ad-hoc wireless networks.

CO2: Students will be able to understand design, operation and the performance of MAC layer protocols of Ad Hoc wireless networks.

CO3: Students will be able to understand design, operation and the performance of routing protocol of Ad Hoc wireless network.

CO4: Students will be able to understand design, operation and the performance of transport layer protocol of Ad Hoc wireless networks.

CO5: Students will be able to understand sensor network Architecture and will be able to distinguish

between protocols used in Adhoc wireless networks and wireless sensor networks.

Text Book & Reference Books-

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control - Jagannathan Sarangapani, CRC Press.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105160/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	2	2										1	2
CO-2	3	2	2	2									2	1
CO-3	3	2	2	2									2	1
CO-4	3	2	2	2									2	1
CO-5	2	2	1	1									1	2

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year	V/III	Program	B.Tech – Internet of Things
Subject Category: OE	Subject Code: IO 505 OE-I (A)	Subject Name	IoT Communication Protocols

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	0	0	3

w.e.f. July 2024

Prerequisites:

Course Objective:

- In this course, learners will be going to learn about various protocols designed for the implementation of the Internet of Things (IoT) applications.

UNITs	Descriptions	Hrs.
I	Introduction: IoT architecture outline, standards - IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics.	8
II	Iot Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant Architectural views. Real-World Design Constraints- Introduction, Technical Design constraints.	8
III	IoT Data Link Layer: PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7	8
IV	Network Layer Protocols: Network Layer-IPv4,IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.	8
V	IOT Transport & Session Layer Protocols: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)- (TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT.	8
Total Hours		40

Course Outcomes:

CO1: Understand fundamentals of IoT architecture outline and standards
CO2: Understand and analyze different architectural views.
CO3: Understand the importance of IoT Data Link Layer & Network Layer Protocols.
CO4: Understand the importance of Iot Transport.
CO5: Understand the importance of Session Layer Protocols.

Text Book & Reference Books-

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications ,2016
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",1st Edition, Academic Press, 2015
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106105166

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	2	2										1	2
CO-2	3	2	2	2									2	1
CO-3	3	2	2	2									2	1
CO-4	3	2	2	2									2	1
CO-5	2	2	1	1									1	2

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

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DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Internet of Things				
Subject Category	OE	Subject Code:		IO 505 OE- I (B)	Subject Name	Operating Systems for IoT				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	0	0	3

w.e.f. July 2024

Prerequisites:

Data Structures

Course Objective:

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.
- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.

UNITs	Descriptions	Hrs.
I	Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.	**8**
II	Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.	8
III	Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm. Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks. Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.	8
IV	Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm. Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning. Instance-Based Learning- Introduction, k-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.	8

V	The AI Problems, The Underlying Assumption, AI Techniques, Level of the Model, Criteria for Success, Some general references, one Final Word. Problems and State Space Search, Defining Problems as a State Space Search, Production Systems, Production Characteristics, Production System Characteristics, and issues in the design of Search Programs, additional problems. Generate-and-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.	8
Total Hours		40

Course Outcomes:

CO-1 Understand the concepts of computational intelligence like machine learning.
CO-2 Ability to get the skill to apply machine learning techniques to address the real time problems in different areas.
CO-3 Understand the Neural Networks and its usage in machine learning application.•
CO-4 Describe various searching methods and reasoning in AI.
CO-5 Uses of Knowledge Representation Techniques.

Text Book & Reference Books-

1. Machine Learning – Tom M. Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
3. Artificial Intelligence -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill
4. "PROLOG Programming For Artificial Intelligence" -By Ivan Bratko(Addison-Wesley

List/Links of e-learning resource

- https://nptel.ac.in/courses/106102220

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2	1									1	2
CO-2	2	1	1	1	2								1	2
CO-3	2	1	2	1			1						1	1
CO-4	2	1	2	1										2
CO-5	2	1			1								1	

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF CS & IT

Semester/Year		V/III		Program		B.Tech – Internet of Things					
Subject Category	OE	Subject Code:		IO 505 OE- 1 (C)	Subject Name	Ad-hoc & Sensor Networks for IoT					
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

w.e.f. July 2024

Prerequisites:

Computer Networks, Mobile Computing

Course Objective:

- To understand the concepts of sensor networks.
- To understand the MAC and transport protocols for ad hoc networks.
- To understand the security of sensor networks.
- To understand the applications of adhoc and sensor networks.

UNITs	Descriptions	Hrs.
I	Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs. Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topologybased routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-Location Services-DREAM, Quorum-based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.	8
II	Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.	8
III	Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc	8
IV	Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.	8
V	Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.	8
Total Hours		40

Course Outcomes:

CO1: Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
CO2: Ability to solve the issues in real-time application development based on ASN.
CO3: Ability to conduct further research in the domain of ASN
CO4: Ability to understand layers
CO5: Understanding the concept of dynamic nature of WSNs.

Text Book & Reference Books-

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.

2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105160/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	2	2										1	2
CO-2	3	2	2	2									2	1
CO-3	3	2	2	2									2	1
CO-4	3	2	2	2									2	1
CO-5	2	2	1	1									1	2

Suggestive list of experiments:

Note: Implement Experiment No: 1 to 5 using NS2/NS3 Simulation Tool. Implement Experiment No: 6 to 10 using MATLAB Tool.

1. Create a sample wireless topology using Simulation Tool.
2. Create a mobile Ad-hoc networks using Simulation Tool.
3. Implement an Ad-hoc On-demand Distance Vector protocol using Simulation Tool.
4. Implement a Transmission Control Protocol using Simulation Tool.
5. Implement an User Datagram Protocol using Simulation Tool.
6. Implement a Low Energy Adaptive Hierarchy protocol using Simulation Tool.
7. Implement a Power Efficient Gathering in Sensor Information System using Simulation Tool.
8. Implement a Sensor Protocol for Information via Negotiation (SPIN) using Simulation Tool.
9. Implement a Power Efficient and Delay Aware MAC protocol using Simulation Tool
10. Implement a Scheduling based protocol for WSNs using Simulation Tool.

Recommendation by Board of studies on	
Approval by Academic council on	
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Subject handled by department	Department of IT

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DEPARTMENT OF CS & IT

Semester/Year	V/III	Program	B.Tech – Internet of Things
Subject Category: DLC	Subject Code: IO 506	Subject Name	IoT Lab

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
				30	10	10	50	0	0	4	2

w.e.f. July 2024

Prerequisites:

Microprocessor and Microcontroller

Course Objective:

- To introduce IoT development boards and integration of sensors with it.

UNITs	Descriptions	Hrs.
I	Using Raspberry Pi 1. Calculate the distance using distance sensor. 2. Basic LED functionality. 3. Calculate temperature and humidity using DHT sensor. Using Arduino Board 1. Calculate the distance using distance sensor. 2. Basic LED functionality. 3. Calculate temperature and humidity using DHT sensor. Using ESP Board 1. Calculate the distance using distance sensor. 2. Basic LED functionality. 3. Calculate temperature and humidity using DHT sensor.	40
Total Hours		40

Course Outcomes:

CO1: To develop the ability of understanding of IoT Development boards
CO2: To integrate the sensors with the development boards.
CO3: To send the data over the cloud.

Text Book & Reference Books-

1. Developing IoT projects with ESP, Second Edition, Packt Publication.
2. Developing IoT projects with Arduino, Second Edition, Packt Publication.
3. Developing IoT projects with Raspberry Pi, Second Edition, Packt Publication.

List/Links of e-learning resource

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Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_{10}	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	2	2										1	2
CO-2	3	2	2	2									2	1
CO-3	3	2	2	2									2	1

Suggestive list of experiments:

Using Raspberry Pi

1. Calculate the distance using distance sensor. 2. Basic LED functionality. 3. Calculate temperature and humidity using DHT sensor. Using Arduino Board 1. Calculate the distance using distance sensor. 2. Basic LED functionality. 3. Calculate temperature and humidity using DHT sensor. Using ESP Board 1. Calculate the distance using distance sensor. 2. Basic LED functionality. 3. Calculate temperature and humidity using DHT sensor.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year	VI/III	Program	B.Tech – Internet of Things

Subject Category	DC	Subject Code:	IO 601	Subject Name	IoT Cloud Processing and Analytics

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	10	10	10	30	10	10	150	3	0	2	4

w.e.f. July 2024

Prerequisites:

Course Objective:

Knowledge on IoT networking connectivity protocols and IoT Analytics for the cloud processing.

