

Government of Pakistan

National Vocational and Technical Training Commission

Prime Minister's Hunarmand Pakistan Program

"Skills for All"



Course Contents / Lesson Plan

Course Title: Mechatronics (Robotics)

Duration: 6 Months

Revised Edition

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| Trainer Name | |
| Course Title | Mechatronics (Robotics) |
| Objectives and Expectations | <p>Employable skills and hands-on practice for Mechatronics (Robotics)</p> <p>The future of technological advancement will thrive on the synergetic use of interdisciplinary/multi-disciplinary skill-set such as mechatronic engineering. It is a relatively new engineering discipline based on cross-pollination between electro-mechanical and computer engineering practices. This course covers the breadth of mechatronic engineering topics that underscore both the existing and future needs of our industry. It aims at inculcating a wide array of skill-set ranges in the students so that they can become a contributor to the indigenous design and development of solutions to mechatronic problems of national relevance.</p> <p>The primary objective of this course is to build the capacity of trainees in the following core areas of mechatronic engineering. These include:</p> <ol style="list-style-type: none"> 1. CAD/CAM, 3D Modeling 2. Computer programming language 3. Logic design and embedded systems 4. Instrumentation, sensors, and actuators 5. Automation 6. Control systems 7. Emerging technologies including the Internet of Things (IoT), Augment Reality (AR) / Virtual Reality (VR) <p><u>Main Expectations:</u></p> <p>In short, the course under reference should be delivered by professional instructors in such a robust hands-on manner that the trainees are comfortably able to employ their skills for earning money (through wage/self-employment) at its conclusion.</p> <p>This course thus clearly goes beyond the domain of the traditional training practices in vogue and underscores an expectation that a market-centric approach will be adopted as the main driving force while delivering it. The instructors should therefore be experienced enough to be able to identify the training needs for the possible market roles available out there. Moreover, they should also know the strengths and weaknesses of each trainee to prepare them for such market roles during/after the training.</p> <ol style="list-style-type: none"> i. Specially designed practical tasks to be performed by the trainees have been included in the Annexure-I to this document. The record of all tasks performed individually or in groups must be preserved by the management of the training Institute clearly labeling name, trade, session, etc so that these are ready to be physically inspected/verified through monitoring visits from time to time. The weekly distribution of tasks has also been indicated in the weekly lesson plan given in this document. ii. To materialize the main expectations, a special module on <u>Job Search & Entrepreneurial Skills</u> has been included in the latter part of this course (5th & 6th month) through which, the trainees will be made aware |

of the Job search techniques in the local as well as international job markets (Gulf countries). Awareness around the visa process and immigration laws of the most favored labor destination countries also form a part of this module. Moreover, the trainees would also be encouraged to venture into self-employment and exposed to the main requirements in this regard. It is also expected that a sense of civic duties/roles and responsibilities will also be inculcated in the trainees to make them responsible citizens of the country.

- iii. A module on **Work Place Ethics** has also been included to highlight the importance of good and positive behavior in the workplace in the line with the best practices elsewhere in the world. An outline of such qualities has been given in the Appendix to this document. Its importance should be conveyed in a format that is attractive and interesting for the trainees such as through PPT slides +short video documentaries. Needless to say that if the training provider puts his heart and soul into these otherwise non-technical components, the image of the Pakistani workforce would undergo a positive transformation in the local as well as international job markets.

To maintain interest and motivation of the trainees throughout the course, modern techniques such as:

- Motivational Lectures
- Success Stories
- Case Studies

These techniques would be employed as an additional training tool wherever possible (these are explained in the subsequent section on Training Methodology).

Lastly, evaluation of the competencies acquired by the trainees will be done objectively at various stages of the training and a proper record of the same will be maintained. Suffice to say that for such evaluations, practical tasks would be designed by the training providers to gauge the problem-solving abilities of the trainees.

(i) **Motivational Lectures**

The proposed methodology for the training under reference employs motivation as a tool. Hence besides the purely technical content, a trainer is required to include elements of motivation in his/her lecture. To inspire the trainees to utilize the training opportunity to the full and strive towards professional excellence. Motivational lectures may also include general topics such as the importance of moral values and civic role & responsibilities as a Pakistani. A motivational lecture should be delivered with enough zeal to produce a deep impact on the trainees. It may comprise of the following:

- Clear Purpose to convey the message to trainees effectively.
- Personal Story to quote as an example to follow.
- Trainees fit so that the situation is actionable by trainees and not represent a just idealism.
- Ending Points to persuade the trainees on changing themselves.

A good motivational lecture should help drive creativity, curiosity, and spark the desire needed for trainees to want to learn more.

The impact of a successful motivational strategy is amongst others commonly

visible in increased class participation ratios. It increases the trainees' willingness to be engaged on the practical tasks for a longer time without boredom and loss of interest because they can see in their mind's eye where their hard work would take them in short (1-3 years); medium (3 -10 years) and long term (more than 10 years).

As this tool is expected that the training providers would make arrangements for regular well planned motivational lectures as part of a coordinated strategy interspersed throughout the training period as suggested in the weekly lesson plans in this document.

