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|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Programme Name/s | : Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Telecommunication Engg./ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Textile Technology/ Electronics & Computer Engg./ Textile Manufactures |
| Programme Code | : AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ FC/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ MU/ PG/ PN/ PO/ TC/ TE/ TX |
| Semester | : First |
| Course Title | : BASIC MATHEMATICS |
| Course Code | : 311302 |

I. RATIONALE

Basic Mathematics plays a crucial role in diploma programmes as it fosters the development of critical thinking skills, enhances quantitative literacy, prepares students for higher education, promotes problem-solving abilities, cultivates logical and abstract thinking and fosters mathematical literacy. By engaging with Mathematics, students acquire logical reasoning, problem-solving techniques and analytical thinking, which are valuable for lifelong learning and professional growth. Calculus is a branch of Mathematics that calculates how matter, particles and heavenly bodies actually move. Derivatives are useful to find maxima and minima of the function, velocity and acceleration are also useful for many engineering optimization problems. Statistics can be defined as a type of mathematical analysis which involves the method of collecting and analyzing data and then summing up the data into a numerical form for a given set of factual data or real-world observations. It equips individuals with the ability to interpret numerical information, make informed decisions and navigate real-world situations. Moreover, Mathematics provides a foundation for further studies in various disciplines and prepares students to tackle complex challenges. By exploring abstract concepts and logical structures, students develop their ability to reason, make connections, and approach problems with clarity and precision. Furthermore, studying Mathematics helps students appreciate the historical and cultural significance of Mathematics and its applications in diverse fields, thereby fostering mathematical literacy and a deeper understanding of the world. Hence the course provides the insight to analyze engineering problems scientifically using logarithms, matrices, trigonometry, straight line, differential calculus and statistics. By incorporating these topics, students comprehend to approach engineering problems from a mathematical perspective, enabling them to devise efficient and effective solutions and this leads to preparing

Diploma graduates well-rounded, adaptable and capable of making significant contributions to the branch-specific problems.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Apply the concept of Mathematics to solve industry-based technology problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Apply the concepts of algebra to solve engineering (discipline) related problems.
- CO2 - Utilize trigonometry to solve branch specific engineering problems.
- CO3 - Solve area specific engineering problems under given conditions of straight lines.
- CO4 - Apply differential calculus to solve discipline specific problems.
- CO5 - Use techniques and methods of statistics to crack discipline specific problems.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

| Course Code | Course Title | Abbr | Course Category/s | Learning Scheme | | | | | | Credits | Assessment Scheme | | | | | | | | | | |
|-------------|-------------------|------|-------------------|--------------------------|----|----|-----|-----|----------------|---------|-------------------|-------|-------|------------------|-----|-------------|-----|-------------|----|----|-----|
| | | | | Actual Contact Hrs./Week | | | SLH | NLH | Paper Duration | | Theory | | | Based on LL & TL | | Based on SL | | Total Marks | | | |
| | | | | CL | TL | LL | | | | | FA-TH | SA-TH | Total | Practical | | SLA | | | | | |
| | | | | | | | Max | Min | | | | | | Max | Min | Max | Min | | | | |
| 311302 | BASIC MATHEMATICS | BMS | AEC | 4 | 2 | - | 2 | 8 | 4 | 3 | 30 | 70 | 100 | 40 | - | - | - | - | 25 | 10 | 125 |

Total IKS Hrs for Sem. : 6 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 1 | <p>TLO 1.1 Solve the given simple problem based on laws of logarithm.</p> <p>TLO 1.2 Solve given system of linear equations using matrix inversion method.</p> <p>TLO 1.3 Obtain the proper and improper partial fraction for the given simple rational function.</p> <p>TLO 1.4 Solve simultaneous equations by using concept given in Ancient Indian Mathematics.</p> | <p>Unit - I Algebra</p> <p>1.1 Logarithm: Concept and laws of logarithm.</p> <p>1.2 Matrices: Matrices, algebra of matrices, transpose, value of determinant of matrix of order 3×3, adjoint and inverse of matrices.</p> <p>1.3 Matrices: Solution of simultaneous equations by matrix inversion method.</p> <p>1.4 Partial Fractions: Types of partial fraction based on nature of factors and related Problems.</p> <p>1.5 Algebra in Indian Knowledge System: Solution of simultaneous equations (Indian Mathematics)..</p> | <p>Improved Lecture Tutorial Assignment Demonstration Simulation</p> |
| 2 | <p>TLO 2.1 Apply the concept of Compound angle, allied angle and multiple angles to solve the given simple engineering problem(s).</p> <p>TLO 2.2 Apply the concept of Sub-multiple angle to solve the given simple engineering related problem(s).</p> <p>TLO 2.3 Apply concept of factorization and de-factorization formulae to solve the given simple engineering problem(s).</p> <p>TLO 2.4 Investigate given simple problems by utilizing inverse trigonometric ratios.</p> <p>TLO 2.5 Use concept given in Ancient Indian Mathematics for trigonometry to solve given problems.</p> | <p>Unit - II Trigonometry</p> <p>2.1 Trigonometric ratios of allied angles, compound angles, multiple angles ($2A$, $3A$), submultiples angles. (without proof)</p> <p>2.2 Factorization and De factorization formulae. (without proof).</p> <p>2.3 Inverse Trigonometric Ratios and related problems.</p> <p>2.4 Principle values and relation between trigonometric and inverse trigonometric ratios.</p> <p>2.5 Trigonometry in Indian Knowledge System: The Evolution of Sine Function in India.</p> <p>2.6 Indian Trigonometry: Basic Indian Trigonometry- Introduction and Terminology (From Ancient Beginnings to Nilakantha).</p> <p>2.7 Trigonometry in Indian Knowledge System: Pythagorean triples in Sulabasutras.</p> | <p>Improved Lecture Tutorial Assignment Demonstration Simulation Flipped Classroom approach</p> |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 3 | <p>TLO 3.1 Calculate angle between given two straight lines.</p> <p>TLO 3.2 Formulate equation of straight lines related to given engineering problems.</p> <p>TLO 3.3 Identify perpendicular distance from the given point to the line.</p> <p>TLO 3.4 Calculate perpendicular distance between the given two parallel lines.</p> <p>TLO 3.5 Use geometry given in Sulabasutras to solve the given problems.</p> | <p>Unit - III Straight Line</p> <p>3.1 Straight line and slope of straight line: Angle between two lines, Condition of parallel and perpendicular lines.</p> <p>3.2 Various forms of straight lines: Slope point form, two-point form, Double intercept form, General form.</p> <p>3.3 Perpendicular distance from a point on the line.</p> <p>3.4 Perpendicular distance between two parallel lines.</p> <p>3.5 Geometry in Sulabasutras in Indian Knowledge System (construction of square, circling the square). (Indian Mathematics).</p> | <p>Improved Lecture Tutorial Assignment Demonstration Simulation</p> |
| 4 | <p>TLO 4.1 Solve the given simple problems based on functions.</p> <p>TLO 4.2 Solve the given simple problems based on rules of differentiation.</p> <p>TLO 4.3 Obtain the derivatives of composite, implicit, parametric, inverse, logarithmic, exponential functions.</p> <p>TLO 4.4 Apply the concept of differentiation to find given equation of tangent and normal.</p> <p>TLO 4.5 Apply the concept of differentiation to calculate maxima, minima and radius of curvature for given function.</p> <p>TLO 4.6 Familiar with concept of calculus given in Indian Mathematics.</p> | <p>Unit - IV Differential Calculus</p> <p>4.1 Functions and Limits: Concept of function and simple examples.</p> <p>4.2 Functions and Limits: Concept of limits without examples.</p> <p>4.3 Derivatives: Rules of derivatives such as sum, Product, Quotient of functions.</p> <p>4.4 Derivatives: Derivative of composite functions (chain Rule), implicit and parametric functions.</p> <p>4.5 Derivatives: Derivatives of inverse, logarithmic and exponential functions.</p> <p>4.6 Applications of derivative: Second order derivative without examples, Equation of tangent and normal, Maxima and minima, Radius of curvature.</p> <p>4.7 Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers.(Indian Mathematics).</p> | <p>Improved Lecture Tutorial Assignment Demonstration Simulation</p> |
| 5 | <p>TLO 5.1 Obtain the range and coefficient of range of the given grouped and ungrouped data.</p> <p>TLO 5.2 Calculate mean and standard deviation of ungrouped and grouped data related to the given simple engineering problem(s).</p> <p>TLO 5.3 Determine the variance and coefficient of variance of given grouped and ungrouped data.</p> <p>TLO 5.4 Justify the consistency of given simple sets of data.</p> | <p>Unit - V Statistics</p> <p>5.1 Range, coefficient of range of discrete and grouped data.</p> <p>5.2 Mean deviation and standard deviation from mean of grouped and ungrouped data.</p> <p>5.3 Variance and coefficient of variance.</p> <p>5.4 Comparison of two sets of observation.</p> | <p>Improved Lecture Tutorial Assignment Demonstration Simulation Flipped Classroom approach</p> |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|----------------------------------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|
| LLO 1.1 Solve simple problems of Logarithms based on given applications. | 1 | Solve simple problems of Logarithms based on given applications. | 2 | CO1 |
| LLO 2.1 Solve elementary problems on Algebra of matrices for branch specific engineering related applications. | 2 | Solve elementary problems on Algebra of matrices for branch specific engineering related applications. | 2 | CO1 |
| LLO 3.1 Apply the concept of matrix to solve engineering problems. | 3 | Solve solution of Simultaneous Equation using inversion method. | 2 | CO1 |
| LLO 4.1 Apply the concept of matrix to solve engineering problems. | 4 | Apply Matrix Inversion method to determine currents through various branches of given electrical networks. | 2 | CO1 |
| LLO 5.1 Apply the concept of matrix to solve engineering problems. | 5 | Determine inverse of a non-singular matrix by using open source software. | 2 | CO1 |
| LLO 6.1 Apply the concept of partial fraction to solve engineering problems. | 6 | Resolve into partial fraction using linear non-repeated, repeated, and irreducible quadratic factors. | 2 | CO1 |
| LLO 7.1 Solve problems on Compound, Allied, multiple and sub multiple angles for related shapes. | 7 | Solve problems on Compound, Allied, multiple and sub multiple angles for related shapes. | 2 | CO2 |
| LLO 8.1 Utilize the concept of trigonometry to solve engineering problems. | 8 | Practice problems on factorization and de factorization. | 2 | CO2 |
| LLO 9.1 Utilize the concept of trigonometry to solve engineering problems. | 9 | Solve problems on inverse trigonometric ratios based on applications. | 2 | CO2 |
| LLO 10.1 Solve branch specific engineering problems under given conditions of straight lines. | 10 | Practice problems on equation of straight lines using different forms. | 2 | CO3 |
| LLO 11.1 Solve branch specific engineering problems under given conditions of straight lines. | 11 | Solve problems on perpendicular distance, distance between two parallel lines and angle between two lines. | 2 | CO3 |
| LLO 12.1 Solve branch specific engineering problems under given conditions of straight lines. | 12 | Use given form of straight line to calculate the speed, distance and time of moving object. | 2 | CO3 |
| LLO 13.1 Apply the concept of derivative to solve engineering problems. | 13 | Solve problems to find derivatives of implicit function and parametric function. | 2 | CO4 |
| LLO 14.1 Apply the concept of derivative to solve engineering problems. | 14 | Solve problems to find derivative of logarithmic and exponential functions for engineering applications. | 2 | CO4 |
| LLO 15.1 Apply the concept of equation of tangent and normal to solve engineering problems. | 15 | Solve problems based on finding equation of tangent and normal for engineering applications. | 2 | CO4 |
| LLO 16.1 Apply the concept of maxima, minima and radius of curvature to solve engineering problems. | 16 | Solve problems based on finding maxima, minima of function and radius of curvature at a given point for engineering applications. | 2 | CO4 |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|-----------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------------------------|----------------|--------------|
| LLO 17.1 Apply the concept of equation of tangent and normal to solve engineering problems. | 17 | Use the concept of tangent and normal to solve the given problem of Engineering Drawing. | 2 | CO4 |
| LLO 18.1 Apply the concept of Maxima and Minima to solve engineering problems. | 18 | Use the concept of Maxima and Minima to obtain optimum value for given engineering problem. | 2 | CO4 |
| LLO 19.1 Apply the concept of radius of curvature to solve engineering problems. | 19 | Use the concept of radius of curvature to solve given branch specific engineering problem. | 2 | CO4 |
| LLO 20.1 Utilize the concept of derivative to solve engineering problems. | 20 | Use the concept of derivative to find the slope of a bending curve for given engineering problem. | 2 | CO4 |
| LLO 21.1 Use concept of range and mean deviation to crack branch specific problems. | 21 | Solve problems on finding range, coefficient of range and mean deviation for given applications. | 2 | CO5 |
| LLO 22.1 Use concept of standard deviation and coefficient of variance to crack branch specific problems. | 22 | Solve problems on standard deviation, coefficient of variation and comparison of two sets. | 2 | CO5 |
| LLO 23.1 Use concept of standard deviation to crack branch specific problems. | 23 | Calculate the Standard Deviation for Concrete with the given data for given engineering applications. | 2 | CO5 |

Note : out of above suggestive LLOs -

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Create a function that takes a matrix as input and returns its inverse matrix if it exists. Also Implement a program that finds the inverse of a square matrix.
- Collect the Data of Marks obtained by your class in mid sem test. Compute the variance and coefficient of variance of the data and interpret the result using the free open source software ORANGE.
- Prepare models using matrices to solve simple problems based on cryptography.
- Collect Model on quality control analysis, energy efficiency assessment, environmental monitoring, and process optimization, for these models, analyze data and calculate variance and standard deviation, make a presentation including short videos.
- Prepare the model using the concept of tangent and normal bending of roads in case of sliding of a vehicle, express geometrically the same through any open source software.
- Prepare the model using the concept of radius of curvature to bending of railway tracks, express geometrically the same through any open source software.
- A window in the form of a rectangle surmounted by a semicircular opening. The total perimeter of the window to admit maximum light through the whole opening, prepare a model using concept of Maxima and Minima for the

above problem and verify the result.

- Visualize trigonometric waveforms and create animations utilizing sine or cosine functions and make a presentation.
- Develop a program of trigonometric function calculator that computes sine, cosine, and tangent values.
- Collect applications of the radius of curvature on lens design and optics, mirror and reflective surface properties, road and highway design, structural behavior, roller coaster track design, and composite material manufacturing and make a video of 5-minutes duration.
- Prepare models using trigonometry based on at least 10 engineering problems.
- Apply trigonometric principles to calculate angles, distances, forces, and dimensions relevant to the chosen area and make a poster presentation.
- Prepare charts using determinant to find area of regular shapes.
- Design a puzzle based on matrices. Create a grid of numbers and operations.
- Develop a math game based on operations of matrices.
- Use matrices as a tool for music composition. Assign different musical elements (e.g., notes, chords, rhythms) to matrix elements, and experiment with combining and transforming the matrices to create unique musical compositions. You can use musical notation open software or even traditional instruments to bring your compositions to life.
- Attempt any 10-12 Micro Projects, out of the given list.