UNITs	Descriptions	Hrs.
I	IoT devices, Networking basics, IoT networking connectivity protocols, IoT networking data messaging protocols, Analyzing data to infer protocol and device characteristics.	**6**
II	IoT Analytics for the Cloud: Introduction to elastic analytics, Decouple key components, Cloud security and analytics, Designing data processing for analytics, Applying big data technology to storage.	8
III	Exploring IoT Data: Exploring and visualizing data, Techniques to understand data quality, Basic time series analysis, Statistical analysis.	8
IV	Data Science for IoT Analytics: Introduction to Machine Learning, Feature engineering with IoT data, Validation methods, Understanding the bias–variance tradeoff, Use cases for deep learning with IoT data.	10
V	Strategies to Organize Data for Analytics: Linked Analytical Datasets, Managing data lakes, data retention strategy.	8
Total Hours		40

Course Outcomes:

CO1: Implement the architectural components and protocols for application development
CO2: Identify data analytics and data visualization tools as per the problem characteristics.
CO3: Learning data exploration techniques.
CO4: To get to know the different data science techniques.
CO5: Form the strategies to organize data.

Text Book & Reference Books-

1. Arshdeep Bahga and Vijay Madisetti, “Internet of Things – A Hands on Approach”, Universities Press, 2015.
2. Kevin, Townsend, Carles, Cufí, Akiba and Robert Davidson, "Getting Started with Bluetooth Low Energy” O'Reilly.
3. Madhur Bhargava “IoT Projects with Bluetooth Low Energy, Packt Publishing, August 2017.
4. Robin Heydon,” Bluetooth Low Energy: The Developer's Handbook”, Pearson, October 2012
5. Kumar Saurabh,” Cloud Computing”, Wiley India, 1st Edition, 2016.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105166/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	1	2										1	2
CO-2	3	2	2	1									1	2
CO-3	3	2	2	1									2	1
CO-4	3	2	2	1									2	1
CO-5	3	2	1										1	1

Suggestive list of experiments:

1. Install Virtualbox/Vmware Workstation with different flavors of linux or windows OS on top of windows7 or 8. 2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs 3. Install Google App Engine. Create a hello world app and other simple web applications using python/java. 4. Find a procedure to transfer the files from one virtual machine to another virtual machine. 5. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version) 6. Install Hadoop single node cluster and run simple applications like word count.	
Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

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DEPARTMENT OF IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	DC	Subject Code:	IO 602	Subject Name	Programming Languages for IoT

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	10	10	10	30	10	10	150	3	0	2	4

w.e.f. July 2024

Prerequisites:

Course Objective:

1. This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi.
2. The course focuses on higher-level operating systems, advanced networking, user interfaces, multimedia and uses more computing intensive IoT applications as examples using Raspberry Pi running Linux as the platform of choice.

UNITs	Descriptions	Hrs.
I	Getting Started with Raspberry Pi: Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS, Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operates the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface. Basics of Python programming language: Programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow.	**6**
II	**Introducing Micro Python:** MicroPython Features, MicroPython Limitations, Experimenting with Python on PC, Installing Python 3 on Windows 10, Running the Python Console, Running Python Programs with the Interpreter, The Run, Evaluate, Print Loop (REPL Console), Off and Running with MicroPython, Additional Hardware, Basic Electronics Kit, Breadboard and Jumper Wires and 3 Examples.	8
III	**IoT Physical Servers and Cloud Offerings:** Introduction to Cloud Storage models and communication APIs. Web Server – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API. Connecting to APIs.	8
IV	**Baking Pi:** Powering Raspberry Pi, Formatting SD cards, Installing and connecting Raspberry pi, How to tell Raspberry pi is working, Installing Raspbian with NOOBS, Networking Raspberry Pi, Connecting with Ethernet, Connecting Via Local Computer Network, Connecting Via Wireless Network, Updating and Upgrading, Setting up a Host Name, Connecting Raspberry pi with SSH, Creating Simple Raspberry pi application.	10
V	**FIRST Project on Java:** Bill of Materials, Getting Started with NetBeans, Downloading and Configuring NetBeans, Revisiting HelloRaspberryPi, Brewing Java, Communicating with a USB Scale, Coffee Calculator, Asynchronous Communication, Coffee Brewing Recipe, Commercial Licensing.	8
Total Hours		40

Course Outcomes:

CO1: Knowing the fundamentals of R- Pi
CO2: Understanding the basi concepts of MicroPython.
CO3: Understanding the cloud server and web server.
CO4: To get to know the working of R-Pi
CO5: Understanding the concepts of NetBeans.

Text Book & Reference Books-

1. Simon Monk, “Programming the Raspberry Pi: Getting Started with Python”, January 2012, McGraw Hill Professional.
2. MicroPython for the Internet of Things, A Beginner’s Guide to Programming with Python on Microcontrollers, Charles Bell, Apress.
3. Raspberry Pi with Java: Programming the Internet of Things (IoT) (Oracle Press) 1st Edition.
4. Eben Upton and Gareth Halfacree, “Raspberry Pi User Guide”, August 2016, 4th edition, John Wiley & Sons
5. Alex Bradbury and Ben Everard, “Learning Python with Raspberry Pi”, Feb 2014, JohnWiley & Sons
6. Michael Margolis, “Arduino Cookbook”, First Edition, March 2011, O'Reilly Media, Inc
7. The official raspberry Pi Projects Book,

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105166/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	1	2										1	2
CO-2	3	1	2	1									1	2
CO-3	3	2	2	1									2	1
CO-4	3	1	2	1									2	1
CO-5	3		1										1	1

Suggestive list of experiments:

1. Program to On Board blink LED
2. Program to blink External LED
3. Program to Control LED using Button
4. Program for Boot Button LED
5. Program to Get input from two switches and switch on corresponding LEDs.
6. Program to Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
7. Program to read Buntton 35
8. Program to Switch on a relay at a given time using sleep function, where the relay’s contact terminals are connected to a load.
9. Program for Buzzer
10. Program for Thermistor

Recommendation by Board of studies on	
Approval by Academic council on	
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Subject handled by department	Department of IT

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DEPARTMENT OF IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IO 603 DE –II A	Subject Name	IoT Security

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	-	-	3

w.e.f. July 2024

Prerequisites:

Course Objective:

1. Understand the fundamentals, various attacks and importance of Security aspects in IoT.
2. Understand the techniques, protocols and some idea on security towards Gaming models.
3. Understand the operations of Bitcoin blockchain, crypto-currency as application of blockchain technology.
4. Understand the essential components of IoT.
5. Understand security and privacy challenges of IoT.

UNITs	Descriptions	Hrs.
I	Fundamentals of IoT and Security and its need, Prevent Unauthorized Access to Sensor Data, Block ciphers, Introduction to Blockchain, Introduction of IoT devices, IoT Security Requirements, M2M Security, Message integrity, Modeling faults and adversaries, Difference among IoT devices, computers, and embedded devices.	**6**
II	IoT and cyber-physical systems RFID Security, Authenticated encryption Byzantine Generals problem sensors and actuators in IoT. IoT security (vulnerabilities, attacks, and countermeasures), Cyber Physical Object Security, Hash functions, Consensus algorithms and their scalability problems, Accelerometer, photoresistor, buttons.	8
III	Security engineering for IoT development Hardware Security, Merkle trees and Elliptic curves digital signatures, verifiable random functions, Zero-knowledge systems motor, LED, vibrator. IoT security lifecycle, Front-end System Privacy Protection, Management, Secure IoT Databases, Public-key crypto (PKI), blockchain, the challenges, and solutions, analog signal vs. digital signal.	8
IV	Data Privacy Networking Function Security Trees signature algorithms proof of work, Proof of stake, Networking in IoT, Device/User Authentication in IoT IoT Networking Protocols, Crypto-currencies, alternatives to Bitcoin consensus, Bitcoin scripting language and their use Real-time communication.	10
V	Introduction to Authentication Techniques Secure IoT Lower Layers, Bitcoin P2P network, Ethereum and Smart Contracts, Bandwidth efficiency, Data Trustworthiness in IoT Secure IoT Higher Layers, Distributed consensus, Smart Contract Languages and verification challenges data analytics in IoT - simple data analyzing methods.	8
Total Hours		40

Course Outcomes:

CO1: Incorporate the best practices learnt to identify the attacks and mitigate the same.
CO2: Adopt the right security techniques and protocols during the design of IoT products.
CO3: Assimilate and apply the skills learnt on ciphers and block chains when appropriate.
CO4: Describe the essential components of IoT.
CO5: Find appropriate security/privacy solutions for IoT.