Course-related motivational lectures online link is available in **Annexure-II**.

(ii) Success Stories

Another effective way of motivating the trainees is by means of Success Stories. Its inclusion in the weekly lesson plan at regular intervals has been recommended till the end of the training.

A success story may be disseminated orally, through a presentation, or using a video/documentary of someone that has risen to fortune, acclaim, or brilliant achievement. A success story shows how a person achieved his goal through hard work, dedication, and devotion. An inspiring success story contains compelling and significant facts articulated clearly and easily comprehensible words. Moreover, it is helpful if it is assumed that the reader/listener knows nothing of what is being revealed. The optimum impact is created when the story is revealed in the form of:-

- Directly in person (At least 2-3 cases must be arranged by the training institute)
- Through an audio/ videotaped message (2-3 high-quality videos must be arranged by the training institute)

It is expected that the training provider would collect relevant high-quality success stories for inclusion in the training as suggested in the weekly lesson plan given in this document.

Suggestive structure and sequence of a sample success story and its various shapes can be seen in **Annexure III**.

(iii) Case Studies

Where a situation allows, case studies can also be presented to the trainees to widen their understanding of the real-life specific problem/situation and to explore the solutions.

In simple terms, the case study method of teaching uses a real-life case example/a typical case to demonstrate a phenomenon in action and explain theoretical as well as practical aspects of the knowledge related to the same. It is an effective way to help the trainees comprehend in depth both the theoretical and practical aspects of the complex phenomenon in depth with ease. Case teaching can also stimulate the trainees to participate in discussions and thereby boost their confidence. It also makes the classroom atmosphere interesting thus maintaining the trainee's interest in training till the end of the course.

Depending on suitability to the trade, the weekly lesson plan in this document

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| | <p>may suggest case studies be presented to the trainees. The trainer may adopt a PowerPoint presentation or video format for such case studies whichever is deemed suitable but only those cases must be selected that are relevant and of a learning value.</p> <p>The Trainees should be required and supervised to carefully analyze the cases.</p> <p>For this purpose, they must be encouraged to inquire and collect specific information/data, actively participate in the discussions, and intended solutions to the problem/situation.</p> <p>Case studies can be implemented in the following ways: -</p> <ol style="list-style-type: none"> A good quality trade-specific documentary (At least 2-3 documentaries must be arranged by the training institute) Health & Safety case studies (2 cases regarding safety and industrial accidents must be arranged by the training institute) Field visits(At least one visit to a trade-specific major industry/ site must be arranged by the training institute) |
| Entry-level of trainees | Bachelors |
| Learning Outcomes of the course | <p>Upon completion of this course, the trainees will be able to:</p> <ul style="list-style-type: none"> • Apply engineering drawing techniques for the correct graphical representation of components of mechatronic systems • Model, simulate and analyze the dynamics of mixed-disciplinary physical systems • Program computers for the software solution components of an engineering problem • Design and develop the digital logic-based solution • Program microcontrollers and PLCs for a variety of automation solutions • Interface sensors and actuators with microcontrollers • Apply instrumentation and control system techniques to industrial processes and settings • Steadily develop advanced skills for the operator and troubleshoot complex systems. |

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| Course Execution Plan | <p>Total Duration of Course: 6 Months (26 Weeks)</p> <p>Class Hours: 4 Hours per day</p> <p>Theory: 20% Practical: 80%</p> <p>Weekly Hours: 20 Hours Per week</p> <p>Total Contact Hours: 520 Hours</p> |
| Companies offering jobs in the respective trade | <ol style="list-style-type: none"> 1. Packaging Mall 2. Interloop 3. Tetrapak 4. Nestle 5. Foji Fertilizer 6. Fatima Fertilizer 7. Rafhan mills 8. Ibrahim Fiber 9. Millat Tractor 10. Wah Industries 11. Automobile industries 12. Government institutes |
| Job Opportunities | <p>Mechatronics (Robotics) equipment can be used to minimize risks to people in dangerous situations or to perform routine manufacturing tasks. As the applications for robots expand, more and more careers may involve some work with robotics - learn about a few here.</p> <p>Several careers involve designing, constructing, operating, or programming robotics, as well as selling robotics equipment. Individuals interested in working with robotics will find that they have options in fields like engineering, information technology, and sales.</p> <ul style="list-style-type: none"> • Mechanical engineers • Aerospace engineering and operations technicians • Electro-mechanical technicians • Sales engineers • Computer and information research scientists • Computer programmers |
| No of Students | 25 |
| Learning Place | Classroom / Lab |
| Instructional Resources | <p>Development Platform:</p> <ul style="list-style-type: none"> • http://roboticopenplatform.org/ • https://www.roboticsbusinessreview.com/rbr/5_diy_robotics_platforms_for_makers/ <p>Learning Material:</p> <ul style="list-style-type: none"> • Introduction to Robotics by Craig • Autonomous mobile robots by Seigwart et al. • Computer and Machine Vision: Theory, Algorithms, Practicalities by E.R. Davies • MATLAB r2018b with Image Processing and Computer Vision Toolbox |