Assignment

- Collect examples based on real world applications of logarithm and prepare a pdf file.
- Solve the simultaneous system of equation in two variables by Matrix Inversion Method. Write down a Mathematical programming using any open source software to verify the result.
- Collect an examples on coding theory using applications of matrices and prepare a pdf file.
- Represent the Graph of Trigonometric function, Logarithmic function on Geogebra and interpret the nature of graph and Make a pdf file.
- Measure height of trees in surrounding locations using trigonometry and prepare presentation.
- Find the derivative of $y = x^{\sin x}$ and visualize the graph of the function and its derivative using any open source software geometrically.
- Find height of room or distance between two pillars by using concept of straight line.
- Collect at least 10 examples based on real world applications of standard deviation/variance.
- Collect at least 10 examples based on real world uses of applications of derivative.
- Attempt any 5-7 Assignment, out of the given list.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

| Sr.No | Equipment Name with Broad Specifications | Relevant LLO Number |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 1 | Open-source software like SageMaths, MATHS3D, GeoGebra, Graph, DPLLOT, and Graphing Calculator (Graph Eq 2.13), ORANGE can be used for Algebra, Calculus, Trigonometry, and Statistics respectively. | All |

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

| Sr.No | Unit | Unit Title | Aligned COs | Learning Hours | R-Level | U-Level | A-Level | Total Marks |
|-------|------|--------------|-------------|----------------|---------|---------|---------|-------------|
| 1 | I | Algebra | CO1 | 12 | 2 | 6 | 6 | 14 |
| 2 | II | Trigonometry | CO2 | 16 | 2 | 6 | 6 | 14 |

| Sr.No | Unit | Unit Title | Aligned COs | Learning Hours | R-Level | U-Level | A-Level | Total Marks |
|--------------------|------|-----------------------|-------------|----------------|-----------|-----------|-----------|-------------|
| 3 | III | Straight Line | CO3 | 6 | 2 | 2 | 4 | 8 |
| 4 | IV | Differential Calculus | CO4 | 16 | 2 | 8 | 10 | 20 |
| 5 | V | Statistics | CO5 | 10 | 2 | 6 | 6 | 14 |
| Grand Total | | | | 60 | 10 | 28 | 32 | 70 |

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Tests
- Rubrics for COs Assignment
- Midterm Exam
- Self-learning
- Term Work
- Seminar/Presentation

Summative Assessment (Assessment of Learning)

- End Term Exam
- Micro-project
- Tutorial Performance

XI. SUGGESTED COS - POS MATRIX FORM

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | | | Programme Specific Outcomes* (PSOs) | | |
|-----------------------|----------------------------------------------|-----------------------|---------------------------------------|------------------------|------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------------------|-------|-------|
| | PO-1 Basic and Discipline Specific Knowledge | PO-2 Problem Analysis | PO-3 Design/ Development of Solutions | PO-4 Engineering Tools | PO-5 Engineering Practices for Society, Sustainability and Environment | PO-6 Project Management | PO-7 Life Long Learning | PSO-1 | PSO-2 | PSO-3 |
| CO1 | 3 | 1 | - | 1 | - | 1 | 1 | | | |
| CO2 | 3 | 1 | - | - | 1 | 1 | 1 | | | |
| CO3 | 3 | - | - | - | - | - | - | | | |
| CO4 | 3 | 1 | 1 | 1 | - | 1 | - | | | |
| CO5 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | | | |

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

| Sr.No | Author | Title | Publisher with ISBN Number |
|-------|--------|-------|----------------------------|
|-------|--------|-------|----------------------------|

| Sr.No | Author | Title | Publisher with ISBN Number |
|-------|-------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| 1 | Grewal B. S. | Higher Engineering Mathematics | Khanna publication New Delhi , 2013 ISBN: 8174091955 |
| 2 | Dutta. D | A text book of Engineering Mathematics | New age publication New Delhi, 2006 ISBN: 978-81-224-1689-3 |
| 3 | Kreyszig, Ervin | Advance Engineering Mathematics | Wiley publication New Delhi 2016 ISBN: 978-81-265-5423-2 |
| 4 | Das H.K. | Advance Engineering Mathematics | S Chand publication New Delhi 2008 ISBN: 9788121903455 |
| 5 | Marvin L. Bittinger David J. Ellenbogen Scott A. Surgent | Calculus and Its Applications | Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1 |
| 6 | C. S. Seshadri | Studies in the History of Indian Mathematics | Hindustan Book Agency, New Delhi 110016. ISBN 978-93-80250-06-9 |
| 7 | George Gheverghese Joseph | Indian Mathematics Engaging with the World from Ancient to Modern Times | World Scientific Publishing Europe Ltd. 57 ISBN 978-17-86340-61-0 |
| 8 | Deepak Singh | Mathematics-I | Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-42-4 |
| 9 | Garima Singh | Mathematics-II | Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-52-3 |
| 10 | Gareth James, Daniela Witten, Trevor Hastie Robert and Tibshirani | An Introduction to Statistical Learning with Applications in R | Springer New York Heidelberg Dordrecht London ISBN 978-1-4614-7137-0 ISBN 978-1-4614-7138-7 (eBook) |
| 11 | Gunakar Muley | Sansar Ke Mahan Ganitagya | First Edition, Rajkamal Prakashan, ISBN- 10. 8126703571, ISBN-13. 978- 8126703579. |
| 12 | T.S. Bhanumurthy | A Modern introduction to Ancient Indian Mathematics | New Age International Private Limited, 1 January 2008 ISBN- 10. 812242600X, ISBN- 13. 978-8122426007 |
| 13 | M.P. Trivedi and P.Y. Trivedi | Consider Dimension and Replace Pi | Notion Press; 1st edition (2018), ISBN- 978-1644291795 |

XIII . LEARNING WEBSITES & PORTALS

| Sr.No | Link / Portal | Description |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 1 | http://nptel.ac.in/courses/106102064/1 | Online Learning Initiatives by IITs and IISc |
| 2 | www.scilab.org/ -SCI Lab | Signal processing, statistical analysis, image enhancement. |
| 3 | www.mathworks.com/product/matlab/ -MATLAB | Applications of concepts of Mathematics to coding. |
| 4 | Spreadsheet Applications | Use of Microsoft Excel, Apple Numbers, Google Sheets. |
| 5 | https://ocw.mit.edu/ | MIT Course ware |
| 6 | https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig | Concept of Mathematics through video lectures and notes |
| 7 | http://ocw.abu.edu.ng/courses/mathematics/ | List of Mathematical Courses. |

| Sr.No | Link / Portal | Description |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| 8 | https://libguides.furman.edu/oer/subject/mathematics | Open Education Resources (OER) in Mathematics. |
| 9 | https://phet.colorado.edu/en/simulations/filter?subjects=math&type=html,prototype | Phet Simulation for Mathematics. |
| 10 | https://libguides.cmich.edu/OER/mathematics | Mathematics with OER. |

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| Programme Name/s | : Automation and Robotics/ Digital Electronics/ Electronics & Tele-communication Engg./ Electronics & Communication Engg./ Electronics Engineering/ Instrumentation & Control/ Industrial Electronics/ Instrumentation/ Medical Electronics/ Electronics & Computer Engg. |
| Programme Code | : AO/ DE/ EJ/ ET/ EX/ IC/ IE/ IS/ MU/ TE |
| Semester | : First |
| Course Title | : ENGINEERING WORKSHOP PRACTICE (ELECTRONICS GROUP) |
| Course Code | : 311007 |

I. RATIONALE

Engineering diploma holders specializing in electronics and allied disciplines are expected to handle various mechanical, electrical and electronics tools in the workshop in any industry in which they are employed. This course provides simulated industrial environment and enable students to perform a variety of operations in various shops using relevant mechanical, electrical and electronic materials as well as use appropriate hand tools, equipment, tools and machinery. Through this course student will develop practical skills in sheet metal work, fitting, soldering, de-soldering, assembly, testing etc. of electronic components and circuits, that will also be very useful for projects and other courses that he or she will undertake during the diploma programme as well as in the world of work.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry /employer expected outcome through various teaching learning experiences: Build simple electronic circuits on PCB with metal enclosure.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Use firefighting equipment and other safety related accessories.
- CO2 - Use fitting and sheet metal tools in the workshop.
- CO3 - Test active and passive electronic components.
- CO4 - Perform soldering and de-soldering using soldering tools.
- CO5 - Build simple jobs in the electronic workshop.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

| Course Code | Course Title | Abbr | Course Category/s | Learning Scheme | | | | | | Credits | Assessment Scheme | | | | | | | | | | Total Marks |
|-------------|----------------------------------------------------|------|-------------------|--------------------------|----|----|-----|-----|----------------|---------|-------------------|-------|-------|------------------|-----------|-----|-----|-------------|---|-----|-------------|
| | | | | Actual Contact Hrs./Week | | | SLH | NLH | Paper Duration | | Theory | | | Based on LL & TL | | | | Based on SL | | | |
| | | | | CL | TL | LL | | | | | FA-TH | SA-TH | Total | | Practical | | SLA | | | | |
| | | | | | | | | | | | | | Max | Min | Max | Min | Max | Min | | | |
| 311007 | ENGINEERING WORKSHOP PRACTICE (ELECTRONICS GROUP) | EWP | SEC | - | - | 4 | - | 4 | 2 | - | - | - | - | 50 | 20 | 50@ | 20 | - | - | 100 | |

Total IKS Hrs for Sem. : 2 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
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| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | TLO 1.1 Follow safety practices. TLO 1.2 Explain the procedure for extinguishing fire. TLO 1.3 Use firefighting equipment. TLO 1.4 Locate various machines and equipment in workshop. TLO 1.5 Follow good housekeeping. | Unit - I General Workshop Practice 1.1 Safety practices, causes of accidents, general safety rules, safety signs and symbols 1.2 First aid 1.3 Fire, causes of fire, basic ways of extinguishing the fire, classification of fire, class A, B, C, D, firefighting equipment, fire extinguishers and their types 1.4 Workshop layout 1.5 Issue and return system of tools, equipment and consumables | Demonstrate operation of available extinguisher in workshop Show first aid box Practice by students for handling fire extinguisher |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 2 | <p>TLO 2.1 Identify fitting tools.</p> <p>TLO 2.2 Explain operation of fitting shop machines.</p> <p>TLO 2.3 Use fitting tools.</p> <p>TLO 2.4 Operate machineries related to workshop.</p> <p>TLO 2.5 Perform fitting operations.</p> <p>TLO 2.6 Maintain tools, equipment and machineries.</p> | <p>Unit - II Fitting</p> <p>2.1 Fitting hand tools - bench vice, hammers, chisels, files, hacksaw, surface plate, punch, V - block, angle plate, try square, marking block, steel rule, twist drills, reamers, tap set, die set and their specifications</p> <p>2.2 Operation of fitting shops machineries - Drilling machine, power saw, grinder their specifications and maintenance</p> <p>2.3 Basic process - chipping, filing, scraping, grinding, marking, sawing, drilling, tapping, reaming etc.</p> | <p>Demonstrate various types of tools available in fitting shop with its utility</p> |
| 3 | <p>TLO 3.1 Identify given type of active, passive and SMD electronic components.</p> <p>TLO 3.2 Locate various components such as LED , switch ,relay, 7-segment display , transformer on given circuit.</p> <p>TLO 3.3 Describe steps to use the given type of multimeter.</p> <p>TLO 3.4 Describe the steps to test the given electronics components using the multimeter.</p> | <p>Unit - III Identification of Electronic Components</p> <p>3.1 Electronic components - Passive components like resistor, capacitor and inductor, active components like diode, transistor, IC. Identify SMD components</p> <p>3.2 Switches, relays, LEDs, 7-segment display, step-down transformer, connectors and cables used in electronics circuits</p> <p>3.3 Data sheet and the catalog of electronics components, multimeter</p> <p>3.4 Tools required for electronic workshop - specifications, cost and other important characteristics (Catalogs of multimeter, power supply, to collect the latest information of tools)</p> | <p>Hands on practice</p> |
| 4 | <p>TLO 4.1 Select the soldering and de- soldering tools for the given job.</p> <p>TLO 4.2 Describe procedure for using the given soldering related component.</p> <p>TLO 4.3 Explain function of the given type of de-soldering device.</p> <p>TLO 4.4 Describe problems of given type of soldering.</p> | <p>Unit - IV Electronic Soldering Shop</p> <p>4.1 Soldering and de-soldering tools like normal soldering gun, temperature-controlled soldering gun, soldering metals, soldering flux, de-soldering gun, de-soldering pump, de-soldering mesh</p> <p>4.2 Soldering techniques like hand soldering, wave soldering and dip soldering</p> <p>4.3 Soldering of simple electronics components like resistors, capacitors, diode, switches, LEDs on general purpose PCB</p> <p>4.4 Dry soldering, problems of dry and loose soldering</p> <p>4.5 De-soldering of the components from the PCB</p> | <p>Hands on practice demonstration video on use of soldering station</p> |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| 5 | <p>TLO 5.1 Describe the procedure to build given type simple electronic circuit on bread board.</p> <p>TLO 5.2 Explain the procedure of assembling given simple electronic circuit on general purpose PCB.</p> <p>TLO 5.3 Explain the procedure to use the given type of meter for continuity testing.</p> <p>TLO 5.4 Explain the procedure to test the continuity of the given circuit using the given type of digital multimeter.</p> <p>TLO 5.5 Test a simple circuit using simulation software.</p> | <p>Unit - V Hands On Skills</p> <p>5.1 Continuity testing using multimeter</p> <p>5.2 Breadboard specifications and testing</p> <p>5.3 Measurement of series and parallel combination of resistors and capacitors</p> <p>5.4 Basic simulation software</p> | Hands - on skills |

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------|----------------|--------------|
| LLO 1.1 Use standard safety symbols for a given situation. | 1 | Safety symbols | 2 | CO1 |
| LLO 2.1 Perform mock drill session for firefighting using various classes of fire extinguishers and related accessories. | 2 | * Fire extinguishers and accessories | 2 | CO1 |
| LLO 3.1 Select hand tools and equipment used in the fitting shop. | 3 | Fitting shop hand tools and equipment | 2 | CO2 |
| LLO 4.1 Select machine tools and equipment used in the fitting shop. | 4 | Fitting shop machine tools and equipment | 2 | CO2 |
| LLO 5.1 Identify various fitting tools based on given situation. | 5 | * Identification of fitting tools for given specifications | 2 | CO2 |
| LLO 6.1 Identify various sheet metal tools based on given situation. | 6 | Identification of sheet metal tools for given specifications | 2 | CO2 |
| <p>LLO 7.1 Prepare the fitting job as per given drawings Part-I.</p> <p>LLO 7.2 Prepare the fitting job as per given drawings Part-II.</p> <p>LLO 7.3 Prepare the fitting job as per given drawings Part-III.</p> <p>LLO 7.4 Prepare the fitting job as per given drawings Part-IV</p> <p>LLO 7.5 Prepare the fitting job as per given drawings Part-V.</p> | 7 | * Fitting job preparation | 10 | CO2 |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------|----------------|--------------|
| LLO 8.1 Identify the given hand tools, machine tools and equipment used in sheet metal shop along with its' sketch, applications and specifications Part-I. LLO 8.2 Identify the given hand tools, machine tools and equipment used in sheet metal shop along with its' sketch, applications and specifications Part-II. | 8 | * Identification of tools and equipment in sheet metal shop | 4 | CO2 |
| LLO 9.1 Prepare two simple sheet metal jobs as per given drawings Part-I. LLO 9.2 Prepare two simple sheet metal jobs as per given drawings Part-II. LLO 9.3 Prepare two simple sheet metal jobs as per given drawings Part-III. LLO 9.4 Prepare two simple sheet metal jobs as per given drawings Part-IV. | 9 | * Preparation of sheet metal jobs | 8 | CO2 |
| LLO 10.1 Perform sheet metal and fitting operation for the given utility job. | 10 | * Job preparation using sheet metal and fitting operation | 2 | CO2 |
| LLO 11.1 Identify various: (a) Passive electronic components in the given circuit. LLO 11.2 Identify various: (b) Active electronic components in the given circuit. LLO 11.3 Identify various: (c) SMD electronic components in the given circuit. | 11 | * Passive, active and SMD components | 4 | CO3 |
| LLO 12.1 Identify various controls available on the front panel of analog and digital multimeter. | 12 | * Multimeter | 2 | CO3 |
| LLO 13.1 Determine the value of the given resistor using a digital multimeter to confirm with colour code. | 13 | * Determination of resistor value | 2 | CO3 |
| LLO 14.1 Test the semiconductor diodes using a digital multimeter. | 14 | * Diode testing | 2 | CO3 |
| LLO 15.1 Test the LEDs and 7-segment display using a multimeter. | 15 | * 7- Segment display | 2 | CO3 |
| LLO 16.1 Connect resistors in series and parallel combination on breadboard and measure its value using a digital multimeter. | 16 | * Testing resistors on breadboard using multimeter | 2 | CO3 |
| LLO 17.1 Connect capacitors in series and parallel combination on bread board and measure its value using a multimeter. | 17 | * Testing capacitors on breadboard using multimeter | 2 | CO3 |
| LLO 18.1 Identify primary and secondary winding of step down transformer using a multimeter. | 18 | Identification of windings of transformer | 2 | CO3 |
| LLO 19.1 Identify relay terminals (coil, common, normally open and close). | 19 | Relay terminals | 2 | CO3 |
| LLO 20.1 Solder three components on Printed Circuit Board (PCB). LLO 20.2 Desolder one of the component on Printed Circuit Board (PCB). | 20 | * Soldering and desoldering components on PCB | 2 | CO4 |
| LLO 21.1 Build simple circuits on a breadboard using resistors, diode, switch and LED. | 21 | * Building circuit on breadboard | 2 | CO5 |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------|----------------|--------------|
| LLO 22.1 Build simple circuits using relay and other electronics components. | 22 | Building circuit using relay and components | 2 | CO5 |
| LLO 23.1 Test any one of the circuits developed in the LLO-16 / LLO-17 using testing equipment. | 23 | * Building and testing of circuits on PCB | 2 | CO5 |
| LLO 24.1 Identify the components and the virtual instruments available in any basic simulation software. | 24 | * Identification of components and virtual instruments in simulation software | 2 | CO5 |
| LLO 25.1 Build simple circuit using basic simulation software. LLO 25.2 Test the built circuit using basic simulation software. | 25 | Building and Testing of circuit using basic simulation software | 2 | CO5 |
| LLO 26.1 Collect information about ancient tools for understanding Indian knowledge system. | 26 | * Draw sketches of various ancient tools | 2 | CO1 CO2 |