Text Book & Reference Books-

1. B. Russell and D. Van Duren, “Practical Internet of Things Security,” Packt Publishing, 2016.
2. FeiHU, “Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations”, CRC Press, 2016.

3. Narayanan et al., “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction,”
4. Princeton University Press, 2016.
5. A. Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies,” O’Reilly, 2014.
6. T. Alpcan and T. Basar, “Network Security: A Decision and Game-theoretic Approach,”
7. Cambridge University Press, 2011.
8. Security and the IoT ecosystem, KPMG International, 2015.
9. Internet of Things: IoT Governance, Privacy and Security Issues” by European Research Cluster.
10. Ollie Whitehouse, “Security of Things: An Implementers' Guide to Cyber-Security for Internet of Things Devices and Beyond”, NCC Group, 2014
11. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/106/106106129/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	1	2										1	2
CO-2	3	2	1	1									1	2
CO-3	3	2	1	1									2	1
CO-4	3	2	2	1									2	1
CO-5	3	2	1										1	1

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IO 603 DE –II B	Subject Name	Cryptography

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	-	-	3

w.e.f. July 2024

Prerequisites:

Course Objective:

1. Gain in-depth knowledge on Lightweight Cryptography and its relation to the new security in RFID tags.
2. Apply proactive and defensive measures to counter potential threats, attacks and intrusions.

UNITs	Descriptions	Hrs.
I	**Anti-counterfeiting and RFID** - Anti-Counterfeiting and Supply Chain Security, Networked RFID Systems, PC Network Architecture, A Security Primer.	**6**
II	**Security and Privacy Current Status -** Addressing Insecurities and Violations of Privacy, RFID Tag Vulnerabilities in RFID Systems, From Identification to Authentication – A Review of RFID Product Authentication Techniques.	8
III	**Network Based Solutions** - EPC System for a Safe & Secure Supply Chain and How it is Applied, The Potential of RFID and NFC in Anti-Counterfeiting, Improving the Safety and Security of the Pharmaceutical Supply Chain.	8
IV	**Cryptographic Solutions** - Product Specific Security Based on RFID Technology, Strengthening the Security of Machine-Readable Documents, Enhancing Security of Class I Generation 2 RFID against Traceability and Cloning.	10
V	**Low-cost Cryptographic Solutions**: A Random Number Generator for Application in RFID Tags, A Low-Cost Solution to Cloning and Authentication Based on a Lightweight Primitive, Lightweight Cryptography for Low Cost RFID.	8
Total Hours		40

Course Outcomes:

CO1: Ability to learn Cryptographic based solutions, attacks and intrusions.
CO2: Understand security and privacy issues in radio frequency identification (RFID) systems.
CO3: Understanding multiple ways to attack and defend in industrial systems.
CO4: Understanding the concepts of basics of cryptography solutions.
CO5: Application of low cost cryptography solutions.

Text Book & Reference Books-

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
3. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley & Sons.
4. Amitabha Ghosh and Rapeepat Ratasuk "Essentials of LTE and LTE-A", Cambridge University Press.
5. Athanasios G. Kanatos, Konstantina S. Nikita, Panagiotis Mathiopoulos, "New Directions in Wireless Communication Systems from Mobile to 5G", CRC Press.
6. Theodore S. Rappaport, Robert W. Heath, Robert C. Danials, James N. Murdock "Millimeter Wave Wireless Communications", Prentice Hall Communications.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105162/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	2	2										1	2
CO-2	3	1	2	1									1	2
CO-3	3	1	2	1									2	1
CO-4	3	2	2	1									2	1
CO-5	3	2	1										1	1

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – IT				
Subject Category	DE	Subject Code:	IO 603 DE –II C	Subject Name			Information Theory & Coding				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

w.e.f. July 2024

Prerequisites:

Basic Knowledge of probability.

Course Objective:

- To understand Information properties and source coding techniques.
- To acquire knowledge about error coding techniques for efficient transmission.
- To understand various compression algorithms for data, Image and video.

UNITs	Descriptions	Hrs.
I	Information–Entropy-Information rate-classification of codes – Kraft Mc Millanine quality-Source coding theorem–Shannon – Fano coding – Huffman coding–Extended, Huffman coding – Joint and conditional entropies-Mutual information-Discrete memory less channels–BSC- BEC – Channel capacity-Shannon limit.	8
II	Text: Adaptive Huffman Coding – Arithmetic Coding – LZW algorithm–Audio: Perceptual coding-Masking techniques – Psychoacousticmodel-MEGAudiolayersI,II,III,DolbyAC3- Speech: Channel Vocoder-Linear Predictive Coding.	8
III	Image and Video Formats–GIF–TIFF– SIF–CIF – QCIF–Image compression: READ- JPEG – Video Compression: Principles-I, B, P frames - Motion estimation - Motion compensation - H.261 -MPEG standard.	8
IV	Definitions and Principles: Hamming weight-Hamming distance-Minimum distance decoding –Single parity codes – Hamming codes – Repetition codes – Linear block codes – Cyclic codes –Syndrome calculation-Encoder and decoder– Cyclic Redundancy check codes.	8
V	Convolutional codes–code tree–trellis-state diagram-Encoding–Decoding: Sequential search and Viterbi algorithm– Principle of Turbo coding.	8
Total Hours		40

Course Outcomes:

CO-1: Apply the suitable coding schemes for information..
CO2: Make use of coding schemes for text compression**.**
CO-3: Illustrate the compression schemes for video and image. .
CO-4: Utilize the various types of error control codes**.**
CO-5: Construct the code tree and state diagram for error control codes.

Text Book & Reference Books-

1. Ranjan Bose, “Information Theory, Coding and Cryptography”, Tata McGraw Hill, 2nd edition.
2. P.S. Satyanarayana, “Concepts of Information Theory and Coding”, Dynaram Publication, 2005
3. Richard B. Wells, “Applied Coding and Information Theory for Engineers” Pearson Education, LPE 2004.
4. Shu Lin and Daniel Castello, “Error Control Coding – Fundamentals and Applications”, second edition 2004
5. Thomas M Cover, Joy Thomas, “Elements of Information Theory”, MGH 2006.

List/Links of e-learning resource

- https://archive.nptel.ac.in

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	3	2	3	1							2	3	1
CO-2		2	3	2	3									
CO-3	2	1	2	3	2								1	
CO-4		2	3	2								1		2
CO-5		1	2	3									2	

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IO 604 DE – III A	Subject Name	Mobile Application Development for IoT

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

w.e.f. July 2024

Prerequisites:

Course Objective:

Students will learn mobile application development for Internet of Things (IoT) devices.

UNITs	Descriptions	Hrs.
I	IoT Product Conceptualization: IoT Product Development Lifecycle, IoT Product Conceptualizations IoT Programming Fundamentals: Getting Started, IoT Programming setup for LED flashing, Program to display message on screen, Program to read LDR level and display on screen, Android APK to perform read write operation, Particle android APK to control LED intensity, LED switching with HTML interface, Cloud based motion detection, Displaying temperature sensor data on terminal, Publishing sensor values on the cloud, Performing computation on sensor values.	**6**
II	**IoT Programming Applications:** Gas level detection using MQ2 sensor, Blink Android Application for controlling LED from mobile, Integration of Temperature and Gas Sensor with Blynk Mobile Application, Printing real-time Date and Time values on serial terminal, Display temperature value on serial terminal, Display temperature values on 16*2 LCD display Interfacing: Interfacing of Nokia 5110 display, display image on Nokia 5110, Particle Electron displaying battery charging level status, GPS tracking device interface to get coordinates.	8
III	**IoT Product Hardware Development:** Product realization, Connection diagram of IoT product, Engineering board development, Product board customization and optimization, Flowchart of IoT warehouse monitoring system, Wireless communication between the multiple kits, Particle cloud IDE.	8
IV	**IoT Advance Wireless Interfaces:** Bluetooth communication between master and slave module, Data visualization on ThingSpeak cloud using webhook services, Storing data into google excel sheet and sending the sheets to emails.	10
V	**IoT Production System:** IoT Warehouse Monitoring System, IoT Product Packaging, Future of IoT Product Development.	8
Total Hours		40

Course Outcomes:

CO1: Understand significance of IoT programming fundamentals.
CO2: Understand and analyze IoT programming applications.
CO3: Develops IoT applications using standardized hardware.
CO4: Discuss concepts of IoT Advance Wireless Interfaces and IoT Production System.
CO5: To get the basics of production system.