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| | <ul style="list-style-type: none">• Computer Lab• Mechatronic system Maintenance and Instruction Manuals |
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MODULES

| Scheduled Week | Module Title | Learning Units | Remarks |
|----------------|---|---|--|
| Week 1 | ➤ Introduction | Motivational Lecture (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Course Introduction • Success stories • Job market • Course Applications • Institute/work ethics • What is Mechatronic engineering? • Examples and applications of mechatronic systems | Home Assignment <ul style="list-style-type: none"> • Task 1 • Task 2 <p><i><u>Details may be seen at Annexure-I</u></i></p> |
| Week 2 | <u>Module -1</u> Chapter 1 CAD/CAM | Success stories (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Engineering drawing • Computer-Aided Design (CAD) • Computer-Aided Manufacturing (CAM) • Relevant software | <ul style="list-style-type: none"> • Task 3 <p><i><u>Details may be seen at Annexure-I</u></i></p> |
| Week 3 | Chapter 2 2D Modeling | Motivational Lecture (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • 2D modeling • 2D drafting • parametric modeling | <ul style="list-style-type: none"> • Task 4 <p><i><u>Details may be seen at Annexure-I</u></i></p> |
| Week 4 | Chapter 3 3D Modelling | Success stories (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • 3D modeling • 3D drafting • Design documentation | <ul style="list-style-type: none"> • Task5 • Task 6 <p><i><u>Details may be seen at Annexure-I</u></i></p> |
| Week 5 | Chapter 4 CAM Software Programming | Motivational Lecture (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • CAM programming • Relevant Software tools • Simulation using CAM software | <ul style="list-style-type: none"> • Task7 <p><i><u>Details may be seen at Annexure-</u></i></p> |

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| | | | <u>!</u> |
| Week 6 | Module 2 Chapter 1 Basics of Control Systems | Success stories (For further detail please see Page No: 3& 4) <ul style="list-style-type: none"> • Introduction to Control Systems • Types of Feedback in Control Systems • Introduction to Matlab | <ul style="list-style-type: none"> • Task 8 <u>Details may be seen at Annexure-!</u> |
| Week 7 | Chapter 2 Time Response Analysis of Control Systems | Motivational Lecture (For further detail please see Page No: 3& 4) <ul style="list-style-type: none"> • Block Diagram Reduction • Signal Flow Graphs • Time Response Analysis • Performing Time response analysis in Matlab | <ul style="list-style-type: none"> • Task 9 <u>Details may be seen at Annexure-!</u> |
| Week 8 | Chapter 3 Stability of Control Systems | Success stories (For further detail please see Page No: 3& 4) <ul style="list-style-type: none"> • First Order Control Systems • Second Order Control Systems • Steady State Errors • Implement PID in Matlab | <ul style="list-style-type: none"> • Task 9a <u>Details may be seen at Annexure-!</u> |
| Week 9 | Chapter 4 | Motivational Lecture (For further detail please see Page No: 3& 4) <ul style="list-style-type: none"> • Stability of a Control System • Stability Analysis of Control Systems • Root Locus Method • Improve stability of PID in Matlab | <ul style="list-style-type: none"> • Task 9b <u>Details may be seen at Annexure-!</u> |
| Week 10 | Module 3 Chapter 1 Embedded Systems | Success stories (For further detail please see Page No: 3& 4) <ul style="list-style-type: none"> • Basics of embedded systems • Basics of microprocessor and microcontroller • Difference between microprocessors and microcontrollers | <ul style="list-style-type: none"> • Task 10 <u>Details may be seen at Annexure-!</u> |
| Week 11 | Chapter 2 Microcontrollers Programming | Motivational Lecture (For further detail please see Page No: 3& 4) <ul style="list-style-type: none"> • The architecture of microcontroller | <ul style="list-style-type: none"> • Task 11 <u>Details may be seen at</u> |

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| | | (e.g. Arduino, PIC) <ul style="list-style-type: none"> • Programming microcontrollers in Assembly language • Programming microcontrollers in a high-level language (e.g. C/C++) | <u>Annexure-I</u> |
| Week 12 | Chapter 3 Computer Programming Language(s) | Success stories (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Classification of languages • Fundamental concepts of assembly language • Fundamental concepts of C language | <ul style="list-style-type: none"> • Task 12 • Task 13 <u>Details may be seen at Annexure-I</u> |
| Week 13 | Chapter 4 Sensors and Actuators | Motivational Lecture (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Basics of sensors • Basics of actuators • Interfacing sensors with microcontrollers • Interfacing actuators with microcontrollers | <ul style="list-style-type: none"> • Task 14 • Task 14A <u>Details may be seen at Annexure-I</u> |
| Week 14 | Module 4 Chapter 1 Instrumentation | Success stories (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Fundamentals of instrumentation • Basic instruments used in industry • Temperature sensors • Load Sensors, light sensors, and proximity sensors • Thermo-couples to measure temperature | <ul style="list-style-type: none"> • Home Assignment |
| Week 15 | Mid-Term Assignment | | |
| Week 16 | Module 5 Chapter 1 Industrial Control System (I) | Motivational Lecture (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Basics of Industrial Control System • Fundamentals of automatic process plants • Basic principles of reading and analyzing process drawings • Technical safety | <ul style="list-style-type: none"> • Task 15 • Task 15A <u>Details may be seen at Annexure-I</u> |
| Week 17 | Chapter 2 Industrial Control System (II) | Success stories (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Technical safety | <ul style="list-style-type: none"> • Task 16 <u>Details may be</u> |