Note : out of above suggestive LLOs -

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) : NOT APPLICABLE

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

| Sr.No | Equipment Name with Broad Specifications | Relevant LLO Number |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1 | Mechanical foam type Fire Extinguisher with ISI mark (9 litre, B and C type Fire Extinguisher) | 1,2 |
| 2 | A, B, C portable type Fire Extinguisher with ISI mark | 1,2 |
| 3 | Fitting tools: Hammers, Chisels, Files, Hacksaw, Surface Plate, Punch, V Block, Angle Plate, Try Square, Marking Block, Steel Rule, Twist Drills, Reamers, Tap Set, Die Set | 3,4,5,7 |
| 4 | Bench Drilling machine (up to 13 mm drill cap.) with ½ H.P. Motor 1000 mm. height | 3,4,5 |
| 5 | Power Saw machine: 350 mm mechanical with 1 HP Motor & all Accessories | 3,4,5 |
| 6 | Bench Grinder: 200 mm Grinding Disc diameter 200 mm. with 25 mm. bore | 3,4,5 |
| 7 | Work Benches: 1800mm*1900mm*750mm | 3,4,5,6,7,8,9,10 |
| 8 | Sheet Metal Hand Tools: Snip, Shears Sheet Gauge, Straight Edge, L Square, Scriber, Divider, Trammel, Punches, Pliers, Stakes, Groovers, Limit Set | 6,8,9,10 |
| 9 | Consumable Components: Resistors, Capacitors, Diodes, Transistors, ICs, IC Sockets, General Purpose PCBs, LEDs, Relays, Switches, Connectors, Connecting Wires, Soldering Metal, Soldering Flux, De-soldering Mesh | 11,13,14,15,16,17,19,21,22,23 |

| Sr.No | Equipment Name with Broad Specifications | Relevant LLO Number |
|-------|-------------------------------------------------------------------------|-------------------------------|
| 10 | Magnifying Lens with Lamp | 11 |
| 11 | Multimeter: 3 and ½ digit with Component Tester | 12,13,14,15,16,17,18,19,23 |
| 12 | Wire Cutter | 16,17,21,22,23 |
| 13 | Anti-static Mat | 16,17,18,19,20,21,22,23,24,25 |
| 14 | Soldering Gun: 40 Watts, Holding Stand, Temperature Control, Power Cord | 20,22 |
| 15 | De-soldering Gun: 80 Watts | 20,22 |
| 16 | Clip-on Ammeter | 22 |
| 17 | PCB Drilling Machine | 22 |
| 18 | Open-source Simulation Software | 24,25 |

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table) : NOT APPLICABLE

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Rubrics for continuous assessment based on process and product related performance indicators (50 marks)

Summative Assessment (Assessment of Learning)

- End of the term examination, Viva-voce, Workshop performance (50 marks)

XI. SUGGESTED COS - POS MATRIX FORM

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | | | Programme Specific Outcomes* (PSOs) | | |
|-----------------------|----------------------------------------------|-----------------------|---------------------------------------|------------------------|------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------------------|-------|-------|
| | PO-1 Basic and Discipline Specific Knowledge | PO-2 Problem Analysis | PO-3 Design/ Development of Solutions | PO-4 Engineering Tools | PO-5 Engineering Practices for Society, Sustainability and Environment | PO-6 Project Management | PO-7 Life Long Learning | PSO-1 | PSO-2 | PSO-3 |
| CO1 | 1 | 2 | - | 3 | - | 1 | 2 | | | |
| CO2 | 1 | 2 | - | 2 | 2 | 2 | 1 | | | |
| CO3 | 2 | 2 | 2 | 2 | 2 | - | 1 | | | |
| CO4 | 1 | - | - | 2 | - | 2 | - | | | |
| CO5 | 2 | 1 | 3 | 2 | 3 | - | 1 | | | |

Legends :- High:03, Medium:02,Low:01, No Mapping: -

*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

| Sr.No | Author | Title | Publisher with ISBN Number |
|-------|------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| 1 | Raghuwanshi B.S. | A Course in Workshop Technology | Dhanpat Rai & Sons, New Delhi, 2017 or latest edition |
| 2 | Sarathe A.K. | Engineering Workshop Practice | Khanna Book Publishing Co.(P) Ltd. , New Delhi; 2021 or latest edition ISBN: 978-9391505516 |
| 3 | Gupta J.K., Khurmi R.S. | A Textbook of Manufacturing Process (Workshop Technology) | S.Chand and Co., New Delhi, 2021 or latest edition, ISBN: 978-8121908689 |
| 4 | Jones, Thomas H. | Electronic Components Handbook | Reston Publishing, Virginia, US, latest edition, ISBN: 978-0879092221 |
| 5 | Mehta V.K., Mehta Rohit | Principles of Electronics | S. Chand and Co., New Delhi-110 055, 2014, ISBN: 978-8121924504 |
| 6 | Glory Priyadarshini J. , Rani K.S.S., Maheswari M.P., Gomathy S. | Engineering Workshop practice on Electrical & Electronics Engineering | Notion Press, Mumbai, 2021 or latest edition, ISBN: 978-1639203819 |

XIII . LEARNING WEBSITES & PORTALS

| Sr.No | Link / Portal | Description |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 1 | http://fireextinguishertraining.com/ | Fire extinguisher |
| 2 | www.youtube.com/watch?v=WE-SislzSMY | Fire extinguisher |
| 3 | https://www.youtube.com/watch?v=IUojO1HvC8c | Fire extinguisher |
| 4 | https://www.youtube.com/watch?v=0jbFC8dvTVY | Electrical tools |
| 5 | https://www.electroschematics.com/tools/ | Electronic tools |
| 6 | https://www.youtube.com/watch?v=Fwj_d3uO5g8 | Diodes |
| 7 | http://www.eleccircuit.com | Electronic circuit |
| 8 | https://mightyohm.com/files/soldercomic/FullSolderComic_EN.pdf | Soldering |
| 9 | https://www.tinkercad.com/ | 3D modeling software |
| 10 | multisim online | Simulation software |

| | |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Programme Name/s | : Artificial Intelligence/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Cloud Computing and Big Data/ Computer Technology/ Computer Engineering/ Computer Science & Engineering/ Digital Electronics/ Data Sciences/ Electronics & Tele-communication Engg./ Electronics & Communication Engg./ Electronics Engineering/ Computer Hardware & Maintenance/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Medical Electronics/ Electronics & Computer Engg./ |
| Programme Code | : AI/ AN/ AO/ BD/ CM/ CO/ CW/ DE/ DS/ EJ/ ET/ EX/ HA/ IC/ IE/ IF/ IH/ IS/ MU/ TE |
| Semester | : First |
| Course Title | : ENGINEERING GRAPHICS (Electronics, Computer and allied branches) |
| Course Code | : 311008 |

I. RATIONALE

Engineering graphics is the language of engineers. The concepts of graphical language are used in expressing the ideas, conveying the instructions, which are used in carrying out the jobs on the sites, shop floor etc. This course is useful in developing drafting and sketching skills in the student. It covers the knowledge & use of drawing instruments & also familiarizes the learner about Bureau of Indian standards related to engineering drawing. The curriculum aims at developing the ability to draw and read various engineering curves, projections and dimensioning styles. The subject mainly focuses on use of drawing instruments, developing imagination and translating ideas into sketches. This course also helps to develop the idea of visualizing the actual object or part on the basis of drawings and blue prints. This preliminary course aims at building a foundation for the further courses related to engineering drawing and other allied courses in coming semesters

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Prepare engineering drawing using prevailing drawing instruments.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Draw geometrical figures and engineering curves.
- CO2 - Apply principles of orthographic projections for drawing given pictorial views.
- CO3 - Apply basic CAD commands for drawing different entities.
- CO4 - Use various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.
- CO5 - Draw free hand sketches of given engineering elements.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

| Course Code | Course Title | Abbr | Course Category/s | Learning Scheme | | | | | | Credits | Assessment Scheme | | | | | | | | | | Total Marks |
|-------------|------------------------------------------------------------------|------|-------------------|--------------------------|----|----|-----|-----|----------------|---------|-------------------|-------|-------|------------------|-------|-----|-----|-------------|-----|-----|-------------|
| | | | | Actual Contact Hrs./Week | | | SLH | NLH | Paper Duration | | Theory | | | Based on LL & TL | | | | Based on SL | | | |
| | | | | CL | TL | LL | | | | | FA-TH | SA-TH | Total | Practical | | SLA | | | | | |
| | | | | | | | | | | | | | | FA-PR | SA-PR | Max | Min | Max | Min | | |
| 311008 | ENGINEERING GRAPHICS (Electronics, Computer and allied branches) | EGP | DSC | 2 | - | 4 | - | 6 | 3 | - | - | - | - | 50 | 20 | 50@ | 20 | - | - | 100 | |

Total IKS Hrs for Sem. : 2 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| 1 | TLO 1.1 Prepare drawing using drawing instruments. TLO 1.2 Use IS SP-46 for dimensioning. TLO 1.3 Use different types of lines. TLO 1.4 Draw regular geometrical figures. TLO 1.5 Draw figures having tangency constructions. | Unit - I Basic Elements of Drawing 1.1 Drawing Instruments and supporting material: method to use them with applications. 1.2 Standard sizes of drawing sheets (ISO-A series) 1.3 I.S. codes for planning and layout. 1.4 Letters and numbers (single stroke vertical) 1.5 Convention of lines and their applications. 1.6 Scale - reduced, enlarged & full size 1.7 Dimensioning techniques as per SP-46 (Latest edition) – types and applications of chain, parallel and coordinate dimensioning 1.8 Geometrical constructions. | Model Demonstration |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| 2 | <p>TLO 2.1 Explain different engineering curves with areas of application.</p> <p>TLO 2.2 Draw different conic sections.</p> <p>TLO 2.3 Draw involute and cycloidal curves.</p> <p>TLO 2.4 Draw helix and spiral curves from the given data</p> <p>TLO 2.5 Plot Loci of points from the given data.</p> | <p>Unit - II Engineering curves & Loci of Points.</p> <p>2.1 Concept and understanding of focus, directrix, vertex and eccentricity. Conic sections.</p> <p>2.2 Methods to draw an ellipse by Arcs of circle method & Concentric circles method.</p> <p>2.3 Methods to draw a parabola by Directrix-Focus method & Rectangle method</p> <p>2.4 Methods to draw a hyperbola by Directrix-Focus method.</p> <p>2.5 Methods to draw involutes: circle & pentagon,</p> <p>2.6 Methods to draw Cycloidal curve: cycloid, epicycloid and hypocycloid</p> <p>2.7 Methods to draw Helix & Archimedean spiral.</p> <p>2.8 Loci of points on Single slider crank mechanism with given specifications</p> | Demonstration |
| 3 | <p>TLO 3.1 Explain methods of the given types of Projections.</p> <p>TLO 3.2 Draw orthographic views of simple 2D entities containing lines, circles and arcs only</p> <p>TLO 3.3 Draw orthographic views from the given pictorial views.</p> <p>TLO 3.4 Use IS code IS SP-46 for dimensioning technique</p> | <p>Unit - III Orthographic projections</p> <p>3.1 Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications.</p> <p>3.2 Orthographic projection: First angle and Third angle method, their symbols. Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces.</p> | Model Demonstration Video Demonstrations |
| 4 | <p>TLO 4.1 Draw basic 2D entities in Auto CAD software</p> <p>TLO 4.2 Modify and edit the given commands.</p> <p>TLO 4.3 Prepare 2D drawing of the given simple engineering components using Auto CAD software.</p> <p>TLO 4.4 Print given drawing using printer/ plotter</p> | <p>Unit - IV Computer Aided Drafting</p> <p>4.1 Basic entities: line, circle, arc, polygon, ellipse, rectangle, multiline, polyline.</p> <p>4.2 Commands: trim, delete, copy, offset, array, block, layers.</p> <p>4.3 Dimensioning: linear, horizontal, vertical, aligned, rotated, baseline, continuous, diameter, radius, angular dimensions.</p> <p>4.4 Text: Single line, multiline.</p> <p>4.5 Standard sizes of sheet, selecting various plotting parameters such as paper size, paper units, drawing orientation, plot scale, plot offset, plot area, print preview.</p> | Presentations Video Demonstrations |
| 5 | <p>TLO 5.1 Sketch proportionate freehand sketches of the given machine elements.</p> <p>TLO 5.2 Select proper fasteners and locking arrangement.</p> | <p>Unit - V Free Hand Sketches of Engineering Elements</p> <p>5.1 Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching)</p> | Model Demonstration |