Text Book & Reference Books-

1. IoT Product Development with Programming: Stepwise programming approach with Particle Development board Kindle Edition by Mahesh Jadhav and Tejas Sarang Patil.
2. Kale, Vivek. Parallel Computing Architectures and APIs: IoT Big Data Stream Processing 1st edition, CRC Press, 2019.
3. IoT Product Development with Programming: Stepwise programming approach with Particle Development board Kindle Edition by Mahesh Jadhav and Tejas Sarang Patil.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/106/106106156/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	2										1	2
CO-2	3	2	2	1									1	2
CO-3	3	2	2	1									2	1
CO-4	3	2	2	1									2	1
CO-5	2	2	1										1	1

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
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DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – Internet of Things				
Subject Category	DE	Subject Code:		IO 604 DE – III B	Subject Name		Web Engineering				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	0	4

w.e.f. July 2024

Prerequisites:

Course Objective:

- Understand the characteristics of web applications
- Learn to Model web applications
- Be aware of Systematic methods
- Be familiar with the testing techniques for web applications

UNITs	Descriptions	Hrs.
I	**Introduction To Web Engineering And Requirements Engineering**, Motivation, Categories of Web Applications, Characteristics of Web Applications, Product-related Characteristics, Usage related Characteristics, Development-related Characteristic, Evolution of web engineering – Requirements Engineering Activities RE Specifics in Web Engineering, Principles for RE of Web Applications, Adapting RE Methods to Web Application Development, Requirement Types, Notations, Tools	8
II	**Web Application Architectures & Modelling Web Applications:** Introduction- Categorizing Architectures, Specifics of Web Application Architectures, Components of a Generic Web Application Architecture, Layered Architectures, 2-Layer Architectures, N-Layer Architectures Data-aspect Architectures, Database-centric Architectures, Architectures for Web Document Management, Architectures for Multimedia Data Modeling Specifics in Web Engineering, Levels, Aspects, Phases Customization, Modeling Requirements, Hypertext Modeling, Hypertext Structure Modeling Concepts.	8
III	**Web Application Design** Introduction, Web Design from an Evolutionary Perspective, Information Design, Software Design: A Programming Activity, Merging Information Design and Software Design, Problems and Restrictions in Integrated Web Design, A Proposed Structural Approach, Presentation Design, Presentation of Nodes and Meshes, Device-independent Development, Approaches, Inter action Design, User Interaction User Interface Organization, Navigation Design, Designing a Link Representation, Designing Link Internals, Navigation and Orientation, Structured Dialog for Complex Activities, Interplay with Technology and Architecture, Functional Design.	8
IV	**TESTING WEB APPLICATIONS** Introduction, Fundamentals, Terminology, Quality Characteristics, Test Objectives, Test Levels, Role of the Tester, Test Specifics in Web Engineering, Test Approaches, Conventional Approaches, Agile Approaches, Test Scheme, Three Test Dimensions, Applying the Scheme to Web	8

	Applications, Test Methods and Techniques, Link Testing, Browser Testing, Usability Testing, Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, Test Automation, Benefits and Drawbacks of Automated Test, Test Tools.	
V	**WEB PROJECT MANAGEMENT** Understanding Scope, Refining Framework Activities, Building a Web Team, Managing Risk, Developing a Schedule, Managing Quality, Managing Change, Tracking the Project. Introduction to node JS – web sockets.	8
Total Hours		40

Course Outcomes:

CO-1: Understand and apply the characteristics of web applications by requirements engineering.
CO-2: Categorizing web architecture and model web applications.
CO-3: Design and development of web applications.
CO-4: Applying various test on web applications.
CO-5: Scope and utility of web project management.

Text Book

1.Gerti Kappel, Birgit Proll, "Web Engineering", John Wiley and Sons Ltd.

Reference Books

1. Roger S. Pressman, David Lowe, "Web Engineering", Tata McGraw Hill Publication.
2. Guy W. Lecky-Thompson, "Web Programming", Cengage Learning.
3. Chris Bates, "Web Programming: Building Internet Applications", Third Edition, Wiley India Edition.
4. John Paul Mueller, "Web Development with Microsoft Visual Studio 2005", Wiley Dream Tech.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106105084

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	2										1	2
CO-2	3	2	2	1									1	2
CO-3	3	2	2	1									1	2
CO-4	3	2	2	1										2
CO-5	2	2	1										1	2

Suggestive list of experiments:

1. Design the following static web pages required for an online book store web site. 1) HOME PAGE: The static home page must contain three frames. 2) LOGIN PAGE 3) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table. 4) REGISTRATION PAGE
2. Write JavaScript to validate the following fields of the Registration page. 1. First Name (Name should contains alphabets and the length should not be less than 6 characters). 2. Password (Password should not be less than 6 characters length). 3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com) 4. Mobile Number (Phone number should contain 10 digits only). 5. Last Name and Address (should not be Empty).
3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
4. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems: a) Input: Click on Display Date button using onclick( ) function Output: Display date in the textbox b) Input: A number n obtained using prompt Output: Factorial of n number using alert c) Input: A number n obtained using prompt Output: A multiplication table of numbers from 1 to 10 of n using alert d) Input: A number n obtained using prompt and add another number using confirm Output: Sum of the entire n numbers using alert

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
7. Develop and demonstrate PHP Script for the following problems: a) Write a PHP Script to find out the Sum of the Individual Digits. b) Write a PHP Script to check whether the given number is Palindrome or not
8. Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF CS & IT

Semester/Year		VI/III		Program		B.Tech – Internet of Things				
Subject Category	DE	Subject Code:		IO 604 DE – III C	Subject Name	UI/UX				
Maximum Marks Allotted								Contact Hours		Total Credits
Theory				Practical			Total Marks			
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P
60	20	10	10	-	-	-	100	3	1	0	4

w.e.f. July 2024

Prerequisites:

Knowledge of computer programming with any programming language like C/C++, Java.

Course Objective:

- The aim of the UI/UX course is to provide students with the knowledge of user- centered design, user-cantered methods in design, graphic design on screens, simulation and prototyping techniques.
- Also usability testing methods, interface technologies and user centered design in corporate perspective.

UNITs	Descriptions	Hrs.
I	Introduction to the UI: What is User Interface Design (UI) -The Relationship Between UI and UX, Roles in UI/UX, A Brief Historical Overview of Interface Design, Interface Conventions, Approaches to Screen Based UI, Template vs Content, Formal Elements of Interface Design, Active Elements of Interface Design, Composing the Elements of Interface Design, UI Design Process, Visual Communication design component in Interface Design.	7
II	Introduction to UX: UX Basics- Foundation of UX design, Good and poor design, Understanding Your Users, Designing the Experience Elements of user Experience, Visual Design Principles, Functional Layout, Interaction design.	7
III	Introduction to the Interface, Navigation Design, User Testing, Developing and Releasing Your Design.	7
IV	UI/ UX Design Tools: User Study- Interviews, writing personas: user and device personas, User Context, Building Low Fidelity Wireframe and High-Fidelity Polished Wireframe Using wire framing Tools, Creating the working Prototype using Prototyping tools, Sharing and Exporting Design.	7
V	Information and Data Study: Understanding and collection of data, methods of collecting data, tools for collecting data, analysing data, using data analytics tools like Google analytics for user experience, heat mapping tools.	7
Total Hours		35

Course Outcomes:

CO1: Understand iterative user-centered design of graphical user interfaces.
CO2: Apply the user Interfaces to different devices and requirements.
CO3: Create high quality professional documents and artifacts related to the design process.
CO4: Students are capable of programming using mainstream programming languages, can conduct fine software-engineering practices to implement problem-solving schemes as correct, efficient, and well-structured programs
CO5: Students have the logical, algorithmic, and mathematical capability to model and analyze real-world problems in different application domains

Text Book &

1. A Project Guide to UX Design: For user experience designers in the field or in the making (2nd. ed.). Russ Unger and Carolyn Chandler. New Riders Publishing, USA, 2012..