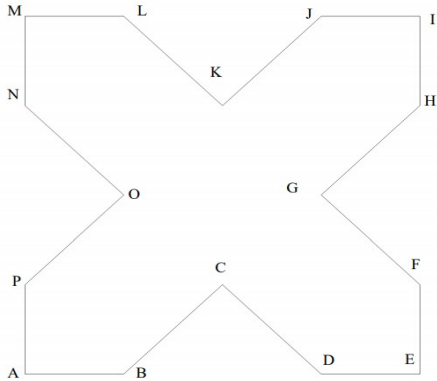
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| | | <ul style="list-style-type: none"> • PLCs programming • Supervisory control and distributed control systems • Graphical user interface • Communication protocols and system integration | <u>seen at Annexure-I</u> |
| Week 18 | Module 6 Chapter 1 AR and VR in Mechatronics | Motivational Lecture (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Game Development Engine (e.g. Unity3D® which has good support for both VR and AR) • Software development kit for VR systems (e.g. Unity VR) • Software development kit for AR systems • Interfacing microcontrollers with VR/AR tools | <ul style="list-style-type: none"> • Task 17 <u>Details may be seen at Annexure-I</u> |
| Week 19 | Module 7 Chapter 1 Hydraulic and Pneumatic Systems | Success stories (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Principles of fluid mechanics • Basics of hydraulic systems • Basics of pneumatics systems • Different types of hydraulic systems • Electro-hydraulic and electro-pneumatic systems | Home Assignment |
| Week 20 | Chapter 2 Industrial Standards | Motivational Lecture (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Fundamental of industrial standards • Design of hydraulics systems • Design of pneumatic systems • Introduction to fluid mechanics circuit diagrams | <ul style="list-style-type: none"> • Task 17A <u>Details may be seen at Annexure-I</u> <ul style="list-style-type: none"> • Class Presentation |
| Week 21 | Employable Project/Assignment (6 weeks i.e. 21-26) besides regular classes. OR On the job training (2 weeks) | <ul style="list-style-type: none"> • Guidelines to the Trainees for selection of students employable project like final year project (FYP) • Assign Independent project to each Trainee • A project-based on trainee's aptitude and acquired skills. • Designed by keeping in view the emerging trends in the local market as well as across the globe. | |

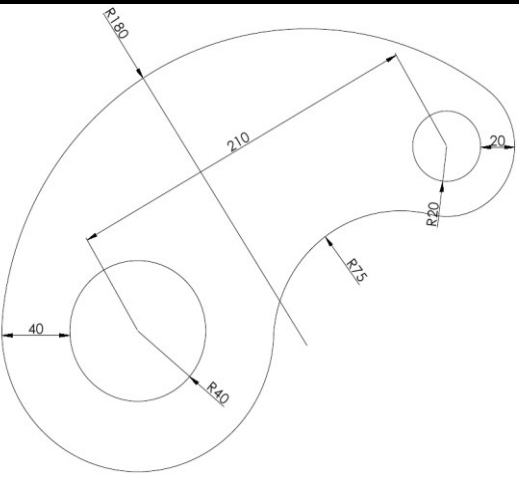
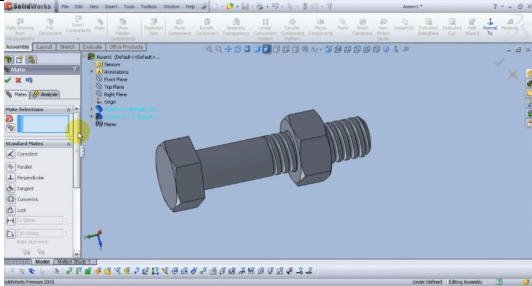
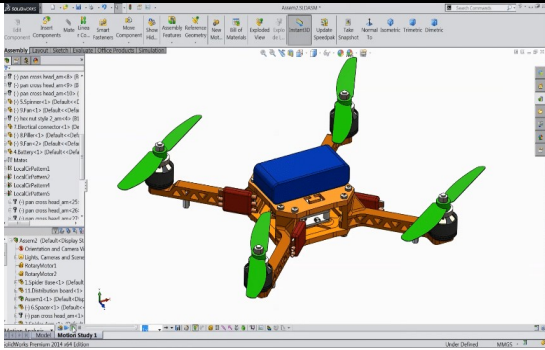
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| | | <ul style="list-style-type: none"> • The project idea may be based on Entrepreneur. • Leading to successful employment. • The duration of the project will be 6 weeks • Ideas may be generated via different sites such as: https://1000projects.org/ https://nevonprojects.com/ https://www.freestudentprojects.com/ https://technofizi.net/best-computer-science-and-engineering-cse-project-topics-ideas-for-students/ • Final viva/assessment will be conducted on project assignments. • At the end of the session, the project will be presented in a skills competition • The skill competition will be conducted on zonal, regional, and National levels. • The project will be presented in front of Industrialists for commercialization • The best business idea will be placed in the NAVTTC business incubation center for commercialization. <p style="text-align: center;">OR</p> <p>On the job training for 2 weeks:</p> <ul style="list-style-type: none"> • Aims to provide 2 weeks of industrial training to the Trainees as part of the overall training program • Ideal for the manufacturing trades • As an alternative to the projects that involve expensive equipment • Focuses on increasing Trainee's motivation, productivity, efficiency, and quick learning approach. | |
| Week 22 | Chapter 4 Introduction to Hydraulic and Pneumatic Components | Motivational Lecture (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Working principles of hydraulic and pneumatic components • Drives, pumps, reservoirs, filters, coolers, and heaters • Valves: sizing routines, PVs, DCVs, NRVs, FCVs • Cylinders and motors | Home assignment |
| Week 22 | Module 8 Chapter 1 Maintenance of | Success stories (<i>For further detail please see Page No: 3& 4</i>) | <ul style="list-style-type: none"> • Task 18 <i>Details</i> |