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|-----------------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|
| LLO 1.1 Use drawing instruments | 1 | * Draw horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter. (Sketch Book). | 2 | CO1 |
| LLO 2.1 Use IS code related to dimensioning standard LLO 2.2 Draw the given types of lines | 2 | * Draw different types of lines, dimensioning styles (Sketch Book) | 2 | CO1 |
| LLO 3.1 Draw figure as per the given sketch | 3 | * Draw one figure showing dimensioning techniques, two problems on redraw the figures and one problem on loci of points - slider crank mechanism. (Sketch Book) | 2 | CO1 |
| LLO 4.1 Draw figures using IS Standard for drawing | 4 | * Draw one figure showing dimensioning techniques, two problems on redraw the figures and one problem on loci of points - slider crank mechanism. (01 Sheet) | 4 | CO1 |
| LLO 5.1 Identify different Engineering curves LLO 5.2 Draw different types of curves | 5 | * Draw any four Engineering Curves (Sketchbook) | 2 | CO1 |
| LLO 6.1 Identify different Engineering curves LLO 6.2 Draw different types of curves | 6 | * Draw any four Engineering Curves – (01 Sheet) | 4 | CO1 |
| LLO 7.1 Apply method of projection for drawing simple orthographic views | 7 | * Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc.- (Sketchbook) | 2 | CO2 CO4 |
| LLO 8.1 Apply method of projection for drawing simple orthographic views | 8 | Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc.- (01 Sheet) | 4 | CO2 CO4 |
| LLO 9.1 Apply method of projection for drawing complex orthographic views | 9 | Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs etc. (Sketchbook) | 2 | CO2 CO4 |
| LLO 10.1 Apply method of projection for drawing complex orthographic views | 10 | * Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs etc.- (01 Sheet) | 4 | CO2 CO4 |
| LLO 11.1 Apply CAD commands for drawing different entities. | 11 | * Draw basic 2D entities like rectangle, rhombus, polygon, arcs, circles using CAD. Commands. | 4 | CO3 |
| LLO 12.1 Apply CAD commands for drawing different entities. | 12 | * Draw basic 2D entities using rectangular and circular arrays. | 2 | CO3 |
| LLO 13.1 Apply CAD commands for drawing different entities. | 13 | Draw basic branch specific components using CAD commands | 2 | CO3 CO4 |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|-------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------|
| LLO 14.1 Apply CAD commands for drawing different entities. | 14 | Draw complex branch specific components using CAD commands. | 4 | CO3 CO4 |
| LLO 15.1 Draw Orthographic views of a given object. | 15 | Problem Based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views (sketch book). | 2 | CO2 CO4 |
| LLO 16.1 Draw standard discipline oriented components using free hand . | 16 | * Draw freehand Sketches of 12 different standard components (Sketch book) | 2 | CO5 |
| LLO 17.1 Draw standard discipline oriented components using free hand . | 17 | Draw freehand Sketches of 12 different standard components (1 Sheet) | 2 | CO5 |
| LLO 18.1 Collect information of an ancient Indian culture related to engineering graphics | 18 | * Correlate ancient Indian sculptures, Indian temples, Monuments, etc. with Engineering Graphics | 2 | CO1 CO2 CO3 CO4 CO5 |

Note : out of above suggestive LLOs -

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- List the applications of engineering curves in different fields of engineering and submit a report on it.
- Prepare a list of industrial and household components in which conic curves are used and justify the utility of these curves.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

| Sr.No | Equipment Name with Broad Specifications | Relevant LLO Number |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 1 | Drawing Table with Drawing Board of Full Imperial/ A1 size. | All |
| 2 | Models of objects for orthographic projections | 7,8,9,10 |
| 3 | Models/ Charts of objects mentioned in unit no. 5 | 16,17 |
| 4 | Set of various industrial drawings being used by industries. | All |
| 5 | Set of drawings sheets mentioned in section 6.0 could be developed by experienced teachers and made used available on the MSBTE portal to be used as reference/standards. | All |

| Sr.No | Equipment Name with Broad Specifications | Relevant LLO Number |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 6 | Drawing equipment and instruments for class room teaching-large size: a. T-square or drafter (Drafting Machine). b. Set squares (450 and 300-600) c. Protector. d. Drawing instrument box (containing set of compasses and dividers). Drawing sheets, Drawing pencils, Eraser, Drawing pins / clips | All |
| 7 | CAD Workstation: 2GB RAM, 320 GB HDD, 17" screen, 1GHz (Minimum Requirement) | 11,12,13,14 |
| 8 | Plotter: Print Resolution upto 1200X600 Dpi, 16 MB Memory | 11,12,13,14 |
| 9 | Licensed Latest Network of AutoCAD Software | 11,12,13,14 |

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

| Sr.No | Unit | Unit Title | Aligned COs | Learning Hours | R-Level | U-Level | A-Level | Total Marks |
|--------------------|------|--------------------------------------------|-------------|----------------|----------|----------|-----------|-------------|
| 1 | I | Basic Elements of Drawing | CO1 | 6 | 0 | 0 | 8 | 8 |
| 2 | II | Engineering curves & Loci of Points. | CO1 | 6 | 0 | 0 | 8 | 8 |
| 3 | III | Orthographic projections | CO2,CO4 | 8 | 0 | 0 | 16 | 16 |
| 4 | IV | Computer Aided Drafting | CO3,CO4 | 4 | 0 | 0 | 8 | 8 |
| 5 | V | Free Hand Sketches of Engineering Elements | CO4,CO5 | 6 | 0 | 0 | 10 | 10 |
| Grand Total | | | | 30 | 0 | 0 | 50 | 50 |

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Term work

Summative Assessment (Assessment of Learning)

- Practical

XI. SUGGESTED COS - POS MATRIX FORM

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | | | Programme Specific Outcomes* (PSOs) | | |
|-----------------------|----------------------------------------------|-----------------------|---------------------------------------|------------------------|------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------------------|-------|-------|
| | PO-1 Basic and Discipline Specific Knowledge | PO-2 Problem Analysis | PO-3 Design/ Development of Solutions | PO-4 Engineering Tools | PO-5 Engineering Practices for Society, Sustainability and Environment | PO-6 Project Management | PO-7 Life Long Learning | PSO-1 | PSO-2 | PSO-3 |
| CO1 | 3 | - | - | 2 | - | 2 | - | | | |

| | | | | | | | | | |
|-----|---|---|---|---|---|---|---|--|--|
| CO2 | 3 | - | - | 2 | - | 2 | - | | |
| CO3 | 3 | - | - | 2 | - | 2 | - | | |
| CO4 | 3 | - | - | 2 | - | 2 | 2 | | |
| CO5 | 3 | - | - | 2 | - | 2 | - | | |

Legends :- High:03, Medium:02,Low:01, No Mapping: -

*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

| Sr.No | Author | Title | Publisher with ISBN Number |
|-------|-----------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------|
| 1 | Bureau of Indian Standards. | Engineering Drawing Practice for Schools and Colleges IS: SP-46 | Third Reprint, October 1998 ISBN No. 81-7061-091-2 |
| 2 | Bhatt, N.D. | Engineering Drawing | Charotar Publishing House, 2010 ISBN No. 978-93-80358-17-8 |
| 3 | Bhatt, N.D.; Panchal, V. M | Machine Drawing | Charotar Publishing House, 2010 ISBN No. 978-93-80358-11-6 |
| 4 | Jolhe, D.A. | Engineering Drawing | Tata McGraw Hill Edu. New Delhi, 2010, ISBN No. 978-0-07-064837-1 |
| 5 | Dhawan, R. K. | Engineering Drawing | S. Chand and Company New Delhi, ISBN No. 81-219-1431-0 |
| 6 | Pradhan, S.K Jain, K.K | Engineering Graphics | Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-50-9 |
| 7 | Jeyapoovan T | Engineering Drawing and Graphics using AutoCAD | Vikas Publishing House Pvt. Ltd., First Reprint 2013, ISBN NO.978-81259-4000-5 |
| 8 | Salunkhe R | AutoCAD 2013 2D & 3D for Civil and Mechanical Engineering | Aruta Publishers Chiplun, 2013, ISBN No. 978-81-902648-1-5 |

XIII . LEARNING WEBSITES & PORTALS

| Sr.No | Link / Portal | Description |
|-------|-------------------------------------------------------------------------------------------------------|--------------------------------------|
| 1 | https://www.youtube.com/watch?v=dmt6_n7Sgcg | Free Hand Sketches |
| 2 | https://www.youtube.com/watch?v=dmt6_n7Sgcg | Orthographic Projection |
| 3 | https://www.youtube.com/watch?v=3WXPanCq9LI | Basics of Projection |
| 4 | https://www.youtube.com/watch?v=fvjk7PlxAuo | Introduction to Engineering Graphics |
| 5 | https://www.youtube.com/watch?v=cmR9cfWJRUU | Basics of AutoCAD |

| | |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Programme Name/s | : Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Dress Designing & Garment Manufacturing/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Hotel Management & Catering Technology/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures |
| Programme Code | : AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DD/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ FC/ HA/ HM/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ TC/ TE/ TR/ TX |
| Semester | : First |
| Course Title | : YOGA AND MEDITATION |
| Course Code | : 311003 |

I. RATIONALE

Diploma Graduate needs a sound body and mind to face the challenging situations in career as employee or as an entrepreneur. Yoga and Meditation brings about the holistic development of an individual and equips with necessary balance to handle the challenges. The age of polytechnic student is appropriate to get introduced to yoga practice as this will help them in studies as well as his professional life. Moreover, Yoga inculcates discipline in all walks of the life of student. Pranayama practice regulates breathing practices of the student to improve stamina, resilience. Meditation empowers a student to focus and keep calm to get peace of mind. World Health Organization (WHO) has also emphasized the role of yoga and meditation as stress prevention measure. National Education Policy -2020 highlights importance of yoga and meditation amongst students of all ages. Therefore, this course for Diploma students is designed for the overall wellbeing of the student and aims to empower students to adopt and practice "Yoga" in daily life .

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Practice basic Yoga and Pranayama in daily life

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Practice basic Yoga and Pranayama in daily life to maintain physical and mental fitness.
- CO2 - Practice meditation regularly for improving concentration and better handling of stress and anxiety.
- CO3 - Follow healthy diet and hygienic practices for maintaining good health.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

| Course Code | Course Title | Abbr | Course Category/s | Learning Scheme | | | | | Credits | Paper Duration | Assessment Scheme | | | | | | | | | | |
|-------------|---------------------|------|-------------------|--------------------------|----|----|-------|-------|---------|----------------|-------------------|------------------|-------|---|-------|-------------|-----|-------------|----|----|----|
| | | | | Actual Contact Hrs./Week | | | SLH | NLH | | | Theory | Based on LL & TL | | | | Based on SL | | Total Marks | | | |
| | | | | CL | TL | LL | | | | | | Practical | | | | SLA | | | | | |
| | | | | | | | FA-TH | SA-TH | | | Total | | FA-PR | | SA-PR | | Max | Min | | | |
| 311003 | YOGA AND MEDITATION | YAM | VEC | - | - | 1 | 1 | 2 | 1 | | - | - | - | - | 25 | 10 | - | - | 25 | 10 | 50 |

Total IKS Hrs for Sem. : 1 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

| Sr.No | Theory Learning Outcomes (TLO's)aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|--------------------------------------------------|-------------------------------------------------------------------------|--------------------------------|
|-------|--------------------------------------------------|-------------------------------------------------------------------------|--------------------------------|

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|----------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|
| LLO 1.1 Practice warming up for Yoga. | 1 | Introduction :- Presentations on Introduction to Yoga and its History. Lab Exp: 1. Perform warming up exercises to prepare the body from head to toe for Yoga. | 5 | CO1 |
| LLO 2.1 Practice Surya Namaskar | 2 | Lab Exp: 2. Perform all the postures of Surya Namaskar one by one in a very slow pace, after warm up. Lab Exp 3. Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) in one go. Experiment 2 to 4 must be followed by shavasana for self relaxation. | 7 | CO1 CO2 |
| LLO 3.1 Practice basic Asanas | 3 | Lab Exp: 4 Perform Sarvangasana, Halasana, Kandharasana (setubandhasana) Lab Exp: 5 Perform Bhujangasana, Naukasana, Mandukasana Lab Exp: 6 Perform Paschimottasana, Baddhakonasana, Bharadwajasana. Lab Exp: 7 Perform Veera Bhadrasana, Vrukshasana, Trikonasana. Follow up experiment 5 to 7 with shavasana for self relaxation | 8 | CO2 |
| LLO 4.1 Practice basic pranayama | 4 | Lab Exp: 8 Perform Bhastrika, Anulom Vilom Pranayam Kriya Lab Exp: 9 Practice Kapalbhathi Pranayam Kriya Lab Exp: 10 Practice Bhramary Pranayam. | 5 | CO3 |
| LLO 5.1 Practice meditation | 5 | Lab Exp: 11 Perform sitting in Dhyana Mudra and meditating. Start with five minute and slowly increasing to higher durations. (Trainer will explain the benefits of Meditation before practice) | 5 | CO3 |

Note : out of above suggestive LLOs -

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Maintain a diary indicating date wise practice done by the student with a photograph of self in yogic posture.

Assignment

- Prepare Diet and nutrition chart for self

Self Learning

- Practice at least thrice a week.
- Read books on different methods to maintain health, wellness and to enhance mood
- Watch videos on Yoga Practices.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

| Sr.No | Equipment Name with Broad Specifications | Relevant LLO Number |
|-------|---------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 1 | Yoga and Meditation kits : Yoga Mats, Yoga Rollers, Yoga Blocks, Aero Yoga Clothing Blankets, Cloth Straps, Bolsters, Wheels | All |

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table) : NOT APPLICABLE**X. ASSESSMENT METHODOLOGIES/TOOLS****Formative assessment (Assessment for Learning)**

- Lab performance, Self-learning and Terms work

Summative Assessment (Assessment of Learning)

- Actual Practical Performance

XI. SUGGESTED COS - POS MATRIX FORM

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | | | Programme Specific Outcomes* (PSOs) | | |
|-----------------------|----------------------------------------------|-----------------------|---------------------------------------|------------------------|------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------------------|-------|-------|
| | PO-1 Basic and Discipline Specific Knowledge | PO-2 Problem Analysis | PO-3 Design/ Development of Solutions | PO-4 Engineering Tools | PO-5 Engineering Practices for Society, Sustainability and Environment | PO-6 Project Management | PO-7 Life Long Learning | PSO-1 | PSO-2 | PSO-3 |
| CO1 | - | - | - | - | 3 | - | - | | | |
| CO2 | - | - | - | - | 3 | - | - | | | |
| CO3 | - | - | - | - | 3 | - | - | | | |

Legends :- High:03, Medium:02,Low:01, No Mapping: -

*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

| Sr.No | Author | Title | Publisher with ISBN Number |
|-------|--------|-------|----------------------------|
|-------|--------|-------|----------------------------|

| Sr.No | Author | Title | Publisher with ISBN Number |
|-------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 1 | Swami Vivekananda | Patanjalis Yoga Sutras | Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: ? 978-9354407017 |
| 2 | Luisa Ray, Angus Sutherland | Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and me | Vital Life Books (2022) ISBN-13?: ? 978-1739737009 |
| 3 | Swami Saradananda | Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your | Watkins Publishing (2019) ISBN-13?: ? 978-1786782786 |
| 4 | Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSW | The Relaxation and Stress Reduction Workbook | A New Harbinger Self-Help Workbook (2019) |
| 5 | Ann Swanson | Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice | ISBN-13?: ? 978-1465479358 |

XIII . LEARNING WEBSITES & PORTALS

| Sr.No | Link / Portal | Description |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| 1 | https://onlinecourses.swayam2.ac.in/aic19_ed28/preview-introduction to Yoga and Applications of Yog | Yoga and Applications of Yoga |
| 2 | https://onlinecourses.swayam2.ac.in/aic23_ge09/preview | Yoga for Creativity |
| 3 | https://onlinecourses.swayam2.ac.in/aic23_ge05/preview | Yoga for concentration |
| 4 | https://onlinecourses.swayam2.ac.in/aic23_ge06/preview | yoga for memory development |
| 5 | https://onlinecourses.nptel.ac.in/noc21_hs29/preview | Psychology of Stress, Health and Well-being |
| 6 | https://onlinecourses.swayam2.ac.in/nce19_sc04/preview | Food Nutrition for Healthy Living - Course – Swayam |
| 7 | https://www.classcentral.com/course/swayam-fitness-management- | Fitness Management from Swayam |

: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/
 Agricultural Engineering/
 Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/
 Cloud Computing and Big Data/
 Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer
 Engineering/
 Civil & Rural Engineering/ Construction Technology/ Computer Science &
 Engineering/ Fashion & Clothing Technology/
 Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-
 communication Engg./
 Electrical Power System/ Electronics & Communication Engg./ Electronics
 Engineering/ Food Technology/
 Computer Hardware & Maintenance/ Instrumentation & Control/ Industrial
 Electronics/ Information Technology/
 Computer Science & Information Technology/ Instrumentation/ Interior Design &
 Decoration/ Interior Design/
 Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical
 Electronics/
 Production Engineering/ Printing Technology/ Polymer Technology/ Textile Technology/
 Electronics & Computer Engg./ Textile Manufactures

Programme Name/s

Programme Code

: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DE/ DS/
 EE/ EJ/ EP/ ET/ EX/ FC/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ MU/
 PG/ PN/ PO/ TC/ TE/ TX

Semester

: First

Course Title

: BASIC SCIENCE

Course Code

: 311305

I. RATIONALE

Diploma engineers have to deal with various materials and machines. This course is designed with fundamental information to help the diploma engineering students to apply the basic concepts and principles of physics and chemistry to solve broad-based engineering problems. The basic concepts and principles of sciences related to heat, electricity, magnetism, optics, semiconductors, engineering materials will help in understanding the technology courses where emphasis is on the applications of these in various technology domain applications

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

This course is to be taught and implemented with the aim to develop in the student, the course outcomes (COs) leading to the attainment of following industry identified outcome expected from this course: Apply principles of physics and chemistry to solve broad based relevant engineering problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Use basic instruments to measure the physical quantities in various engineering situations.