Reference Books

1. The Elements of User Experience: User-Centered Design for the Web and Beyond, Second Edition Jesse James Garrett, Pearson Education. 2011
2. The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Third Edition Wilbert O. Galitz , Wiley Publishing, 2007.
3. The UX Book Process and Guidelines for Ensuring a Quality User Experience, Rex Hartson and Pardha S. Pyla, Elsevier, 2012.

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc21_ar05/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	2	1			1							1	2
CO-2	3	2	1										1	2
CO-3	3	2	1							1				1
CO-4	3	2	1	1	1			1						1
CO-5	3	2	1										1	1

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF IT

Semester/Year	VI/III	Program	B.Tech – Internet of Things

Subject Category	OE	Subject Code:	OE 605 OE – II A	Subject Name	IoT Cloud Processing and Analytics

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	10	10	10				100	3	0	0	3

w.e.f. July 2024

Prerequisites:

Course Objective:

Knowledge on IoT networking connectivity protocols and IoT Analytics for the cloud processing.

UNITs	Descriptions	Hrs.
I	IoT devices, Networking basics, IoT networking connectivity protocols, IoT networking data messaging protocols, Analyzing data to infer protocol and device characteristics.	**6**
II	IoT Analytics for the Cloud: Introduction to elastic analytics, Decouple key components, Cloud security and analytics, Designing data processing for analytics, Applying big data technology to storage.	8
III	Exploring IoT Data: Exploring and visualizing data, Techniques to understand data quality, Basic time series analysis, Statistical analysis.	8
IV	Data Science for IoT Analytics: Introduction to Machine Learning, Feature engineering with IoT data, Validation methods, Understanding the bias–variance tradeoff, Use cases for deep learning with IoT data.	10
V	Strategies to Organize Data for Analytics: Linked Analytical Datasets, Managing data lakes, data retention strategy.	8
Total Hours		40

Course Outcomes:

CO1: Implement the architectural components and protocols for application development
CO2: Identify data analytics and data visualization tools as per the problem characteristics.
CO3: Learning data exploration techniques.
CO4: To get to know the different data science techniques.
CO5: Form the strategies to organize data.

Text Book & Reference Books-

6. Arshdeep Bahga and Vijay Madisetti, “Internet of Things – A Hands on Approach”, Universities Press, 2015.
7. Kevin, Townsend, Carles, Cufí, Akiba and Robert Davidson, "Getting Started with Bluetooth Low Energy” O'Reilly.
8. Madhur Bhargava “IoT Projects with Bluetooth Low Energy, Packt Publishing, August 2017.
9. Robin Heydon,” Bluetooth Low Energy: The Developer's Handbook”, Pearson, October 2012
10. Kumar Saurabh,” Cloud Computing”, Wiley India, 1st Edition, 2016.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105166/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	1	2										1	2
CO-2	3	2	2	1									1	2
CO-3	3	2	2	1									2	1
CO-4	3	2	2	1									2	1
CO-5	3	2	1										1	1

Suggestive list of experiments:	
Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF IT

Semester/Year		VI/III	Program		B.Tech – Internet of Things
Subject Category	OE	Subject Code:	OE 605 OE – II B	Subject Name	Programming Languages for IoT

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	10	10	10				100	3	0	0	3

w.e.f. July 2024

Prerequisites:

Course Objective:

3. This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi.
4. The course focuses on higher-level operating systems, advanced networking, user interfaces, multimedia and uses more computing intensive IoT applications as examples using Raspberry Pi running Linux as the platform of choice.

UNITs	Descriptions	Hrs.
I	Getting Started with Raspberry Pi: Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS, Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operates the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface. Basics of Python programming language: Programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow.	**6**
II	**Introducing Micro Python:** MicroPython Features, MicroPython Limitations, Experimenting with Python on PC, Installing Python 3 on Windows 10, Running the Python Console, Running Python Programs with the Interpreter, The Run, Evaluate, Print Loop (REPL Console), Off and Running with MicroPython, Additional Hardware, Basic Electronics Kit, Breadboard and Jumper Wires and 3 Examples.	8
III	**IoT Physical Servers and Cloud Offerings:** Introduction to Cloud Storage models and communication APIs. Web Server – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API. Connecting to APIs.	8
IV	**Baking Pi:** Powering Raspberry Pi, Formatting SD cards, Installing and connecting Raspberry pi, How to tell Raspberry pi is working, Installing Raspbian with NOOBS, Networking Raspberry Pi, Connecting with Ethernet, Connecting Via Local Computer Network, Connecting Via Wireless Network, Updating and Upgrading, Setting up a Host Name, Connecting Raspberry pi with SSH, Creating Simple Raspberry pi application.	10
V	**FIRST Project on Java:** Bill of Materials, Getting Started with NetBeans, Downloading and Configuring NetBeans, Revisiting HelloRaspberryPi, Brewing Java, Communicating with a USB Scale, Coffee Calculator, Asynchronous Communication, Coffee Brewing Recipe, Commercial Licensing.	8
Total Hours		40

Course Outcomes:

CO1: Knowing the fundamentals of R- Pi
CO2: Understanding the basi concepts of MicroPython.
CO3: Understanding the cloud server and web server.
CO4: To get to know the working of R-Pi
CO5: Understanding the concepts of NetBeans.

Text Book & Reference Books-

1. Simon Monk, “Programming the Raspberry Pi: Getting Started with Python”, January 2012, McGraw Hill Professional.
2. MicroPython for the Internet of Things, A Beginner’s Guide to Programming with Python on Microcontrollers, Charles Bell, Apress.
3. Raspberry Pi with Java: Programming the Internet of Things (IoT) (Oracle Press) 1st Edition.
4. Eben Upton and Gareth Halfacree, “Raspberry Pi User Guide”, August 2016, 4th edition, John Wiley & Sons
5. Alex Bradbury and Ben Everard, “Learning Python with Raspberry Pi”, Feb 2014, JohnWiley & Sons
6. Michael Margolis, “Arduino Cookbook”, First Edition, March 2011, O'Reilly Media, Inc
7. The official raspberry Pi Projects Book,

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105166/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	1	2										1	2
CO-2	3	1	2	1									1	2
CO-3	3	2	2	1									2	1
CO-4	3	1	2	1									2	1
CO-5	3		1										1	1

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF IT

Semester/Year		VI/III		Program		B.Tech – Internet of Things				
Subject Category	OE	Subject Code:	OE 605 OE – II C	Subject Name		IoT Security				

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	-	-	3

w.e.f. July 2024

Prerequisites:

Course Objective:

1. Understand the fundamentals, various attacks and importance of Security aspects in IoT.
2. Understand the techniques, protocols and some idea on security towards Gaming models.
3. Understand the operations of Bitcoin blockchain, crypto-currency as application of blockchain technology.
4. Understand the essential components of IoT.
5. Understand security and privacy challenges of IoT.