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| | Mechatronic Systems | <ul style="list-style-type: none"> • Maintenance operations • Operating principles of mechanical systems and electromechanical systems • Operating principles of hydraulic and pneumatic systems | <u>may be seen at Annexure-I</u> |
| Week 23 | Chapter 2 Maintenance of Mechatronic Systems | Motivational Lecture (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Electronic Control System • Process Control Systems • The basic strategy for fault detection in mechatronics systems • Troubleshooting electromechanical systems system | |
| Week 24 | Module 9 Chapter 1 Freelancing in Mechatronic System (I) | Success stories (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Basics of freelancing careers • Complete guide on how to make a successful gig • What are buyer requests? • Importance of testing, verification, and validation | |
| Week 25 | Chapter 2 Freelancing in Mechatronic Systems (II) | Motivational Lecture (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • On choosing/selecting appropriate project according to acquired skill-set • Microcontroller based products • Mechanical design and manufacturing based products • Integrated solutions to mechatronic engineering-related problems | |
| Week 26 | Entrepreneurship and Final Assessment in project | Success stories (<i>For further detail please see Page No: 3& 4</i>) <ul style="list-style-type: none"> • Job Market Searching • Self-employment • Freelancing sites • Introduction • Fundamentals of Business Development • Entrepreneurship • Startup Funding • Business Incubation and Acceleration • Business Value Statement • Business Model Canvas | |

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| | | <ul style="list-style-type: none"> • Sales and Marketing Strategies • How to Reach Customers and Engage CxOs • Stakeholders Power Grid • RACI Model, SWOT Analysis, PEST Analysis • SMART Objectives • OKRs • Cost Management (OPEX, CAPEX, ROCE, etc.) • Final Assessment | |
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Tasks For Certificate in Mechatronics (Robotics)

| Task No. | Task | Description | Week |
|----------|-----------------------------|--|--------|
| 1 | Search Job Market | <ul style="list-style-type: none"> Search videography jobs available in Pakistan Enlist at least five videography job titles | Week 1 |
| 2 | Learn Ethics | Prepare a list of your values and prioritize the top 10 values | |
| 3 | Create 2D Design in AutoCAD |  <p>Coordinates: A=(290,100), B=(340,100), C=(390,150), D=(440,100), E=(490,100), F=(490,150), G=(440,200), H=(490,250), I=(490,300), J=(440,300), K=(390,250), L=(340,300), M=(290,300), N=(290,250), O=(340,200), P=(290,150).</p> <p>* Based on the concept of coordinates. You are expected to draw these figures using entirely the coordinate system and the command windows.</p> | Week 2 |

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| 4 | Create 2D Design in AutoCAD |  | Week 3 |
| 5 | Create 3D Design in AutoCAD |  <p>Nut and Bolt</p> | Week 4 |
| 6 | Create 3D Design in AutoCAD |  <p>Quadcopter</p> | |
| 7 | CAM design | <ul style="list-style-type: none"> Use appropriate software to design a simple component and produce a part program which could be post-processed and used to manufacture it on a CNC machine | Week 5 |