- CO2 - Apply the basic principles of electromagnetics to solve given engineering problems.
- CO3 - Apply basic principles of thermometry and fibre optics to solve engineering problems.
- CO4 - Predict the structure, properties and behaviour of molecules and compounds based on the types of chemical bond.
- CO5 - Apply the concepts of electrochemistry and corrosion preventive measures in industry.
- CO6 - Use the appropriate engineering material and catalyst appropriately.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

| Course Code | Course Title | Abbr | Course Category/s | Learning Scheme | | | | | | Credits | Assessment Scheme | | | | | | | | | | |
|-------------|---------------|------|-------------------|--------------------------|----|----|-----|-----|----------------|---------|-------------------|-------|-------|------------------|-----|-----|-----|-------------|-----|-------------|----|
| | | | | Actual Contact Hrs./Week | | | SLH | NLH | Paper Duration | | Theory | | | Based on LL & TL | | | | Based on SL | | Total Marks | |
| | | | | CL | TL | LL | | | | | FA-TH | SA-TH | Total | Practical | | SLA | | | | | |
| | | | | | | | Max | Min | | | | | | Max | Min | Max | Min | Max | Min | | |
| 311305 | BASIC SCIENCE | BSC | DSC | 4 | - | 4 | 2 | 10 | | 5 | 1.5 | 30 | 70*# | 100 | 40 | 50 | 20 | 50@ | 20 | | 50 |

Total IKS Hrs for Sem. : 4 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

♦ **Candidate remaining absent in practical examination of any one part of Basic Science course i.e. Physics, Chemistry will be declare as Absent in Mark List and has to appear for examination. The marks of the part for which candidate was present will not be processed or carried forward.**

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|---------------------------------------------------|-------------------------------------------------------------------------|--------------------------------|
|-------|---------------------------------------------------|-------------------------------------------------------------------------|--------------------------------|

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| 1 | <p>TLO 1.1 Explain physical quantities and its types with examples.</p> <p>TLO 1.2 Differentiate between scalar and vector quantities with examples.</p> <p>TLO 1.3 Apply dimensional analysis to check correctness of equation and conversion of units in different systems .</p> <p>TLO 1.4 Estimate the errors in the measurement for the give problem.</p> <p>TLO 1.5 Explain the working of ancient astronomical instruments to measure distance , time and hour angle .</p> <p>TLO 1.6 Explain the procedure of measuring the dimension of a given object by using vernier calipers and screw gauge .</p> | <p>Unit - I Units and Measurements</p> <p>1.1 Unit, physical quantities: fundamental and derived quantities and their units Systems of units: CGS, MKS and SI .</p> <p>1.2 Scalar and Vector Physical Quantities.</p> <p>1.3 Dimensions, dimensional formula ,Applications of dimensional analysis; correctness of physical equations ,conversion factor for interconversion of units in different systems of units.</p> <p>1.4 Errors, types of errors: instrumental, systematic and random error, estimation of errors: absolute, relative and percentage error, significant figures.</p> <p>1.5 Ancient astronomical instruments:Chakra, Dhanuryatra , Yasti and Phalaka yantra .</p> <p>1.6 Applications of Vernier calipers , Screw gauge .</p> | <p>Chalk and board Improved lecture, Tutorial Assignment Demonstration</p> |
| 2 | <p>TLO 2.1 Explain electric field, potential and potential difference.</p> <p>TLO 2.2 Explain magnetic intensity and flux with their units.</p> <p>TLO 2.3 Apply laws of series and parallel combination to the given electrical circuits.Explain the heating effect of electric current.</p> <p>TLO 2.4 Distinguish between conductors, semiconductors and insulators on the basis of energy bands.</p> <p>TLO 2.5 Explain the I-V characteristics and applications of p-n junction diode.</p> | <p>Unit - II Electricity, Magnetism and Semiconductors</p> <p>2.1 Concept of charge, Coulomb's inverse square law, Electric field, Electric field intensity, potential and potential difference.</p> <p>2.2 Magnetic field and magnetic field intensity and its units, magnetic lines of force, magnetic flux .</p> <p>2.3 Electric current, Ohm's law, specific resistance, laws of series and parallel combination of resistance, conversion of galvanometer into ammeter and voltmeter, Heating effect of electric current .</p> <p>2.4 Conductors, Insulators and Semiconductors, Energy bands, intrinsic and extrinsic semiconductors, minority and majority charge carriers.</p> <p>2.5 p-n junction diode, Depletion layer I-V characteristics of p-n junction, static and dynamic resistance, applications of p-n junction diode ,: Half wave rectifier.</p> | <p>Chalk and board Improved lecture, Tutorial Assignment Demonstration Educational Games</p> |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 3 | <p>TLO 3.1 Convert temperature in different temperature scales.</p> <p>TLO 3.2 Compare different modes of heat transfer with examples.</p> <p>TLO 3.3 Inter-relate the characteristics of the three gas laws.</p> <p>TLO 3.4 Inter-relate the characteristics of the three gas laws.</p> <p>TLO 3.5 Explain total internal reflection in optical fiber.</p> <p>TLO 3.6 Differentiate between types optical fiber with applications.</p> | <p>Unit - III Thermometry and Fiber Optics</p> <p>3.1 Heat, temperature, temperature scale: Degree Celsius, degree Kelvin, degree Fahrenheit.</p> <p>3.2 Modes of heat transfer: Conduction , Convection and Radiation , Applications in daily life .</p> <p>3.3 Boyle's law, Charle's law, Gay Lussac's law, perfect gas statements equations and simple numerical.</p> <p>3.4 Law of thermal conductivity ,Newton's law of cooling.</p> <p>3.5 Law of refraction, total internal reflection.</p> <p>3.6 Optical fiber: Principle, construction and working Types of Optical fibers;Single mode step index, Multimode step index, Multimode graded index Applications of optical fibers.</p> | <p>Chalk and board Improved lecture, Tutorial Assignment Demonstration Flip classroom Educational Games</p> |
| 4 | <p>TLO 4.1 Explain the properties of given material based on the bond formation.</p> <p>TLO 4.2 Describe the molecular structure of given solid, liquid and gases.</p> <p>TLO 4.3 Describe the crystal structure of the given solids.</p> <p>TLO 4.4 Explain Properties of metallic solid.</p> | <p>Unit - IV Chemical bonding</p> <p>4.1 Indian Chemistry:-Philosophy of atom by Acharya Kanad.</p> <p>4.2 Electronic theory of valency: Assumptions , Chemical bonds: Types and characteristics of electrovalent bond, covalent bond, coordinate bond, hydrogen bond, metallic bond and Intermolecular forces of attraction.</p> <p>4.3 Molecular arrangement in solid, liquid and gases.</p> <p>4.4 Structure of solids: crystalline and amorphous solids ,Properties of metallic solid, Unit cell: simple cubic, body center cubic (BCC) , face centre cubic (FCC), hexagonal close pack crystals.</p> | <p>Simulation, Model Display, Demonstration Chalk and board , PPT, ect</p> |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 5 | <p>TLO 5.1 Describe mechanism of electrolysis of CuSO₄ solution by using cu and pt rods</p> <p>TLO 5.2 Solve numerical based on Faraday's first and second law of electrolysis.</p> <p>TLO 5.3 Distinguish between primary and secondary cell</p> <p>TLO 5.4 Describe the phenomenon of the given type of corrosion and its prevention.</p> <p>TLO 5.5 Identify the different factors affecting rate of corrosion for the given type of material.</p> <p>TLO 5.6 Select the protective measures to prevent the corrosion in the given corrosive medium.</p> | <p>Unit - V Electro chemistry and Metal Corrosion, its prevent ion</p> <p>5.1 Electrolyte- Types of electrolyte, ionization and dissociation ,Cathode, Anode, Electrode potential: oxidation and reduction, Mechanism of electrolysis :Electrolysis, Electrochemical series for cations and anions. Mechanism of electrolysis of CuSO₄ solution</p> <p>5.2 Faraday's laws of electrolysis: Faraday's first and second law, relation between electrochemical equivalent and chemical equivalent, Numerical. Applications of electrolysis: Electro-refining of copper and Electroplating.</p> <p>5.3 Difference between primary and secondary cell.</p> <p>5.4 Corrosion: Definition and Types of corrosion Dry corrosion: Mechanism, Types of oxide film, Wet corrosion :Mechanism hydrogen evolution in acidic medium, oxygen absorption in neutral or alkaline medium ,Galvanic cell action by Daniel cell.</p> <p>5.5 Factors affecting the rate of corrosion.</p> <p>5.6 Corrosion control: Modification of environment, Use of protective coatings, coating of less active metal like Tin (Tinning), coating of more active metal like Zinc (Galvanizing), Anodic and cathodic protection, Choice of material-using pure metal and using metal alloy</p> | <p>Simulation, Demonstration, Flipped Classroom, Collaborative Learning, Case Study, On-site/Industrial Visit ,chalk and board etc.</p> |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 6 | <p>TLO 6.1 Identify the ingredients of the given paints.</p> <p>TLO 6.2 List out salient properties of the given paint and varnish.</p> <p>TLO 6.3 Describe the properties of insulating materials for the given application.</p> <p>TLO 6.4 Differentiate the given types of structural polymers.</p> <p>TLO 6.5 Describe the polymerization process of the given polymer.</p> <p>TLO 6.6 Explain the properties and uses of the given polymer, elastomer and adhesive.</p> <p>TLO 6.7 Describe the application of relevant adhesives required for the given material.</p> <p>TLO 6.8 Suggest the lubricant for various types of machines in industry.</p> <p>TLO 6.9 Select the relevant catalyst for given application.</p> | <p>Unit - VI Engineering Materials and Catalysis</p> <p>6.1 Paints: Purposes of applying paint, Characteristics of paints, Ingredients of paints, Function and examples of each ingredient.</p> <p>6.2 Varnish: Types, Difference between paint and varnishes.</p> <p>6.3 Insulators: Characteristics, Classification, Properties and Application of Glass wool Thermocol.</p> <p>6.4 Polymer and Monomer : Classification on the basis of Molecular structure, on the basis of monomers (homo polymer and copolymer), on the basis of Thermal behavior (Thermoplastics and Thermosetting).</p> <p>6.5 Types Polymerization Reaction, Addition Polymerization, Condensation Polymerization, Synthesis, properties and application of Polyethylene, Polyvinyl chloride, Teflon, Polystyrene, Phenol formaldehyde, Epoxy Resin.</p> <p>6.6 Adhesives: Characteristics, Classification and their uses</p> <p>6.7 Lubricants: Classification, properties and Applications.</p> <p>6.8 Catalysis: Types of catalysis homocatalysis, heterocatalysis .</p> <p>6.9 Catalyst: Types of Catalyst Positive, Negative and Auto-catalyst, Catalytic Promoter and Catalytic inhibitor, Industrial application of catalyst.</p> | <p>Simulation, Demonstration, On-site Visit, Chalk and Board, etc.</p> |