UNITs	Descriptions	Hrs.
I	Fundamentals of IoT and Security and its need, Prevent Unauthorized Access to Sensor Data, Block ciphers, Introduction to Blockchain, Introduction of IoT devices, IoT Security Requirements, M2M Security, Message integrity, Modeling faults and adversaries, Difference among IoT devices, computers, and embedded devices.	**6**
II	IoT and cyber-physical systems RFID Security, Authenticated encryption Byzantine Generals problem sensors and actuators in IoT. IoT security (vulnerabilities, attacks, and countermeasures), Cyber Physical Object Security, Hash functions, Consensus algorithms and their scalability problems, Accelerometer, photoresistor, buttons.	8
III	Security engineering for IoT development Hardware Security, Merkle trees and Elliptic curves digital signatures, verifiable random functions, Zero-knowledge systems motor, LED, vibrator. IoT security lifecycle, Front-end System Privacy Protection, Management, Secure IoT Databases, Public-key crypto (PKI), blockchain, the challenges, and solutions, analog signal vs. digital signal.	8
IV	Data Privacy Networking Function Security Trees signature algorithms proof of work, Proof of stake, Networking in IoT, Device/User Authentication in IoT IoT Networking Protocols, Crypto-currencies, alternatives to Bitcoin consensus, Bitcoin scripting language and their use Real-time communication.	10
V	Introduction to Authentication Techniques Secure IoT Lower Layers, Bitcoin P2P network, Ethereum and Smart Contracts, Bandwidth efficiency, Data Trustworthiness in IoT Secure IoT Higher Layers, Distributed consensus, Smart Contract Languages and verification challenges data analytics in IoT - simple data analyzing methods.	8
Total Hours		40

Course Outcomes:

CO1: Incorporate the best practices learnt to identify the attacks and mitigate the same.
CO2: Adopt the right security techniques and protocols during the design of IoT products.
CO3: Assimilate and apply the skills learnt on ciphers and block chains when appropriate.
CO4: Describe the essential components of IoT.
CO5: Find appropriate security/privacy solutions for IoT.

Text Book & Reference Books-

12. B. Russell and D. Van Duren, "Practical Internet of Things Security," Packt Publishing, 2016.
13. FeiHU, "Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations", CRC

Press, 2016.
14. Narayanan et al., “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction,”
15. Princeton University Press, 2016.
16. A. Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies,” O’Reilly, 2014.
17. T. Alpcan and T. Basar, “Network Security: A Decision and Game-theoretic Approach,”
18. Cambridge University Press, 2011.
19. Security and the IoT ecosystem, KPMG International, 2015.
20. Internet of Things: IoT Governance, Privacy and Security Issues” by European Research Cluster.
21. Ollie Whitehouse, “Security of Things: An Implementers' Guide to Cyber-Security for Internet of Things Devices and Beyond”, NCC Group, 2014
22. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/106/106106129/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	1	2										1	2
CO-2	3	2	1	1									1	2
CO-3	3	2	1	1									2	1
CO-4	3	2	2	1									2	1
CO-5	3	2	1										1	1

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		**VI/III**		**Program**		**B.Tech – Internet of Things**
Subject Category	**DLC**	**Subject Code:**	**IO 606**	**Subject Name**		**LabVIEW Programming**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
-	**-**	**-**	**-**	**30**	**10**	**10**	**50**	**0**	**0**	**4**	**2**

w.e.f. July 2024

Prerequisites:

Basic Knowledge of Programming.

Course Objective:

- To impart adequate knowledge on virtual instrumentation for acquisition and analysis of real time application.

UNITs	**Descriptions**	**Hrs.**
I	1. Study of labVIEW and its Environment. I. Front Panel Window, Block diagram and Connector Pane II. Menus and Palettes III. Basic Operations and Configuration Options IV. Date Types 2. Study of Arithmetic Operators and Creating Vis using Basic Arithmetic operation. 3. Study of Logical Operators and Creating Vis using Logical Operation. 4. Study of Comparative Operators and C5rweating Vis using Comparative Operations. 5. Study of Array and Their basic Operations and developing VIS using these arrays. 6. Study of Control Structures using: I. For Loop and While Loop II. Shift Register and Tunnel III. Case and Sequence Structure 7. Study of Data Plotting: I. Waveform Graph II. Waveform Chart III. XY Graph 8. Study of NI ELVIS-II Proto Type Board. I. Instrument Control II. Introduction of Oscilloscope III. Function Generator and Power Supply IV. Digital Multimeter V. Digital Reader and Writer VI. Dynamic System Analyzer 9. Measure the passive components values using NI ELVIS-II proto type board. 10. Data Acquisition using LabVIEW. 11. Analyze the characteristic of active components using NI ELVIS-II proto type-e board. 12. Design a voltage divider circuit on the NI ELVIS-II proto type board. 13. Design and testing the RC Circuit with function generator and oscilloscope using NI ELVIS-II proto type board. **14.** Plot the frequency response of basic 741 Op-Amp circuit using NI	

	ELVIS-II proto type board.	
Total Hours		40

Course Outcomes:

CO 1: To educate about the basic concept of VI.
CO2: To make them understand the programming concepts of VI.
CO 3: To Configure the interface various data acquisition hardware like DAQ, NI ELVIS-II and Sensors.
CO4: To provide an insight to various common instrument interfaces.
CO5: To impart engineering knowledge on various analysis tools of LabVIEW.

Text Book & Reference Books-

1. Jovitha Jerome, Virtual Instrumentation Using LabVIEw, PHI Publication, India 2010.
2. Sanjay Gupta, Virtual Instrumentation Using Labview 2E, McGraw-Hill Education (India) Pvt Limited, India 2010.

List/Links of e-learning resource

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**2**	**1**	**2**										**1**	**2**
CO-2	**3**	**2**	**2**	**1**									**1**	**2**
CO-3	**3**	**2**	**2**	**1**									**2**	**1**
CO-4	**3**	**2**	**2**	**1**									**2**	**1**
CO-5	**2**	**2**	**1**										**1**	**1**

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

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DEPARTMENT OF IT

Semester/Year		VII/IV		Program		B.Tech – Internet of Things
Subject Category	DC	Subject Code:	IO 701	Subject Name		Data Analytics for IoT

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

w.e.f. July 2024

Prerequisites:

7. To understand IoT Analytics and Challenges
8. To Analyze the IoT data to infer the protocol and device characteristics
9. To Explore and visualize data, and techniques to understand data quality

Course Objective:

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.
- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.

UNITs	Descriptions	Hrs.
I	Defining IoT Analytics and Challenges: Introduction to IoT, applications, IoT architectures, introduction to analytics, IoT analytics challenges.	**8**
II	IoT Devices and Networking Protocols: IoT devices, Networking basics, IoT networking connectivity protocols, IoT networking data messaging protocols, Analyzing data to infer protocol and device characteristics.	8
III	IoT Analytics for the Cloud: Introduction to elastic analytics, Decouple key components, Cloud security and analytics, Designing data processing for analytics, Applying big data technology to storage.	8
IV	Exploring IoT Data: Exploring and visualizing data, Techniques to understand data quality, Basic time series analysis, Statistical analysis.	8
V	Data Science for IoT Analytics: Introduction to Machine Learning, Feature engineering with IoT data, Validation methods, Understanding the bias–variance tradeoff, Use cases for deep learning with IoT data.	8
Total Hours		40

Course Outcomes:

CO-1 Understand the fundamentals of IoT Analytics and Challenges
CO-2 Understand and analyze IoT Devices and Networking Protocols
CO-3 Apply IoT Analytics for the Cloud.
CO-4 Understand exploring and visualizing data.
CO-5 Uses of Knowledge Representation Techniques.

Text Book & Reference Books-

1. Minteer, Andrew, Analytics for the Internet of Things (IoT), Packt Publishing Ltd. July 2017, ISBN 9781787120730
2. Kai Hwang, Min Chen, Big-Data Analytics for Cloud, IoT and Cognitive Computing, Wiley.
3. Hwaiyu Geng, Internet of Things and Data Analytics Handbook, Wiley

4. John Soldatos, Building Blocks for IoT Analytics Internet-of-Things Analytics, River Publishers Gerardus Blokdyk.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106102220

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2	1									1	2
CO-2	2	1	1	1	2								1	2
CO-3	2	1	2	1			1						1	1
CO-4	2	1	2	1										2
CO-5	2	1			1								1	

List of Experiments:

1. Implement and analyse linear regression
2. Implement and analyse logistic regression
3. Implement and analyse Decision tree algorithm
4. Implement and analyse Random forest algorithm
5. Implementation of two sample T-test and paired two sample T-test in excel.
6. Implementation of one way and two way ANOVA in excel.
7. Implementation of word count example using MapReduce.
8. Implementation of MapReduce program to count unique number of times a song is played based on user id and track id

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

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DEPARTMENT OF IT

Semester/Year			VII/IV		Program		B.Tech – Internet of Things				
Subject Category	DE		Subject Code:	IO 702 DE – IV (A)	Subject Name		IoT System Architectures				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	0	4

w.e.f. July 2024

Prerequisites:

Knowledge on concepts of IoT applications and IoT architectures, Event driven analysis and security testing IoT systems

Course Objective:

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.
- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.