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| 8 | Getting started with Matlab | <ul style="list-style-type: none"> Install and configure Matlab on your computer Run the commands available at https://www.tutorialspoint.com/matlab/matlab_commands.htm | Week 7 |
| 9 | Time Response Analysis in Matlab | <p>9a</p> <ul style="list-style-type: none"> Find Rise time, settling time, and other step-response characteristics in Matlab https://www.mathworks.com/help/control/ref/lti.stepinfo.html <p>9b</p> <ul style="list-style-type: none"> Design PID Controller in Matlab https://www.mathworks.com/discovery/pid-control.html Tune the designed PID controller in Matlab | Week 8 |
| 10 | Mini project using embedded system | <p>Design of Smart Traffic Light Controller Using Embedded System https://iosrjournals.org/iosr-jce/papers/Vol10-issue1/E01013033.pdf?id=201</p> <p>*Note: The above example is just provided for help. The student may choose from a variety of projects available online and get it approved by the instructor</p> | Week 10 |
| 11 | Mini project using microcontroller | <p>Traffic Light System Controller using Microcontroller https://www.elprocus.com/advanced-microcontroller-based-mini-projects-for-engineering-students/</p> <p>Note: The above example is just provided for help. The student may choose from a variety of projects available online and get it approved by the instructor</p> | Week 11 |
| 12 | Check Whether a Number is Palindrome or Not | <ul style="list-style-type: none"> Write C++ Program to Check Whether a Number is Palindrome or Not | Week 12 |
| 13 | Swap Two Numbers | <ul style="list-style-type: none"> Write C++ Program to Swap Two Numbers | |
| 14 | Interface Sensor and Actuator | <p>The interface of various sensors (temperature, pressure, humidity, motion, etc.) and actuators (hydraulic, Pneumatic, electrical, mechanical, etc.) with microcontroller and and show the final reading/ results to the instructor</p> | Week 13 |
| 14A | Build your CV | <p>Download professional CV template from any good site (https://www.coolfreecv.com or relevant)</p> <ul style="list-style-type: none"> Add Personal Information Add Educational details Add Experience/Portfolio | Week 13-14 |

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| | | <ul style="list-style-type: none"> • Add contact details/profile links | |
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| 15 | Prepare a chart for Health, Safety, and environment (HSE) practices being followed globally. | Prepare a chart for Health, Safety, and environment (HSE) practices being followed globally. | Week 16 |
| 15A | Create an account profile on Fiverr (at least two gigs) and Upwork | Create an account by following these steps: Step 1: Personal Info Step 2: Professional Info Step 3: Linked Accounts Step 4: Account Security | Week 16 onwards |
| 16 | Surf Internet and choose a mini-project related to Industrial Control System. Prepare its prototype | Surf Internet and choose a mini-project related to Industrial Control System. Prepare its prototype | Week 17 |
| 17 | Unity coding (AR/VR) | https://unity.com/how-to/beginner-game-coding-resources | Week 18 |
| 17A | How to search and apply for jobs in at least two labor marketplace countries (KSA, UAE, etc.) | <ul style="list-style-type: none"> • Browse the following website and create an account on each website <ul style="list-style-type: none"> ▪ Bayt.com – The Middle East Leading Job Site ▪ Monster Gulf – The International Job Portal ▪ Gulf Talent – Jobs in Dubai and the Middle East • Find the handy ‘search’ option at the top of your homepage to search for the jobs that best suit your skills. • Select the job type from the first ‘Job Type’ drop-down menu, next, select the location from the second drop-down menu. • Enter any keywords you want to use to find suitable job vacancies. • On the results page you can search for part-time jobs only, full-time jobs only, employers only, or agencies only. Tick the boxes as appropriate to your search. • Search for jobs by: <ul style="list-style-type: none"> ▪ Company ▪ Category | Week 20 onwards |

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| | | <ul style="list-style-type: none"> ▪ Location ▪ All jobs ▪ Agency ▪ Industry | |
| 18 | Troubleshooting | <ul style="list-style-type: none"> • Detect Fault in the assigned system • Take corrective measure • Generate Report | Week 22-23 |

Mechatronics(Robotic)

Controlling Robots with Virtual Reality | Unique Invention By Pakistani Students

https://www.youtube.com/watch?v=2XLu_aj4ySk

Pakistan Army Inducts NRTC Rattler and Hadaf Robo

<https://www.youtube.com/watch?v=0bm3kvQX2t0>

What Is the Role of Good Manners in the Workplace? By Qasim Ali Shah | In Urdu

<https://www.youtube.com/watch?v=Qi6Xn7yKIIQ>

What is freelancing and how you can make money online - BBCURDU

<https://www.youtube.com/watch?v=9jCJN3Ff0kA>

Hisham Sarwar Motivational Story | Pakistani Freelancer

https://www.youtube.com/watch?v=CHm_BH7xAXk

Annexure-II

SUGGESTIVE FORMAT AND SEQUENCE ORDER OF MOTIVATIONAL LECTURE.

Mentor

Mentors are provided an observation checklist form to evaluate and share their observational feedback on how students within each team engage and collaborate in a learning environment. The checklist is provided at two different points: Once towards the end of the course. The checklists are an opportunity for mentors to share their unique perspective on group dynamics based on various team activities, gameplay sessions, pitch preparation, and other sessions, giving insights on the nature of communication and teamwork taking place and how both learning outcomes and the student experience can be improved in the future.