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------------------------------------|----------------|--------------|
| <p>LLO 1.1 Use Vernier caliper to : Measure dimensions of given objects. Measure the dimensions of objects of known dimensions.</p> <p>LLO 1.2 Estimate the errors in measurement.</p> | 1 | Measurements of dimensions of given object by Vernier caliper. | 2 | CO1 |
| <p>LLO 2.1 Use Micrometer Screw gauge to: Measure dimensions of given objects. Measure the dimensions of objects of known dimensions.</p> <p>LLO 2.2 Estimate the errors in measurement.</p> | 2 | Measurements of dimensions of given objects by micrometer screw gauge. | 2 | CO1 |
| LLO 3.1 Apply Ohm's law to solve circuit problems. | 3 | Determination of resistance by Ohm's law. | 2 | CO2 |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------|----------------|--------------|
| LLO 4.1 Determine the specific resistance of given wire. | 4 | Determination of specific resistance of given wire. | 2 | CO2 |
| LLO 5.1 Verify law of series connection of resistors. | 5 | Determination of equivalent resistance in series connection of resistors. | 2 | CO2 |
| LLO 6.1 Verify law of parallel connection of resistors. | 6 | Determination of equivalent resistance in parallel connection of resistors. | 2 | CO2 |
| LLO 7.1 Use magnetic compass to draw the magnetic lines of forces of magnet of different shapes and determine neutral points. | 7 | Determination of neutral points by magnetic compass. | 2 | CO2 |
| LLO 8.1 Use P-N junction diode to draw forward bias and reverse bias I-V characteristics LLO 8.2 Find out static and dynamic resistance of given P N junction diode | 8 | Determination of static and dynamic resistance of given P N junction diode. | 2 | CO2 |
| LLO 9.1 Determine forbidden energy band gap in semiconductors | 9 | Determination of forbidden energy band gap in semiconductors. | 2 | CO2 |
| LLO 10.1 Use Joule's calorimeter to determine Joule's mechanical equivalent of heat | 10 | Determination of Joule's mechanical equivalent of heat by Joule's law. | 2 | CO3 |
| LLO 11.1 Determine the pressure-volume relation using Boyle's law | 11 | Determination of pressure-volume relation using Boyle's law. | 2 | CO3 |
| LLO 12.1 Use Newton's law of cooling to determine the rate of heat loss due to convection phenomena | 12 | Determination of the rate of heat loss due to convection by Newton's law of cooling. | 2 | CO3 |
| LLO 13.1 Use Searle's thermal conductivity apparatus to find coefficient of thermal conductivity of given material (Virtual Lab) | 13 | Determination of Coefficient of thermal conductivity. | 2 | CO3 |
| LLO 14.1 Determine the refractive index of glass slab using TIR phenomenon. | 14 | Determination of the refractive index of glass slab. | 2 | CO3 |
| LLO 15.1 Determine the Numerical Aperture (NA) of a given step index optical fibre | 15 | Determination of the Numerical Aperture (NA) of a given step index optical fiber. | 2 | CO3 |
| LLO 16.1 Identify cation in given ionic solutions by performing selective test | 16 | Identification of cation in given ionic solutions. | 2 | CO4 |
| LLO 17.1 Identify anion in given ionic solutions by performing selective test | 17 | Identification of anion in given ionic solutions. | 2 | CO4 |
| LLO 18.1 Identify states of matter of materials by using simulation. by Applying heating and cooling Techniques. LLO 18.2 Relate temperature-pressure diagram | 18 | Identification of states of matter. | 2 | CO4 |
| LLO 19.1 Determine the electrode potential of copper metal. by setting Electrochemical Cell LLO 19.2 Measure electrode potential of Cu Using Voltmeter. LLO 19.3 Measure the cell potential for various conditions. | 19 | Determination of electrode potential of copper. | 2 | CO5 |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------|----------------|--------------|
| LLO 20.1 Determine the electrode potential of Iron metal. by setting Electrochemical Cell LLO 20.2 Measure electrode potential of Fe Using Voltmeter LLO 20.3 Measure the cell potential for various conditions. | 20 | Determination of electrode potential of Iron metal. | 2 | CO5 |
| LLO 21.1 Determine the voltage generated from chemical reaction using Daniel Cell. LLO 21.2 Set up Daniel Cell. Prepare Electrolyte Solution LLO 21.3 Measure voltage accurately | 21 | Determination of the voltage generated from chemical reaction using Daniel Cell. | 2 | CO5 |
| LLO 22.1 Prepare Electrolyte Solution of CuSO ₄ of known concentration LLO 22.2 Set up electrolysis apparatus LLO 22.3 Control various parameters of electrolysis. LLO 22.4 Determine electrochemical equivalent of Cu metal using Faraday's first law. | 22 | Determination of electrochemical equivalent of Cu metal using Faraday's first law. | 2 | CO5 |
| LLO 23.1 Prepare Electrolyte Solution of the given metal of known concentration LLO 23.2 Set up electrolysis apparatus LLO 23.3 Control various parameters of electrolysis LLO 23.4 Analyze the data obtained from the experiment. LLO 23.5 Verify Faraday second law | 23 | Determination of equivalent weight of metal using Faraday's second law. | 2 | CO5 |
| LLO 24.1 Prepare corrosive solutions LLO 24.2 Determine the extent of corrosion. | 24 | Preparation of corrosive medium for Aluminium at different temperature. | 2 | CO5 |
| LLO 25.1 Prepare corrosive solutions. LLO 25.2 Determine the extent of corrosion LLO 25.3 Compare the corrosion behaviour of Aluminum at different temperatures. | 25 | Determination of rate of corrosion at different temperatures for Aluminium. | 2 | CO5 |
| LLO 26.1 Determine the effect of temperature on viscosity for given lubricating oil using Redwood viscometer- | 26 | Determination of effect of temperature on viscosity for given lubricating oil using Redwood viscometer-I. | 2 | CO6 |
| LLO 27.1 Determine the steam emulsification number of given lubricating oil. LLO 27.2 Measure the steam flow duration | 27 | Determination of the steam emulsification number of given lubricating oil. | 2 | CO6 |
| LLO 28.1 Calculate the flash and fire point of given lubricating oils using Cleveland open cup apparatus | 28 | Determination of flash and fire point of given lubricating oils using Cleveland open cup apparatus. | 2 | CO6 |
| LLO 29.1 Determine the flash point of given lubricating oil using Abel's closed cup apparatus. | 29 | Determination of flash point of given lubricating oil using Abel's closed cup apparatus. | 2 | CO6 |
| LLO 30.1 Determine thinner content in oil paint. using electric oven | 30 | Determination of thinner content in oil paint. | 2 | CO6 |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------------------------|----------------|--------------|
| Note : out of above suggestive LLOs - | | | | |
| <ul style="list-style-type: none"> • Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed. • '*' Marked Practicals (LLOs) Are mandatory • Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable | | | | |

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Series and parallel resistances: Prepare models for combination of series and parallel resistances.
- Magnetic flux: Prepare models to demonstrate magnetic lines of lines of forces of different types of magnet.
- Vernier Calipers: Prepare prototype vernier caliper of desired least.count using card sheet.
- Conductivity: Collect different materials such as metal, plastics, glass etc. and prepare models.
- Gas laws: Prepare models to demonstrate Boyle's laws, Charle's Law and Gay Lussac's law using household objects.
- Carbon resistors: Determine the resistance and tolerance of carbon resistors using color codes and measure values.
- Thermal conductivity: Take different metallic plates of various metals and calculate rate of flow of heat.
- Temperature sensor : Use Temperature sensor IC LM 35 to measure temperature of given body in various temperature scales
- Mobile applications : Use mobile applications for measurements of different physical quantities.
- Optical Fiber and TIR: Prepare model to demonstrate total internal reflection and the propagation of light.
- Convert given galvanometer into ammeter of desired range.
- Convert given galvanometer into voltmeter of desired range.
- LDR: Use Light dependent resistor for measuring the intensity of light.
- Types of bonds: Prepare chart and models displaying different types of bonds with examples.
- Prepare a chart for showing different types of bonds or molecules.
- Crystal Structure: Prepare Models of SC,FCC,HCP,BCC.
- Ionization: Prepare chart displaying ionization phenomenon.
- Corrosion-Prepare Chart displaying images of observed corrosion processes in the surrounding.
- Adhesives: Prepare chart or model to demonstrate the applications of various adhesives.
- Polymer: Collect the samples of different polymers and list their uses.
- Collect information based on market survey of different Polymer and compare the following points. i) Structure ii) Properties.
- Collect information by library survey regarding engineering material used in various industries.

Assignment

- Convert the units of a given physical quantity from one system of units to another.
- Measure room temperature of hot baths / bodies by using mercury thermometer and convert it into different scales.
- Prepare a chart to summarize units and measurements
- Enlist information like band gap, material used, dimension etc about different semiconductor devices.
- Give details about the explanation of concept like electrostatics, magnetic domain, current electricity.
- Demonstrate the variation of angle of refraction with respect to refractive index using online tools.
- Use a digital vernier caliper and micrometer screw gauge for measurements.(lab- based).
- Applications of optical fibers in civil, mechanical , electrical engineering etc.
- Applications of semiconductors in civil, mechanical , electrical engineering etc.

- Explain covalent bond, ionic bond, coordinate bond, hydrogen bond, intermolecular forces
- Draw Crystal structures of SC,BCC, FCC,HCP.
- Distinguish between paints and varnishes.
- Solve numerical based on Faraday's first and second law of electrolysis.
- Enlist various Adhesives with properties and applications.
- Compare between Thermoplastics and Thermosetting.
- State properties and applications thermocol and glass wool.
- Differentiate the given types of structural polymers and list out their applications.
- Demonstrate Mechanism of wet corrosion by waterline corrosion.
- Prepare chart showing mechanism of electrolysis of CuSO₄ solution by using Cu and Pt electrodes.
- Write properties and applications of solid, semisolid and liquid lubricant.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

| Sr.No | Equipment Name with Broad Specifications | Relevant LLO Number |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 1 | Vernier Calipers: Range : 0-150mm , Resolution: 0.1mm | 1 |
| 2 | Micrometer screw gauge : Range : 0-25mm, Resolution: 0.01mm, Accuracy ± 0.02 mm or better | 2 |
| 3 | Digital multimeter : 3 1/2 digit display, 9999 counts, digital multimeter measures: Vac, Vdc (1000V max) , DC A, AC A(10 amp max), Resistance (0 - 100 MOhm | 3,4,5,6 |
| 4 | Resistance Box: 4 decade ranges from 1 ohm to 1K,accuracy 0.1 % - 1 % | 3,4,5,6 |
| 5 | Battery eliminator : 0- 12 V ,2A | 3,4,5,6,8,9,10,12 |
| 6 | Boyle's apparatus: U tube manometer , barometer | 11 |
| 7 | Joule's calorimeter : well insulated "mechanical equivalent of heat apparatus" in wooden box, , digital / analog thermometer, | 10,12 |
| 8 | Electronic balance, with the scale range of 0.001g to 500gm pan size 100 mm; response time 3-5 sec.: power requirement 90-250 V, 10 watt | 19,20,21,22,23,24,25,30 |
| 9 | Electric oven inner size 18''x18''x18''; temperature range 100 to 2500 C. with the capacity of 40 lt. | 30 |
| 10 | Ammeter 0-2 amp voltmeter-0-5v DC | 19,20,21,22,23 |
| 11 | Redwood viscometer-I | 26 |
| 12 | Cleveland open cup apparatus | 28 |
| 13 | Abel's close cup apparatus | 29 |

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

| Sr.No | Unit | Unit Title | Aligned COs | Learning Hours | R-Level | U-Level | A-Level | Total Marks |
|-------|------|--------------------------------------------------------|-------------|----------------|---------|---------|---------|-------------|
| 1 | I | Units and Measurements | CO1 | 7 | 2 | 3 | 4 | 9 |
| 2 | II | Electricity, Magnetism and Semiconductors | CO2 | 13 | 3 | 5 | 6 | 14 |
| 3 | III | Thermometry and Fiber Optics | CO3 | 10 | 2 | 4 | 6 | 12 |
| 4 | IV | Chemical bonding | CO4 | 6 | 2 | 3 | 4 | 9 |
| 5 | V | Electro chemistry and Metal Corrosion, its prevent ion | CO5 | 12 | 3 | 4 | 5 | 12 |
| 6 | VI | Engineering Materials and Catalysis | CO6 | 12 | 3 | 5 | 6 | 14 |

| Sr.No | Unit | Unit Title | Aligned COs | Learning Hours | R-Level | U-Level | A-Level | Total Marks |
|--------------------|------|------------|-------------|----------------|-----------|-----------|-----------|-------------|
| Grand Total | | | | 60 | 15 | 24 | 31 | 70 |

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Two unit tests of 30 marks (Physics 15 marks, Chemistry-15 marks) and average of two unit tests.
- For laboratory learning 50 marks (Physics 25 marks, Chemistry-25 marks).

Summative Assessment (Assessment of Learning)

- End semester assessment of 50 marks for laboratory learning (Physics 25 marks, Chemistry-25 marks).
- End semester assessment of 70 marks through online MCQ examination.

XI. SUGGESTED COS - POS MATRIX FORM

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | | | Programme Specific Outcomes* (PSOs) | | |
|-----------------------|----------------------------------------------|-----------------------|---------------------------------------|------------------------|------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------------------|-------|-------|
| | PO-1 Basic and Discipline Specific Knowledge | PO-2 Problem Analysis | PO-3 Design/ Development of Solutions | PO-4 Engineering Tools | PO-5 Engineering Practices for Society, Sustainability and Environment | PO-6 Project Management | PO-7 Life Long Learning | PSO-1 | PSO-2 | PSO-3 |
| CO1 | 3 | 1 | | 2 | 1 | 1 | 1 | | | |
| CO2 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | | | |
| CO3 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | | | |
| CO4 | 3 | 2 | | | 2 | | 1 | | | |
| CO5 | 3 | 2 | 1 | 1 | 2 | | 1 | | | |
| CO6 | 3 | 2 | | | 2 | 1 | 1 | | | |

Legends :- High:03, Medium:02, Low:01, No Mapping: -
 *PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

| Sr.No | Author | Title | Publisher with ISBN Number |
|-------|----------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------|
| 1 | Narlikar J. V. ;Joshi , A. W.; Mathur , Anuradha ; et al | Physics Textbook Part I - Class XI | National Council of Education Research and Training, New Delhi, 2010, ISBN : 8174505083 |
| 2 | Narlikar, J.V.;Joshi , A. W.; Mathur , Anuradha ; et al | Physics Textbook Part II - Class XI | National Council of Education Research and Training, New Delhi, 2015, ISBN : 8174505660 |

| Sr.No | Author | Title | Publisher with ISBN Number |
|-------|--------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 3 | Narlikar J.V.;Joshi , A. W.; Ghatak A.K. et al | Physics Textbook Part I - Class XII | National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506314 |
| 4 | Narlikar, J.V.;Joshi , A. W.; Ghatak A.K. et al | Physics Textbook Part II - Class XII | National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506713 |
| 5 | Haliday, David; Resnik, Robert and Walker, Jearl | Fundamentals of Physics | John Wiley & sons, Hoboken, USA, 2014 ISBN : 812650823X |
| 6 | Jain and Jain | Engineering Chemistry | National Council of Education Research and Training, New Delhi, 2010, ISBN : 8174505083 |
| 7 | Dara S. S. | Engineering Chemistry | National Council of Education Research and Training, New Delhi, 2015, ISBN : 8174505660 |
| 8 | Bagotsky V.S. | Fundamental of electrochemistry | National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506314 |
| 9 | Jain and Jain | Engineering Chemistry | National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506713 |
| 10 | Aryabhata. | The Surya Siddhanta | Baptist Mission press ,Calcutta |
| 11 | Steeramula Rajeswara Sarma | The Archaic And The Exotic : Studies In The History Of Indian Astronomical Instruments | Published by Manohar Book Service, 2008 ISBN 10: 8173045712 / ISBN 13: 9788173045714 |
| 12 | Anju Rawlley,Devdatta V. Saraf | Applied Chemistry with Lab Manual | Khanna Book Publishing Co. (P) Ltd. New Delhi, 2021, ISBN- 978-93-91505-44-8 |
| 13 | Dr. Hussain Jeevakhan | Applied Physics - II | Khanna Book Publishing, (2021), ISBN: 978-93-91505-57-8 |

XIII . LEARNING WEBSITES & PORTALS

| Sr.No | Link / Portal | Description |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 1 | www.sciencejoywagon.com/physicszone | Electricity, Magnetism and Semiconductors , basic of fiber optics |
| 2 | https://phet.colorado.edu | Electricity, Magnetism and Semiconductors ,Thermometry and basic of fiber optics |
| 3 | www.physicsclassroom.com | concepts of basic physics |
| 4 | http://nptel.ac.in/course.php?disciplineId=104 | concepts of basic physics |
| 5 | http://hperphysics.phy-astr.gsu.edu/hbase/hph.html | concepts of basic physics |
| 6 | https://www.youtube.com/results?search_query=amruta+universiti+physics+expts | concepts of basic physics |
| 7 | k. https://www.youtube.com/results?search_query=physics+classes+11+chapter+1 | concepts of basic physics |
| 8 | l. https://www.youtube.com/watch?v=zRGh9_a1J7s | concepts of basic physics |

| Sr.No | Link / Portal | Description |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 9 | https://iksindia.org | IKS physics |
| 10 | www.chem1.com | Chemistry instruction and education |
| 11 | ww.onlinelibrary.wiley.com | Materials and corrosion |
| 12 | www.rsc.org | Catalysis |
| 13 | www.chemcollective.org | Virtual Labs, simulation |
| 14 | https://www.ancient-origins.net/history-famous-people/indian-sage-acharya-kanad-001399 | IKS Philosophy of atom by Acharya Kanad. |
| 15 | https://phet.colorado.edu/en/simulations/filter?subjects=chemistry&type=html,prototype | Identify states of matter of materials by using simulation. |

| | |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Programme Name/s | : Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Dress Designing & Garment Manufacturing/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures |
| Programme Code | : AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DD/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ FC/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ TC/ TE/ TR/ TX |
| Semester | : First |
| Course Title | : COMMUNICATION SKILLS (ENGLISH) |
| Course Code | : 311303 |

I. RATIONALE

The most commonly used medium to express oneself is language. English being a global language is used in all spheres of human life i.e. personal, professional and social. English Language proficiency focuses on strong reading, writing, speaking and listening skills. It will include grammar, vocabulary, comprehension and describing skills to enhance overall language proficiency. English for professional purposes aim to equip the students with necessary language skills required for Public Speaking, presentation and negotiation. English for academic purposes will include academic writing skills and critical thinking considering the need of students to communicate in engineering domain.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to achieve the following industry identified outcome through various learning experiences: "Communicate in written and oral form of English effectively at workplace".

