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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 | Paper Duration | Assessment Scheme | | | | | | | | | | Total Marks |
|-------------|--|------|-------------------|--------------------------|----|----|-------|-------|---------|----------------|-------------------|------------------|-------|-----|-------|-------------|-----|-----|-----|---|-------------|
| | | | | Actual Contact Hrs./Week | | | SLH | NLH | | | Theory | Based on LL & TL | | | | Based on SL | | | | | |
| | | | | | | | | | | | | Practical | | | | | | | | | |
| | | | | CL | TL | LL | FA-TH | SA-TH | | | | Total | FA-PR | | SA-PR | | SLA | | | | |
| | | | | | | | | | | | Max | | Min | 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
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 Follow safety practices.</p> <p>TLO 1.2 Explain the procedure for extinguishing fire.</p> <p>TLO 1.3 Use firefighting equipment.</p> <p>TLO 1.4 Locate various machines and equipment in workshop.</p> <p>TLO 1.5 Follow good housekeeping.</p> | <p>Unit - I General Workshop Practice</p> <p>1.1 Safety practices, causes of accidents, general safety rules, safety signs and symbols</p> <p>1.2 First aid</p> <p>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</p> <p>1.4 Workshop layout</p> <p>1.5 Issue and return system of tools, equipment and consumables</p> | <p>Demonstrate operation of available extinguisher in workshop</p> <p>Show first aid box</p> <p>Practice by students for handling fire extinguisher</p> |
| 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, filling, scraping, grinding, marking, sawing, drilling, tapping, reaming etc.</p> | <p>Demonstrate various types of tools available in fitting shop with its utility</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 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> | Hands on practice |
| 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> | Hands on practice demonstration video on use of soldering station |

| 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 |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|--|-------|--|----------------|--------------|
| LLO 6.1 Identify various sheet metal tools based on given situation. | 6 | Identification of sheet metal tools for given specifications | 2 | CO2 |
| LLO 7.1 Prepare the fitting job as per given drawings Part-I. LLO 7.2 Prepare the fitting job as per given drawings Part-II. LLO 7.3 Prepare the fitting job as per given drawings Part-III. LLO 7.4 Prepare the fitting job as per given drawings Part-IV LLO 7.5 Prepare the fitting job as per given drawings Part-V. | 7 | Fitting job preparation | 10 | CO2 |
| 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 |

| Practical / Tutorial / Laboratory Learning Outcome (LLO) | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles | Number of hrs. | Relevant COs |
|---|-------|--|----------------|--------------|
| 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 : NOTE i. A suggestive list of practical LLOs is given in the table, more such practical LLOs can be added to attain the COs and competency. A judicious mix of minimum 24 or more practical LLOs need to be performed, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry. ii. Hence, the 'Process' and 'Product' related skills associated with each LLOs of the laboratory work are to be assessed according to a suggested sample of Performance Indicators (Weightage in %) as follows: 1) Preparation of experimental set up 20%. 2) Setting and operation 20%. 3) Safety measures 10%. 4) Observations and recording 10%. 5) Interpretation of result and conclusion 20%. 6) Answer to sample questions 10%. 7) Submission of report in time 10%. | | | | |

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 |
|-------|--|---------------------|
|-------|--|---------------------|

| 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 |
| 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 FOR 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 |
|--------------|--|---|---|
| 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=lUojO1HvC8c | 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 |