Session- 1 (Communication):

Please find below an overview of the activities taking place Session plan that will support your delivery and an overview of this session's activity.

| Session- 1 OVERVIEW |
|---|
| Aims and Objectives: |
| <ul style="list-style-type: none">• To introduce the communication skills and how it will work• Get to know mentor and team - build rapport and develop a strong sense of a team• Provide an introduction to communication skills• Team to collaborate on an activity sheet developing their communication, teamwork, and problem-solving• Gain an understanding of participants' own communication skills rating at the start of the program |

| Activity: | Participant Time | Teacher Time | Mentor Time |
|--|------------------|--------------|------------------------------|
| Intro Attend and contribute to the scheduled. | | | |
| Understand good communication skills and how it works. | | | |
| Understand what good communication skills mean | | | |
| Understand what skills are important for good communication skills | | | |
| Key learning outcomes: | Resources: | | Enterprise skills developed: |

| | | |
|---|---|--|
| <ul style="list-style-type: none"> • Understand the communication skills and how it works. • Understand what communication skills mean • Understand what skills are important for communication skills | <ul style="list-style-type: none"> • Podium • Projector • Computer • Flip Chart • Marker | <ul style="list-style-type: none"> • Communication • Self Confidence • Teamwork |
|---|---|--|

| Schedule | Mentor Should do |
|--|---|
| Welcome: 5 min | Short welcome and ask the Mentor to introduce him/herself. Provide a brief welcome to the qualification for the class. Note for Instructor: Throughout this session, please monitor the session to ensure nothing inappropriate is being happened. |
| Icebreaker: 10 min | Start your session by delivering an icebreaker, this will enable you and your team to start to build rapport and create a team presentation for the tasks ahead. The icebreaker below should work well at introductions and encouraging communication, but feel free to use others if you think they are more appropriate. It is important to encourage young people to get to know each other and build strong team links during the first hour; this will help to increase their motivation and communication throughout the sessions. |
| Introduction & Onboarding: 20mins | Provide a brief introduction of the qualification to the class and play the “Onboarding Video or Presentation”. In your introduction cover the following: <ol style="list-style-type: none"> 1. Explanation of the program and structure. (Kamyab jawan Program) 2. How you will use your communication skills in your professional life. 3. Key contacts and key information – e.g. role of teacher, mentor, and SEED. Policies and procedures (user agreements and “contact us” section). Everyone to go to the Group Rules tab at the top of their screen, read out the rules, and ask everyone to verbally agree. Ensure that the consequences are clear for using the platform outside of hours. (9am-8pm) 4. What is up next for the next 2 weeks ahead so young people know what to expect (see pages 5-7 for an overview of the challenge). Allow young people to ask any questions about the session topic. |
| Team Activity Planning: 30 minutes | MENTOR: Explain to the whole team that you will now be planning how to collaborate for the first and second |

| | |
|---|---|
| | <p>collaborative Team Activities that will take place outside of the session. There will not be another session until the next session so this step is required because communicating and making decisions outside of a session requires a different strategy that must be agreed upon so that everyone knows what they are doing for this activity and how.</p> <ul style="list-style-type: none"> • “IDENTIFY ENTREPRENEURS” TEAM ACTIVITY • “BRAINSTORMING SOCIAL PROBLEMS” TEAM ACTIVITY <p><i>As a team, collaborate on a creative brainstorm on social problems in your community. Vote on the areas you feel most passionate about as a team, then write down what change you would like to see happen.</i></p> <p>Make sure the teams have the opportunity to talk about how they want to work as a team through the activities e.g. when they want to complete the activities, how to communicate, the role of the project manager, etc. Make sure you allocate each young person a specific week that they are the project manager for the weekly activities and make a note of this.</p> <p>Type up notes for their strategy if this is helpful - it can be included underneath the Team Contract.</p> |
| <p>Session Close: 5 minutes</p> | <p>MENTOR: Close the session with the opportunity for anyone to ask any remaining questions.</p> <p>Instructor: Facilitate the wrap-up of the session. A quick reminder of what is coming up next and when the next session will be.</p> |

MOTIVATIONAL LECTURES LINKS.

| TOPIC | SPEAKER | LINK |
|--------------------------------|---|---|
| How to Face Problems In Life | Qasim Ali Shah | https://www.youtube.com/watch?v=OrQte08MI90 |
| Just Control Your Emotions | Qasim Ali Shah | https://www.youtube.com/watch?v=JzFs_yJt-w |
| How to Communicate Effectively | Qasim Ali Shah | https://www.youtube.com/watch?v=PhHAQEGehKc |
| Your ATTITUDE is Everything | Tony Robbins Les Brown David Goggins Jocko Willink Wayne Dyer Eckart Tolle | https://www.youtube.com/watch?v=5fS3rj6eIFg |
| Control Your EMOTIONS | Jim Rohn Les Brown TD Jakes Tony Robbins | https://www.youtube.com/watch?v=chn86sH0O5U |
| Defeat Fear, Build Confidence | Shaykh Atif Ahmed | https://www.youtube.com/watch?v=s10dzfbzdz4 |
| Wisdom of the Eagle | Learn Kurooji | https://www.youtube.com/watch?v=bEU7V5rJTtw |
| The Power of ATTITUDE | Titan Man | https://www.youtube.com/watch?v=r8LJ5X2ejqU |
| STOP WASTING TIME | Arnold Schwarzenegger | https://www.youtube.com/watch?v=kzSBrJmXqdg |
| Risk of Success | Denzel Washington | https://www.youtube.com/watch?v=tbnzAVRZ9Xc |