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Construct grammatically correct sentences in English.
- CO2 - Compose paragraphs and dialogues on given situations
- CO3 - Comprehend passages correctly.
- CO4 - Use contextual words in English appropriately
- CO5 - Deliver effective presentations in English using appropriate body language

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

| Course Code | Course Title | Abbr | Course Category/s | Learning Scheme | | | | | | Credits | Paper Duration | Assessment Scheme | | | | | | | | | | Total Marks |
|-------------|--------------------------------|------|-------------------|--------------------------|-----|-----|-------|-------|--------|---------|----------------|-------------------|-------|-----|----|-------------|---|---|----|----|-----|-------------|
| | | | | Actual Contact Hrs./Week | | | SLH | NLH | Theory | | | Based on LL & TL | | | | Based on SL | | | | | | |
| | | | | CL | TL | LL | | | | | | Practical | | | | | | | | | | |
| | | | | | | | FA-TH | SA-TH | Total | | | FA-PR | SA-PR | SLA | | | | | | | | |
| Max | Max | Max | Min | Max | Min | Max | Min | Max | Min | | | | | | | | | | | | | |
| 311303 | COMMUNICATION SKILLS (ENGLISH) | ENG | AEC | 3 | - | 2 | 1 | 6 | 3 | 3 | 30 | 70 | 100 | 40 | 25 | 10 | - | - | 25 | 10 | 150 | |

Total IKS Hrs for Sem. : 0 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination
Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

| Sr.No | Theory Learning Outcomes (TLO's)aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|--------------------------------------------------|-------------------------------------------------------------------------|--------------------------------|
| | | | |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| 1 | <p>TLO 1.1 Use transcription to pronounce words correctly.</p> <p>TLO 1.2 Use prefix and suffix for flexibility and precision in language</p> <p>TLO 1.3 Employ synonyms and antonyms to express similarity and contrast between words.</p> <p>TLO 1.4 Use Homophones to expand their vocabulary</p> <p>TLO 1.5 Make use of the collocations correctly</p> | <p>Unit - I Vocabulary</p> <p>1.1 Phonetics : Vowels(12) Consonants (24) Diphthongs (8)</p> <p>1.2 Prefix & Suffix : . Definition & Examples , List of common prefixes and suffixes</p> <p>1.3 Synonyms & Antonyms : Vocabulary expansion , Context & Usage</p> <p>1.4 Homophones : Identifying Homophones , Meaning & Context , Vocabulary Expansion</p> <p>1.5 Collocations : Definition & identification , Types of collocations</p> | <p>Language Lab Drill Classroom learning Reference Books NPTEL</p> |
| 2 | <p>TLO 2.1 Formulate paragraphs with synchronized sentence structure on the given situation / topic</p> <p>TLO 2.2 Develop dialogues to practice language skill in a structured and meaningful way.</p> | <p>Unit - II Paragraph and Dialogue Writing</p> <p>2.1 Types of paragraphs: Technical , Descriptive , Narrative</p> <p>2.2 Dialogue Writing: i Greetings ii. Development iii. Closing Sentence</p> | <p>Classroom learning Skit Language Lab YouTube videos</p> |
| 3 | <p>TLO 3.1 Respond to the given questions of the specified passage.</p> <p>TLO 3.2 Formulate sentences using new words</p> <p>TLO 3.3 Use correct syntax to construct meaningful sentences for the given situation.</p> <p>TLO 3.4 Respond to the questions on the given seen & unseen passages.</p> | <p>Unit - III Comprehension (Seen and Unseen Passages)</p> <p>3.1 1 Passages from MSBTE workbook 1.Say No to Plastic bags 2.Interview of Dr. APJ Abdul Kalam 3.Maximum Achievements 4.Be Remarkable 5.Arunima Sinha: A Biography 6.Roses of Gratitude</p> <p>3.2 Importance of Comprehension</p> <p>3.3 Unseen Passages</p> <p>3.4 Interpretation of passages in written and Spoken form</p> | <p>Classroom learning interactive session Discussion</p> |
| 4 | <p>TLO 4.1 Describe technical objects with specifications</p> <p>TLO 4.2 Explain the given picture in grammatically correct language.</p> <p>TLO 4.3 Diary Entry on situations</p> <p>TLO 4.4 Translate from English to Marathi/Hindi- vice versa</p> | <p>Unit - IV Communicative Language</p> <p>4.1 Technical objects : i. Heading ii. Description of technical objects</p> <p>4.2 Picture Description : i. Situational picture ii. Describe in your own words</p> <p>4.3 Diary Entry : i. Date ii. Content iii. Name of the writer</p> <p>4.4 Translation of paragraph from English to Marathi/Hindi-Vice versa (Question not to be asked on Translation in Theory Examination)</p> | <p>Language Lab Pictures on situations Classroom learning</p> |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| 5 | TLO 5.1 Cultivate/Develop habit of being presentable TLO 5.2 Formulate speeches for occasions TLO 5.3 Prepare power point presentation TLO 5.4 Use appropriate body language for effective communication | Unit - V Presentation Skills 5.1 Dressing & Grooming : i. Dressing for the occasion ii. Proper grooming 5.2 Speech Writing : i. Situation ii. Salutations iii. Introduction of the topic iv. Description/Body v. Conclusion 5.3 Power Point Presentation : i. Layout ii. Font size iii. Color combination 5.4 Kinesics : i. Facial expressions ii Eye contact iii Postures iv Gestures | Classroom learning Language Lab |

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------|----------------|--------------|
| LLO 1.1 Use transcription in correct form LLO 1.2 Learn to differentiate vowel, diphthong and consonants | 1 | *Write 20 words using phonetic transcription | 2 | CO1 |
| LLO 2.1 Learn correct pronunciation by using headphones in language lab | 2 | Practice pronunciation as per IPA using language lab | 2 | CO1 |
| LLO 3.1 Enhance the understanding of word formation LLO 3.2 Enrich word power LLO 3.3 Construct words with the specific meanings | 3 | *Formulate 20 words using Prefix and Suffix | 2 | CO1 |
| LLO 4.1 Use words and phrases effectively LLO 4.2 Enrich vocabulary LLO 4.3 Develop overall language skills | 4 | *Construct sentences using 20 collocations | 2 | CO1 |
| LLO 5.1 Articulate ideas clearly and effectively LLO 5.2 Improve grammar, punctuation | 5 | *Write two paragraphs of 75 words each | 2 | CO2 |
| LLO 6.1 Add depth to narratives LLO 6.2 Form grammatically correct sentences | 6 | *Compose situational dialogues (Any Two) | 2 | CO2 |
| LLO 7.1 Promote the development of effective communication skills LLO 7.2 .Improve non -verbal communication Skills LLO 7.3 Enhance interpersonal skills LLO 7.4 Build confidence | 7 | Enact Role Plays as per situation and context | 2 | CO5 |
| LLO 8.1 Acquire the ability to convey complex ideas in clear and concise manner LLO 8.2 Expand technical vocabulary LLO 8.3 Enhance the written communication Skills | 8 | *Describe any three technical objects using correct grammar | 2 | CO4 |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------|----------------|--------------|
| LLO 9.1 Develop skills in story telling LLO 9.2 Connect with the audience | 9 | Narrate anecdotes of various situations in English | 2 | CO5 |
| LLO 10.1 Notice and articulate specific elements, colors, shapes, & other visual aids LLO 10.2 Express observations & interpretations clearly and concisely LLO 10.3 Enhance vocabulary | 10 | *Describe a given picture (Any Two) | 2 | CO4 |
| LLO 11.1 Express information in coherent and engaging manner LLO 11.2 Build confidence | 11 | *Introduce oneself and others | 2 | CO5 |
| LLO 12.1 Present complex information in a clear & concise manner LLO 12.2 Develop public speaking skills and presentation skills | 12 | *Prepare a Power point presentation on a given topic | 2 | CO5 |
| LLO 13.1 Improve language skills & expand vocabulary | 13 | *Translate paragraph --English to Marathi/Hindi (vice -Versa) (Any4) | 2 | CO4 |
| LLO 14.1 Reflect on thoughts, feelings, and experiences | 14 | *Write your experience in 50 words on (Four) given situations (Diary Entry) | 2 | CO4 |
| LLO 15.1 Develop language acquisition | 15 | *Respond to the questions based on the given passages | 2 | CO3 |
| LLO 16.1 Build confidence in public speaking LLO 16.2 Enhance the skills in planning and prioritization | 16 | Deliver oral presentations using correct grammar and appropriate body language | 2 | CO5 |

Note : out of above suggestive LLOs -

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Micro project

- Report different types of episodes/anecdotes
- Seminar preparation and presentations
- Make a Podcast episode based on Indian Freedom Fighters
- Summarize the editorial columns of English newspapers
- Summarize the content of an Eminent person's biography / autobiography
- Write a review on the following: Short stories ,Novels ,Films.
- Prepare a booklet on the contribution of eminent Indian scientists
- Prepare a podcast referring ancient literature.
- Prepare blogs, podcast, vlogs
- Prepare a questionnaire & conduct the interview of Industry Personnel, social worker, entrepreneur
- Prepare and participate in debates and extempore speeches

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

| Sr.No | Equipment Name with Broad Specifications | Relevant LLO Number |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 1 | Language Lab with relevant software and Computer system with all necessary components like; motherboard, random access memory (RAM), read-only memory (ROM), Graphics cards, sound cards, internal hard disk drives, DVD drive, network interface card | All |
| 2 | LCD Projector with document reader | All |
| 3 | Smart Board with networking | All |

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

| Sr.No | Unit | Unit Title | Aligned COs | Learning Hours | R-Level | U-Level | A-Level | Total Marks |
|--------------------|------|------------------------------------------|-------------|----------------|-----------|-----------|-----------|-------------|
| 1 | I | Vocabulary | CO1 | 10 | 2 | 4 | 6 | 12 |
| 2 | II | Paragraph and Dialogue Writing | CO2 | 6 | 2 | 4 | 6 | 12 |
| 3 | III | Comprehension (Seen and Unseen Passages) | CO3 | 16 | 5 | 6 | 13 | 24 |
| 4 | IV | Communicative Language | CO4 | 7 | 2 | 4 | 8 | 14 |
| 5 | V | Presentation Skills | CO5 | 6 | 2 | 2 | 4 | 8 |
| Grand Total | | | | 45 | 13 | 20 | 37 | 70 |

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

-

Summative Assessment (Assessment of Learning)

-

XI. SUGGESTED COS - POS MATRIX FORM

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | | | Programme Specific Outcomes* (PSOs) | | |
|-----------------------|----------------------------------------------|-----------------------|---------------------------------------|------------------------|------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------------------|-------|-------|
| | PO-1 Basic and Discipline Specific Knowledge | PO-2 Problem Analysis | PO-3 Design/ Development of Solutions | PO-4 Engineering Tools | PO-5 Engineering Practices for Society, Sustainability and Environment | PO-6 Project Management | PO-7 Life Long Learning | PSO-1 | PSO-2 | PSO-3 |
| CO1 | 1 | 1 | | | | 2 | 1 | | | |
| CO2 | 1 | 1 | | | | 2 | 1 | | | |
| CO3 | 1 | 1 | | | | 2 | 1 | | | |
| CO4 | 1 | 1 | | | | 2 | 1 | | | |
| CO5 | 1 | 1 | | | | 2 | 1 | | | |

Legends :- High:03, Medium:02,Low:01, No Mapping: -

*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

| Sr.No | Author | Title | Publisher with ISBN Number |
|-------|---------------------------------------|----------------------------------|------------------------------|
| 1 | MSBTE | Spectrum, G Scheme and I- Scheme | MSBTE |
| 2 | Kumar, E. Suresh, Sreehari, P Savitri | Effective English with CD | Pearson Education |
| 3 | Gnanamurli | English Grammar at a Glance | S. Chand |
| 4 | CBSE | English Communicative (class X) | Golden |
| 5 | Dr. Anjana Tiwari | Communication Skills in English | Khanna Publishers, New Delhi |

XIII . LEARNING WEBSITES & PORTALS

| Sr.No | Link / Portal | Description |
|-------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| 1 | https://www.britishcouncil.in/english/learn-online | Website link is given to refer Unit 1 |
| 2 | Vocabulary.com | Refer this website for interactive vocabulary quizzes, word lists |
| 3 | International Phonetic Association (IPA) Website | It offers audio examples and charts to help understand and transcribe sounds |
| 4 | grammarly.com/blog | For constructing effective paragraphs and improving clarity |
| 5 | www.newagegolden.com | Refer this website for speech writing, diary entry and paragraph writing |

| | |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Programme Name/s | : Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Telecommunication Engg./ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Hotel Management & Catering Technology/ Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures |
| Programme Code | : AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DE/ DS/ EE/ EJ/ EP/ ET/ EX/ FC/ HA/ HM/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ TC/ TE/ TR/ TX |
| Semester | : First |
| Course Title | : FUNDAMENTALS OF ICT |
| Course Code | : 311001 |

I. RATIONALE

In any typical business setup in order to carry out routine tasks related to create business documents, perform data analysis and its graphical representations and making electronic slide show presentations, the student need to learn various software as office automation tools like word processing applications, spreadsheets and presentation tools. They also need to use these tools for making their project reports and presentations. The objective of this course is to develop the basic competency in students for using these office automation tools to accomplish the job. This course also presents an overview of emerging technologies so that students of different discipline can appraise the applications of these technologies in their respective domain.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcome through various teaching learning experiences: 1) Use computers for Internet services, Electronics Documentation, Data Analysis and Slide Presentation. 2) Appraise Application of ICT based Emerging Technologies.in different domain.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Use computer system and its peripherals for given purpose
- CO2 - Prepare Business document using Word Processing Tool
- CO3 - Analyze Data and represent it graphically using Spreadsheet
- CO4 - Prepare professional Slide Show presentations
- CO5 - Use different types of Web Browsers and Apps
- CO6 - Explain concept and applications of Emerging Technologies

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

| Course Code | Course Title | Abbr | Course Category/s | Learning Scheme | | | | | | Credits | Paper Duration | Assessment Scheme | | | | | | | | | |
|-------------|---------------------|------|-------------------|--------------------------|-----|-----|-----|-----|--------|---------|----------------|-------------------|-------|-------|----|-------------|-------|-------------|-------|-----|-----|
| | | | | Actual Contact Hrs./Week | | | SLH | NLH | Theory | | | Based on LL & TL | | | | Based on SL | | Total Marks | | | |
| | | | | CL | TL | LL | | | | | | Practical | | | | SLA | | | | | |
| | | | | | | | | | | | | FA-TH | SA-TH | Total | | | FA-PR | | SA-PR | Max | Min |
| Max | Max | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | | | | | | | | | | |
| 311001 | FUNDAMENTALS OF ICT | ICT | SEC | 1 | - | 2 | 1 | 4 | 2 | | - | - | - | - | 25 | 10 | 25@ | 10 | 25 | 10 | 75 |

Total IKS Hrs for Sem. : 0 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

| Sr.No | Theory Learning Outcomes (TLO's)aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|--------------------------------------------------|-------------------------------------------------------------------------|--------------------------------|
|-------|--------------------------------------------------|-------------------------------------------------------------------------|--------------------------------|