UNITs	Descriptions	Hrs.
I	The IoT Landscape: What Is IoT? Applications, Architectures, Wireless Networks, Devices, Security and Privacy, Event-Driven Systems. IoT System Architectures: Introduction, Protocols Concepts, IoTOriented Protocols, Databases, Time Bases, Securit	**8**
II	IoT Devices & Event-Driven System Analysis: The IoT Device Design Space, Cost of Ownership and Power Consumption, Cost per Transistor and Chip Size, Duty Cycle and Power Consumption, Platform Design. Event-Driven System Analysis: Introduction, Motivating Example, IoT Network Model, Events, Networks, Devices and Hubs, Single-Hub Networks, Multi-hub Networks, Network Models and Physical Networks, IoT Event Analysis, Event Populations, Stochastic Event Populations, Environmental Interaction Modeling, Event Transport and Migration.	8
III	Industrial Internet of Things: Introduction, Industry 4.0, Industrial Internet of Things (IIoT), IIoT Architecture, Basic Technologies, Applications and Challenges.	8
IV	Security and Safety: Introduction, Systems Security, Network Security, Generic Application Security, Application Process Security and Safety, Reliable-and-Secure-by-Design IoT Applications, Run-Time Monitoring, The ARMET Approach, Privacy and Dependability.	8
V	Security Testing IoT Systems: Introduction, Fuzz Testing for Security, White-Box Fuzzing, Black-Box Fuzzing, Fuzzing Industrial Control Network Systems, Fuzzing Modbus, The Modbus Protocol, Modbus/TCP Fuzzer.	8
Total Hours		40

Course Outcomes:

CO-1 Understand IoT applications and IoT Architectures.
CO-2 Learn about IoT devices and event driven analysis
CO-3 Understand and analyze IIoT.

CO-4 Understand safety and security testing of IoT systems.
CO-5 Understand safety and network systemof IoT systems.

Text Book & Reference Books-

1. Dimitrios Serpanos, Marilyn Wol, Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies, ISBN 978-3-319-69714-7.
2. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015.
3. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit 2).
4. . "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc22_cs53/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2	1									1	2
CO-2	2	1	1	1	2								1	2
CO-3	2	1	2	1			1						1	1
CO-4	2	1	2	1										2
CO-5	2	1			1								1	

List of Experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

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DEPARTMENT OF IT

Semester/Year		VII/IV		Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:		IO 702 DE – IV (B)	Subject Name	Embedded Systems Design

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	0	4

w.e.f. July 2024

Prerequisites:

Knowledge on concepts of IoT applications and IoT architectures, Event driven analysis and security testing IoT systems

Course Objective:

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.
- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.

UNITs	Descriptions	Hrs.
I	The IoT Landscape: What Is IoT? Applications, Architectures, Wireless Networks, Devices, Security and Privacy, Event-Driven Systems. IoT System Architectures: Introduction, Protocols Concepts, IoTOriented Protocols, Databases, Time Bases, Securit	**8**
II	IoT Devices & Event-Driven System Analysis: The IoT Device Design Space, Cost of Ownership and Power Consumption, Cost per Transistor and Chip Size, Duty Cycle and Power Consumption, Platform Design. Event-Driven System Analysis: Introduction, Motivating Example, IoT Network Model, Events, Networks, Devices and Hubs, Single-Hub Networks, Multi-hub Networks, Network Models and Physical Networks, IoT Event Analysis, Event Populations, Stochastic Event Populations, Environmental Interaction Modeling, Event Transport and Migration.	8
III	Industrial Internet of Things: Introduction, Industry 4.0, Industrial Internet of Things (IIoT), IIoT Architecture, Basic Technologies, Applications and Challenges.	8
IV	Security and Safety: Introduction, Systems Security, Network Security, Generic Application Security, Application Process Security and Safety, Reliable-and-Secure-by-Design IoT Applications, Run-Time Monitoring, The ARMET Approach, Privacy and Dependability.	8
V	Security Testing IoT Systems: Introduction, Fuzz Testing for Security, White-Box Fuzzing, Black-Box Fuzzing, Fuzzing Industrial Control Network Systems, Fuzzing Modbus, The Modbus Protocol, Modbus/TCP Fuzzer.	8
Total Hours		40

Course Outcomes:

CO-1 Understand IoT applications and IoT Architectures.
CO-2 Learn about IoT devices and event driven analysis
CO-3 Understand and analyze IIoT.
CO-4 Understand safety and security testing of IoT systems.

CO-5 Understand safety and network systemof IoT systems.

Text Book & Reference Books-

1. Dimitrios Serpanos, Marilyn Wol, Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies, ISBN 978-3-319-69714-7.
2. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015.
3. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit 2).
4. . "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc22_cs53/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2	1									1	2
CO-2	2	1	1	1	2								1	2
CO-3	2	1	2	1			1						1	1
CO-4	2	1	2	1										2
CO-5	2	1			1								1	

List of Experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

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DEPARTMENT OF IT

Semester/Year		VII/IV	Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:	IO 702 DE – IV (C)	Subject Name	Real time Systems

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	0	4

w.e.f. July 2024

Prerequisites:

Computer Organization and Operating System

Course Objective:

- To provide broad understanding of the requirements of Real Time Operating Systems.
- To make the student understand, applications of these Real Time features using case studies.

UNITs	Descriptions	Hrs.
I	Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).	**8**
II	Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use	8
III	Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem	8
IV	Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.	8
V	Case Studies of RTOS: RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, and Tiny OS.	8
Total Hours		40

Course Outcomes:

CO-1 Be able to explain real-time concepts such as pre-emptive multitasking, task priorities, priority inversions, mutual exclusion, context switching, and synchronization, interrupt latency and response time, and semaphores.
CO-2 Able describe how a real-time operating system kernel is implemented.
CO-3 Explain how the real-time operating system implements time management.
CO-4 Discuss how tasks can communicate using semaphores, mailboxes, and queues.
CO-5 Be able to implement a real-time system on an embedded processor.

Text Book & Reference Books-

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011.
2. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH
3. Advanced UNIX Programming, Richard Stevens.
4. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh.

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc22_cs53/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2	1									1	2
CO-2	2	1	1	1	2								1	2
CO-3	2	1	2	1			1						1	1
CO-4	2	1	2	1										2
CO-5	2	1			1								1	

List of Experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

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DEPARTMENT OF IT

Semester/Year		VII/IV		Program		B.Tech – Internet of Things
Subject Category	DE	Subject Code:		IO 703 DE – V (A)	Subject Name	Industrial IoT

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	0	4

w.e.f. July 2024

Prerequisites:

Computer Organization and Operating System

Course Objective:

- To provide students with a good depth of knowledge of Designing Industrial IOT Systems for various applications.

UNITs	Descriptions	Hrs.
I	Introduction to Industrial Internet and Use-Cases: Industrial Internet- Key IIoT TechnologiesInnovation and the IIoT -Key Opportunities and Benefits -The Digital and Human Workforce - Logistics and the Industrial Internet- IOT Innovations in Retail.	**8**
II	The Technical and Business Innovators of The Industrial Internet: Cyber Physical Systems (CPS) – IP Mobility – Network Virtualization - SDN (Software Defined Networks)- The Cloud and Fog – Role of Big Data in IIOT - Role of Machine learning and AI in IIOT	8
III	IIOT Reference Architecture: Industrial Internet Architecture Framework (IIAF) -Industrial Internet Viewpoints -. Architectural Topology: The Three-Tier Topology- Key System Characteristics- Data Management- Advanced data analytics.	8
IV	Protocols for Industrial Internet Systems: Legacy Industrial Protocols - Modern Communication Protocols-Proximity Network Communication Protocols-Wireless Communication TechnologiesGateways: industrial gateways - CoAP (Constrained Application Protocol)	8
V	Middleware Software Patterns and IIOT Platforms: Publish/Subscribe Pattern: MQTT, XMPP, AMQP, DDS- Middleware Architecture- SigFox- LoRaWAN Augmented reality- Real-World Smart Factories Application of IIOT: Case study: Health monitoring, Iot smart city, Smart irrigation, Robot surveillance.	8
Total Hours		40

Course Outcomes:

CO-1 Identify the Key opportunities and benefits in Industrial IoT.
CO-2 Able describe how a real-time operating system kernel is implemented.
CO-3 Apply virtual network to demonstrate the use of Cloud in Industrial IoT.
CO-4 Summarize Legacy Industrial and Modern Communication Protocols.
CO-5 Describe Middleware Architecture, LoRaWAN- and Augmented reality.