SUCCESS STORY

| S. No | Key Information | Detail/Description |
|-------|--|--|
| 1. | Self & Family background | <p>Prof. Dr. Zeeshan Ali-who lives in Karachi, is an example of discipline, commitment, hard work, and dedication-currently serving as Head of Department at Dawood University of Engineering and Technology, started his journey from a small town in Sindh. His primary and secondary education was far below the average student. However, his efforts and hard work proved to be fruitful as he got admission at UET Peshawar in 1997.</p> <p>Mr. Zeeshan Ali started his career as Project Assistant Engineer in 2001 after completing Engineering Degree. Later he joined MUET as a Lab Engineer in 2003. In 2006, he added a feather in his cap by winning a Full bright MS leading to a Ph.D. (Mechatronics) scholarship at the University of Nottingham UK. Returned to Pakistan in 2011 and Joined MUET again.</p> <p>Started working on Mechatronics based projects such as automatic electric cars, drones, submarines, wind turbine, robotics, and industrial automation.</p> <p>Joined Dawood University in 2017 as Professor with the additional assignment as HOD of Department of Industrial Engineering and Management. He quotes Winston S. Churchill:</p> <p><i>"Success is not final; failure is not fatal: It is the courage to continue that counts."</i></p> |
| 2. | How he came on board NAVTTC Training/ or got trained through any other source | <p>"I was introduced by Engr. Liaquat Jamro to NAVTTC platform in 2012" said Dr. Zeeshan.</p> <p>He has contributed to a number of his field related qualifications and training despite a tough schedule and currently conducting PM Kamyab Jawan short courses successfully.</p> |
| 4. | Message to others (under training) | <ul style="list-style-type: none"> • Take the training opportunity seriously • Impose self-discipline and ensure regularity • Hard work pays in the end so be always ready for the same. |

Note: Success story is a source of motivation for the trainees and can be presented in several ways/forms in a NAVTTC skill development course as under: -

1. To call a passed out successful trainee of the institute. He will narrate his success story to the trainees in his own words and meet trainees as well.
2. To see and listen to a recorded video/clip (5 to 7 minutes) showing a successful trainee Audio-video recording that has to cover the above-mentioned points.
3. The teacher displays the picture of a successful trainee (name, trade, institute, organization, job, earning, etc) and narrates his/her story in the teacher's own motivational words.

** The online success stories of renowned professional can also be obtained from **Annex-II***

Workplace/Institute Ethics Guide

Work ethic is a standard of conduct and values for job performance. The modern definition of what constitutes good work ethics often varies. Different businesses have different expectations. Work ethic is a belief that hard work and diligence have a moral benefit and an inherent ability, virtue, or value to strengthen character and individual abilities. It is a set of values-centered on the importance of work and manifested by determination or desire to work hard.

The following ten work ethics are defined as essential for student success:

1. Attendance:

Be at work every day possible, plan your absences don't abuse leave time. Be punctual every day.

2. Character:

Honesty is the single most important factor having a direct bearing on the final success of an individual, corporation, or product. Complete assigned tasks correctly and promptly. Look to improve your skills.

3. Team Work:

The ability to get along with others including those you don't necessarily like. The ability to carry your weight and help others who are struggling. Recognize when to speak up with an idea and when to compromise by blend ideas together.

4. Appearance:

Dress for success set your best foot forward, personal hygiene, good manner, remember that the first impression of who you are can last a lifetime

5. Attitude:

Listen to suggestions and be positive, accept responsibility. If you make a mistake, admit it. Values workplace safety rules and precautions for personal and co-worker safety. Avoids unnecessary risks. Willing to learn new processes, systems, and procedures in light of changing responsibilities.

6. Productivity:

Do the work correctly, quality and timelines are prized. Get along with fellows, cooperation is the key to productivity. Help out whenever asked, do extra without being asked. Take pride in your work, do things the best you know-how. Eagerly focuses energy on accomplishing tasks, also referred to as demonstrating ownership. Takes pride in work.

7. Organizational Skills:

Make an effort to improve, learn ways to better yourself. Time management; utilize time and resources to get the most out of both. Take an appropriate approach to social interactions at work. Maintains focus on work responsibilities.

8. Communication:

Written communication, being able to correctly write reports and memos.
Verbal communications, being able to communicate one on one or to a group.

9. Cooperation:

Follow institute rules and regulations, learn and follow expectations. Get along with fellows, cooperation is the key to productivity. Able to welcome and adapt to changing work situations and the application of new or different skills.

10. Respect:

Work hard, work to the best of your ability. Carry out orders, do what's asked the first time. Show respect, accept, and acknowledge an individual's talents and knowledge. Respects diversity in the workplace, including showing due respect for different perspectives, opinions, and suggestions.