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| 1 | <p>TLO 1.1 Explain the functions of components in the block diagram of computer system.</p> <p>TLO 1.2 Classify the given type of software</p> <p>TLO 1.3 Explain characteristics of the given type of network</p> <p>TLO 1.4 Describe application of the given type of network connecting device</p> <p>TLO 1.5 Describe procedure to manage a file /folder in the given way.</p> | <p>Unit - I Introduction to Computer System</p> <p>1.1 Basics of Computer System: Overview of Hardware and Software: block diagram of Computer System, Input/Output unit CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit</p> <p>1.2 Internal components: processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives)</p> <p>1.3 External Devices: Types of input/output devices, types of monitors, keyboards, mouse, printers: Dot matrix, Inkjet and LaserJet, plotter and scanner, external storage devices CD/DVD, Hard disk and pen drive</p> <p>1.4 Application Software: word processing, spreadsheet, database management systems, control software, measuring software, photo-editing software, video-editing software, graphics manipulation software System Software compilers, linkers, device drivers, oper</p> <p>1.5 Network environments: network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN, WLAN, Wi-Fi and Bluetooth</p> <p>1.6 Working with Operating Systems: Create and manage file and folders, Copy a file, renaming and deleting of files and folders, Searching files and folders, application installation, creating shortcut of application on the desktop.</p> | <p>Hands-on Demonstration Presentations</p> |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| 2 | <p>TLO 2.1 Write steps to create the given text document.</p> <p>TLO 2.2 Explain the given feature for document editing.</p> <p>TLO 2.3 Explain the given page setup features of a document.</p> <p>TLO 2.4 Write the given table formatting feature.</p> <p>TLO 2.5 Write the steps to set the given type of document layout</p> | <p>Unit - II Word Processing</p> <p>2.1 Word Processing: Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, Previewing a document, Saving a document, Closing a document and exiting application.</p> <p>2.2 Editing a Document: Navigate through a document, Scroll through text, Insert and delete text, Select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting</p> <p>2.3 Changing the Layout of a Document: Adjust page margins, Change page orientation, Create headers and footers, Set and change indentations, Insert and clear tabs</p> <p>2.4 Inserting Elements to Word Documents: Insert and delete a page break, Insert page numbers, Insert the date and time, Insert special characters (symbols), Insert a picture from a file, Resize and reposition a picture</p> <p>2.5 Working with Tables: Insert a table, Convert a table to text, Navigate and select text in a table, Resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent page</p> <p>2.6 Working with Columned Layouts and Section Breaks: a Columns, Section breaks, Creating columns, Newsletter style columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths, Adjust</p> | <p>Hands-on Demonstration Presentations</p> |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| 3 | <p>TLO 3.1 Write steps to create the given spreadsheet.</p> <p>TLO 3.2 Explain the given formatting feature of a worksheet.</p> <p>TLO 3.3 Write steps to insert formula and functions in the given worksheet.</p> <p>TLO 3.4 Write steps to create charts for the given data set.</p> <p>TLO 3.5 Explain steps to perform data filter, sort and validation operations on the given data set.</p> <p>TLO 3.6 Write steps to setup and print a spreadsheet.</p> | <p>Unit - III Spreadsheets</p> <p>3.1 Working with Spreadsheets: Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook.</p> <p>3.2 Editing Worksheet: Insert and select data, adjust row height and column width, delete, move data, insert rows and columns, Copy and Paste, Find and Replace, Spell Check, Zoom In-Out, Special Symbols, Insert Comments, Add Text Box, Undo Changes, - Freeze</p> <p>3.3 Formatting Cells and sheet: Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, Header and Footer, Insert Page Breaks, S</p> <p>3.4 Working with Formula: Creating Formulas, Copying Formulas, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical functions such as sqrt, power, applying conditions using IF.</p> <p>3.5 Working with Charts: Introduction to charts, overview of different types of charts, Bar, Pie, Line charts, creating and editing charts. Using chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart in a separate sheet.</p> <p>3.6 Advanced Operations: Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup options.</p> | <p>Hands-on Demonstration Presentations</p> |
| 4 | <p>TLO 4.1 Write the steps to create the given slide presentation.</p> <p>TLO 4.2 Write the steps to insert multiple media in the given presentation.</p> <p>TLO 4.3 Explain the method of including animation, transition effects in slide show.</p> <p>TLO 4.4 Write steps to apply table features in the given presentation</p> <p>TLO 4.5 Write steps to manage charts in the given presentation</p> | <p>Unit - IV Presentation Tool</p> <p>4.1 Creating a Presentation: Outline of an effective presentation, Identify the elements of the User Interface, Starting a New Presentation Files, Creating a Basic Presentation, Working with textboxes, Apply Character Formats, Format Paragraphs, View a Prese</p> <p>4.2 Inserting Media elements: Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation, insert audio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on a Slide, Format</p> <p>4.3 Working with Tables: Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications.</p> <p>4.4 Working with Charts: Insert Charts in a Slide, Modify a Chart, Import Charts from Other Office Applications.</p> | <p>Hands-on Demonstration Presentations</p> |

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's. | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. | Suggested Learning Pedagogies. |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| 5 | <p>TLO 5.1 Explain use of the given setting option in browsers.</p> <p>TLO 5.2 Explain the given option used for effective searching in search engine</p> <p>TLO 5.3 Explain features of the given web service.</p> <p>TLO 5.4 Explain concepts and applications of emerging technologies</p> <p>TLO 5.5 Use various elementary cloud-based tools.</p> | <p>Unit - V Basics of Internet and Emerging Technologies</p> <p>5.1 World Wide Web: Introduction, Internet, Intranet, Cloud, Web Sites, web pages, URL, web servers, basic settings of web browsers- history, extension, default page, default search engine, creating and retrieving bookmarks, use search engines effectively for</p> <p>5.2 Web Services: e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking</p> <p>5.3 Emerging Technologies: IOT, AI and ML, Drone Technologies, 3D Printing.</p> <p>5.4 Tools: Docs, Drive, forms, quiz, Translate and other Apps</p> | <p>Hands-on Demonstration Presentations</p> |

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|
| <p>LLO 1.1 Identify various Input/output devices, connections and peripherals of computer system</p> <p>LLO 1.2 Work with Computer System, Input/output devices, and peripherals for manages files and folders for data storage.</p> | 1 | <p>* a) Work with Computer System, Input/output devices, and peripherals. b) Work with files and folders</p> | 2 | CO1 |
| <p>LLO 2.1 Create and manage word document.</p> <p>LLO 2.2 Apply formatting features on text at line, paragraph and page level.</p> | 2 | <p>*Work with document files: a) Create, edit and save document in Word Processing. b) Text, lines and paragraph level formatting</p> | 2 | CO2 |
| <p>LLO 3.1 Insert and edit images, shapes in a document file</p> | 3 | <p>Work with Images and Shapes in Word Processing.</p> | 2 | CO2 |
| <p>LLO 4.1 Insert table and apply various table formatting features on it.</p> | 4 | <p>*Work with tables in Word Processing.</p> | 2 | CO2 |
| <p>LLO 5.1 Apply page layout features in word processing.</p> <p>LLO 5.2 Print a document by applying various print options</p> <p>LLO 5.3 Use mail merge in word processing</p> | 5 | <p>*Working with layout and printing a) Document page layout, Themes, and printing. b) Use of mail merge with options.</p> | 2 | CO2 |
| <p>LLO 6.1 Enter and format data in a worksheet.</p> <p>LLO 6.2 Insert and delete cells, rows and columns</p> <p>LLO 6.3 Apply alignment feature on cell</p> | 6 | <p>*Create, open and edit Worksheet.</p> | 2 | CO3 |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------------------|----------------|--------------|
| LLO 7.1 Create formula and “If” condition on cell data LLO 7.2 Apply various functions and named ranges in worksheet. | 7 | *Formulas and functions in Worksheet. | 2 | CO3 |
| LLO 8.1 Implement data Sorting, Filtering and Data validation features in a worksheet. | 8 | *Sort, Filter and validate data in Spreadsheet. | 2 | CO3 |
| LLO 9.1 Create charts using various chart options in spreadsheet. | 9 | *Charts for Visual Presentation in Spreadsheet. | 2 | CO3 |
| LLO 10.1 Print the worksheet by applying various print options for worksheet | 10 | Worksheet Printing. | 2 | CO3 |
| LLO 11.1 Apply design themes to the given presentation LLO 11.2 Insert pictures text/images/shapes in slide LLO 11.3 Use pictures text/images/shapes editing options. | 11 | *Make Slide Show Presentation. | 2 | CO4 |
| LLO 12.1 Add tables and charts in the slides. LLO 12.2 Run slide presentation in different modes LLO 12.3 Print slide presentation as handouts/notes | 12 | *Use Tables and Charts in Slide | 2 | CO4 |
| LLO 13.1 Apply animation effects to the text and slides LLO 13.2 Add/set audio and video files in the presentation. | 13 | *a) Insert Animation effects to Text and Slides. b) Insert Audio and Video files in presentation | 2 | CO4 |
| LLO 14.1 Configure internet connection on a computer system LLO 14.2 Use different web services on internet | 14 | a) Internet connection configuration b) Use Internet and Web Services. | 1 | CO5 |
| LLO 15.1 Configure different browser settings LLO 15.2 Use browsers for the given purpose | 15 | Working with Browsers. | 1 | CO5 |
| LLO 16.1 Create web forms for survey using different options. | 16 | *Prepare Web Forms for Survey. | 1 | CO5 |
| LLO 17.1 Create web forms for Quiz using different options | 17 | *Prepare Web Forms for Quiz | 1 | CO5 |

Note : out of above suggestive LLOs -

- Minimum 12 for 2 LL Hrs./Week or 24 for 4 LL hrs./Week are to be Performed.
- '*' Marked Practicals (LLOs) Are mandatory
- Judicial mix of LLOs are to be performed to complete minimum requirement of 12 / 24 as applicable

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Self Learning

- Following are some suggestive self-learning topics: 1) Use ChatGPT/any other AI tool to explore information. 2) Use Calendar to Schedule and edit activities. 3) Use Translate app to translate the given content from one language to another. 4) Use cloud based storage drive to store and share your files.

Micro project

- The microproject has to be industry application based, internet-based, workshop-based, laboratory-based or field-based as suggested by Teacher. 1) Perform a survey on various input and output devices available in market and make its report. 2) Prepare Time Table, Prepare Notes on Technical Topics, Reports, Biodata with covering letter (Subject teacher shall assign a document to be prepared by each students) 3) Prepare slides with all Presentation features such as: classroom presentation, presentation about department, presentation of Technical Topics. (Subject teacher shall assign a presentation to be prepared by each student). 4) Student Marksheet, Prepare Pay bills, tax statement, student’s assessment record using spreadsheet. (Teacher shall assign a spreadsheet to be prepared by each student). 5) Carry-out Survey on different web browsers. 6) Generate resume for different job profile, survey report of any industry using ChatGPT/any other AI tool.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

| Sr.No | Equipment Name with Broad Specifications | Relevant LLO Number |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 1 | a) Computer System with all necessary Peripherals and Internet connectivity. b) Any Office Software c) Any Browser (Any General Purpose Computer available in the Institute) | All |

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

| Sr.No | Unit | Unit Title | Aligned COs | Learning Hours | R-Level | U-Level | A-Level | Total Marks |
|--------------------|------|----------------------------------------------|-------------|----------------|----------|----------|----------|-------------|
| 1 | I | Introduction to Computer System | CO1 | 2 | 0 | 0 | 0 | 0 |
| 2 | II | Word Processing | CO2 | 3 | 0 | 0 | 0 | 0 |
| 3 | III | Spreadsheets | CO3 | 3 | 0 | 0 | 0 | 0 |
| 4 | IV | Presentation Tool | CO4 | 4 | 0 | 0 | 0 | 0 |
| 5 | V | Basics of Internet and Emerging Technologies | CO5,CO6 | 3 | 0 | 0 | 0 | 0 |
| Grand Total | | | | 15 | 0 | 0 | 0 | 0 |

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Lab performance, Assignment, Self-learning and Seminar/Presentation

Summative Assessment (Assessment of Learning)

- Lab. Performance, viva voce

XI. SUGGESTED COS - POS MATRIX FORM

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | | | Programme Specific Outcomes* (PSOs) | | |
|-----------------------|----------------------------------------------|-----------------------|---------------------------------------|------------------------|------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------------------|-------|-------|
| | PO-1 Basic and Discipline Specific Knowledge | PO-2 Problem Analysis | PO-3 Design/ Development of Solutions | PO-4 Engineering Tools | PO-5 Engineering Practices for Society, Sustainability and Environment | PO-6 Project Management | PO-7 Life Long Learning | PSO-1 | PSO-2 | PSO-3 |
| CO1 | 1 | - | - | - | - | - | 1 | | | |
| CO2 | - | - | - | 3 | - | - | 1 | | | |
| CO3 | - | 2 | 1 | 3 | - | - | 1 | | | |
| CO4 | - | - | - | 3 | - | - | 1 | | | |
| CO5 | 1 | - | - | 3 | - | - | 3 | | | |
| CO6 | 1 | - | - | 3 | - | - | 3 | | | |

Legends :- High:03, Medium:02,Low:01, No Mapping: -
 *PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

| Sr.No | Author | Title | Publisher with ISBN Number |
|-------|---------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------|
| 1 | Goel, Anita | Computer Fundamentals | Pearson Education, New Delhi, 2014, ISBN-13: 978-8131733097 |
| 2 | Miller, Michael | Computer Basics Absolute Beginner's Guide, Windows 10 | QUE Publishing; 8th edition August 2015, ISBN: 978-0789754516 |
| 3 | Alvaro, Felix | Linux: Easy Linux for Beginners | CreatevSpace Independent Publishing Platform- 2016, ISBN-13: 978-1533683731 |
| 4 | Johnson, Steve | Microsoft Office 2010: On Demand | Pearson Education, New Delhi India, 2010. ISBN :9788131770641 |
| 5 | Schwartz, Steve | Microsoft Office 2010 for Windows: Visual Quick Start | Pearson Education, New Delhi India, 2012, ISBN : 9788131766613 |
| 6 | Leete, Gurdy, Finkelstein Ellen, Mary Leete | OpenOffice.org for Dummies | Wiley Publishing, New Delhi, 2003 ISBN : 978-0764542220 |

XIII . LEARNING WEBSITES & PORTALS

| Sr.No | Link / Portal | Description |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 1 | https://www.microsoft.com/en-in/learning/office-training.aspx | Office |
| 2 | http://www.tutorialsforopenoffice.org/ | Open Office |
| 3 | https://s3-ap-southeast-1.amazonaws.com/r4ltue295xy0d/Special_Edition_Using_StarOffice_6_0.pdf | Open Office |

| Sr.No | Link / Portal | Description |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| 4 | https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf | Computer Fundamental |
| 5 | http://www.tutorialsforopenoffice.org/ | Open Office |
| 6 | https://www.tutorialspoint.com/computer_fundamentals/index.htm | Computer Fundamental |
| 7 | https://www.tutorialspoint.com/word/ | Word Processing |
| 8 | https://www.javatpoint.com/ms-word-tutorial | Word Processing |
| 9 | https://support.microsoft.com/en-au/office/word-for-windows-training-7bcd85e6-2c3d-4c3c-a2a5-5ed8847 | Word Processing |
| 10 | https://www.javatpoint.com/excel-tutorial | Spreadsheet |
| 11 | https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb | Spreadsheet |
| 12 | https://www.javatpoint.com/powerpoint-tutorial | Powerpoint Presentation |
| 13 | https://support.microsoft.com/en-au/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-b | Powerpoint Presentation |
| 14 | https://www.geeksforgeeks.org/ms-dos-operating-system/ | Operating System |
| 15 | https://www.javatpoint.com/windows | Windows Operating System |
| 16 | https://www.javatpoint.com/what-is-linux | Linux Operating System |
| 17 | https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT | IoT |
| 18 | https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/ | IoT |
| 19 | https://www.javatpoint.com/machine-learning | AI & Machine Learning |
| 20 | https://www.skillrary.com/blogs/read/introduction-to-drone-technology | Drone Technology |
| 21 | https://www.cnet.com/tech/computing/what-is-3d-printing/ | 3D Printing |
| 22 | https://support.google.com/a/users/answer/9389764?hl=en | Apps |