Text Book & Reference Books-

1. Gilchrist, Alasdair, "Industry 4.0 The Industrial Internet of Things", Apress, 2017.
2. Zaigham Mahmood, "The Internet of Things in the Industrial Sector: Security and Device connectivity, smart environments and Industry 4.0 (Springer), 2019.
3. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat "Industrial Internet of Things: Cyber manufacturing Systems" (Springer), 2017.

4. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)
5. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc20_cs69/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2	1									1	2
CO-2	2	1	1	1	2								1	2
CO-3	2	1	2	1			1						1	1
CO-4	2	1	2	1										2
CO-5	2	1			1								1	

List of Experiments:

5.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year			VII/IV		Program		B.Tech – Internet of Things				
Subject Category	DE		Subject Code:	IO 703 DE – V (B)	Subject Name		AR and VR				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	0	4

w.e.f. July 2024

Prerequisites:

Computer Organization and Operating System

Course Objective:

- The objective of this course is to provide a foundation to the fast-growing field of AR and make the students aware of the various AR devices.
- To give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

UNITs	Descriptions	Hrs.
I	Introduction to Augmented Reality: What Is Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality Augmented Reality Concepts- How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.	**8**
II	AR Devices & Components: AR Components – Scene Generator, Tracking system, monitoring system, display, Game scene. AR Devices – Optical See-Through HMD, Virtual retinal systems, Monitor bases systems, Projection displays, Video see-through systems.	8
III	Introduction to Virtual Reality: Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.	8
IV	Representing the Virtual World: Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR, Case Study: GHOST (General Haptics Open Software Toolkit) software development toolkit.	8
V	Visual Perception & Rendering: Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information, Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates.	8
Total Hours		40

Course Outcomes:

CO-1 Describe how AR systems work and list the applications of AR
CO-2 Understand and analyze the hardware requirement of AR.
CO-3 Describe how VR systems work and list the applications of VR.
CO-4 Understand the design and implementation of the hardware that enables VR systems to be built
CO-5 Describe Augmented reality.

Text Book & Reference Books-

1. Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978-1484236178
2. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016), ISBN-10: 9332578494
3. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016.
4. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002.
5. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig,William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.

List/Links of e-learning resource

- https://nptel.ac.in/courses/121106013

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2	1									1	2
CO-2	2	1	1	1	2								1	2
CO-3	2	1	2	1			1						1	1
CO-4	2	1	2	1										2
CO-5	2	1			1								1	

List of Experiments:

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DEPARTMENT OF IT

Semester/Year			VII/IV		Program		B.Tech – Internet of Things				
Subject Category	DE		Subject Code:	IO 703 DE – V (C)	Subject Name		Edge Computing				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	0	4

w.e.f. July 2024

Prerequisites:

Course Objective:

- Knowledge on how edge computing and Internet of Things (IoT) can be used as a way to meet application demands in intelligent IoT systems.

UNITs	Descriptions	Hrs.
I	IoT and Edge Computing Definition and Use Cases: Introduction to Edge Computing Scenario's and Use cases - Edge computing purpose and definition, Edge computing use cases, Edge computing hardware architectures, Edge platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M.	**8**
II	IoT Architecture and Core IoT Modules-A connected ecosystem,IoT versus machine-to-machine versus, SCADA, The value of a network and Metcalfe's and Beckstrom's laws, IoT and edge architecture, Role of an architect, Understanding Implementations with examples-Example use case and deployment, Case study – Telemedicine palliative care, Requirements, Implementation, Use case retrospective.	8
III	RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout and Pinouts, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi, Connecting Raspberry Pi via SSH, Remote access tools, Interfacing DHT Sensor with Pi, Pi as Webserver, Pi Camera, Image & Video Processing using Pi.	8
IV	Implementation of Microcomputer RaspberryPi and device Interfacing, Edge to Cloud ProtocolsProtocols, MQTT, MQTT publish-subscribe, MQTT architecture details, MQTT state transitions, MQTT packet structure, MQTT data types, MQTT communication formats, MQTT 3.1.1 working example.	8
V	Edge computing with RaspberryPi, Industrial and Commercial IoT and Edge, Work with RaspberryPi components and evaluate its performance..	8
Total Hours		40

Course Outcomes:

CO-1 Understand use of the IoT architecture with its entities and protocols, from the IoT devices.
CO-2 Security and privacy issues related to the area of edge computing and IoT.
CO-3 Understand the RaspberryPi architecture and its components.
CO-4 Work with RaspberryPi components and evaluate its performance.

Text Book & Reference Books-

1. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020, ISBN: 9781839214806.
2. Raspberry Pi Cookbook, 3rd Edition, by Simon Monk, Publisher: O'Reilly Media, Inc., 2019,

ISBN: 978149204322.
3. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama, wiley publication, 2019, ISBN: 9781119524984.
4. David Jensen, "Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE.

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc24_cs66/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2	1									1	2
CO-2	2	1	1	1	2								1	2
CO-3	2	1	2	1			1						1	1
CO-4	2	1	2	1										2
CO-5	2	1			1								1	

List of Experiments:

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Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

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(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year			VII/IV		Program		B.Tech – Internet of Things				
Subject Category	PROJ		Subject Code:	IO 704	Subject Name		Major Project Prelim				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
				60	40	-	100	0	0	8	4

w.e.f. July 2024

Prerequisites:

Course Objective:

- Knowledge on how edge computing and Internet of Things (IoT) can be used as a way to meet application demands in intelligent IoT systems.

UNITs	Descriptions	Hrs.
Procedure	a) Each defined project needs to be from Industry/Research organization/Govt.organization/socio-technical issues. b) Project identification should be based on Analysis carried out by the students after completion of B.E Semester 6th Examination but before starting of the 7th Semester. c) Problem definition for the project needs to be submitted by every student in the first week of the 7th Semester to his/her college. d) Each definition will be evaluated based on merit in the beginning of the 7th semester itself by the College. **Facilitation:** You may contact your Major Project In charge co-ordinator/Faculty /Department Head for skilfulAnalysis .	**40**
Guidliness:	1. The project work will be in-house industry project, where student need to implement project related to any domain of industry like education, legal, manufacturing, design, pharmaceutical, Ecommerce, etc. 2. Students are required to get approval of project definition from the department. 3. After approval of project definition students are required to report their project work weekly to respective internal guide. 4. Maximum 4 students can allow working in particular project group. 5. The students are required to identify their project within two weeks of the commencement of the classes and they are required to follow all the rules and instructions issued by department. 6. Each student or student group would work under the guidance of the Faculty from the College. In case any problem/other issue arises for the smooth progress of Inter Departmental project work discovery/Practical Training, it should be immediately brought to the notice of the major project in charge coordinators/Faculty. 7. The students are required to submit Project synopsis Pre-report to their Head of the Department with the remarks of guide in their College during Eighth week of the semester	
Total Hours		40

Course Outcomes:

On successful completion of theproject student should be able to:

CO1: Identify the problem domain correctly and to represent problem using mathematical structures and logics.

CO2: Analyze possible solution strategies and investigate problem domain and design feasible solutions for it.

CO3: Make use of cutting edge tools and technologies to derive solutions for the problems and carried a detailed studied about the feasibility and societal impact of solutions

CO4: Acknowledges the previous work and support required in the solution. Justify the role of individual in project work. Demonstrate leadership skills in team work.

CO5: Present and communicate the importance of solutions of problem domain. Conduct and accomplish all the subtasks for project completion in time and cost effective manner and conclude the project work with possible scopes.

Text Book & Reference Books-

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc24_cs66/preview

Modes of Evaluation and Rubric

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CO-1	3	3	2										2	2
CO-2	2			2		1	2			1			2	
CO-3			3		3	2	3						2	2
CO-4									3				1	
CO-5					2					3	3	3		2

List of Experiments:

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