

Government of Pakistan

National Vocational and Technical Training Commission

Prime Minister's Hunarmand Pakistan Program

"Skill for All"



Course Contents / Lesson Plan

Course Title: Gemology/ Gemstone Carving

Duration: 3 Months

Course Details / Description & Preliminaries

Course Title	Gemology/ Gemstone Carving
Objectives and Expectations	<p><u>Employable skills for F.A/F.Sc Students through an intensive course on Gemology / Gemstone Carving and its Application.</u></p> <p>This is a special course designed to address unemployment in the youth. The course aims to achieve the above objective through hands on practical training delivery by a team of dedicated professionals having rich market/work experience. This course is therefore not just for developing a theoretical understanding/back ground of the trainees. Contrary to that, it is primarily aimed at equipping the trainees to perform commercially in a market space in independent capacity or as a member of a team.</p> <p>The course therefore is designed to impart not only technical skills but soft skills as well as entrepreneurial skills deemed essential for that purpose i.e. communication skills; marketing skills (including freelancing); personal grooming of the trainees and inculcation of the positive work ethics to foster better citizenship in general and improve the image of Pakistani work force in particular.</p> <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 individual trainee to prepare them for such market</p>

**Key Features of
Training & Special
Modules**

roles during/after the training.

- i. Specially designed practical tasks to be performed by the trainees have been included in the Annexure-I to this document. Their weekly distribution has also been indicated in the weekly lesson plan given in 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. In order to materialize the main expectations, a special module on **Job Search & Entrepreneurial Skills** has been included in the course through which, the trainees will be made aware of the Job search techniques in the local as well as international job markets (Gulf and European countries). Awareness around the visa process and immigration laws of the most favored labour destination countries also forms 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 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 at work place 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

<p>Training Tools/ Methodology</p>	<p>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 Pakistani workforce would undergo a positive transformation in the local as well as international job markets.</p> <p>In order to maintain interest and motivation of the trainees throughout the course, modern techniques such as:</p> <ul style="list-style-type: none"> • Motivational lectures • Success stories • Case studies (In documentary or presentation format) <p>These would be employed as additional training tools wherever possible (these are explained in the subsequent section on Training Methodology).</p> <p>Lastly, evaluation of the competencies acquired by the trainees will be done objectively at various stages of the training and 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.</p> <p>(i) Motivational Lectures</p> <p>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:</p>
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- Clear Purpose to convey 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.

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 longer time without boredom and loss of interest because they can clearly 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).

This tool is designed for training providers to ensure 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.

(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 by means of 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. Optimum impact is created when the story is revealed by the person himself either:

- Directly (in person) or,
- Through an audio/ videotaped message.

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 at 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 class room atmosphere interesting thus maintaining the trainee interest in training till the end of the course.

Depending on suitability to the trade, the weekly lesson plan in this document may suggest case studies to be presented to the trainees. The trainer may adopt a power point presentation or video format for such case studies whichever is deemed suitable but it's important that only those cases are selected that are relevant and of a learning value.

The Trainees should be required and supervised to carefully analyze the cases. For the purpose they must be encouraged to inquire and collect specific information / data, actively participate in the discussions and intended solutions of the problem / situation. Case studies can be implemented in the following ways:-

	<ol style="list-style-type: none"> i. A good quality trade specific documentary (At least 2-3 documentaries must be arranged by the training institute) ii. Health & Safety case studies (2 cases regarding safety and industrial accidents must be arranged by the training institute) iii. Field visits (At least one visit to a trade specific major industry/ site must be arranged by the training institute)
Learning Outcome of the Course	<p>By the end of this course, the trainees will be able to understand the following competencies:-</p> <ul style="list-style-type: none"> • Separation of Natural & Synthetic gemstones • Separation of Natural & Treated gemstones • Separation of Natural & Imitation gemstones • Knowledge of Treatment in gemstones • Knowledge of gemstone testing instruments • Knowledge of E-Commerce • Knowledge about Pakistan gemstones • Skill about cutting & polishing i.e. Emerald cut, round brilliant cut, rose cut, oval cut, Marquise cut, heart cut, Bola spider cut etc. • Skill about cabochon cutting • Skill about Balls and Bead making • Skill of making different decorating items.
Entry level of trainees	HSSC or Higher qualification.
Course Execution Plan	Total Duration of Course: 3 Months (13 Weeks)
	Class Hours: 4 Hours per day (06 Days/Week)
	Theory: 20% Practical: 80%
	Weekly Hours: 24 Hours Per week

	Total Contact Hours: 300 Hours
Job Opportunities	<ul style="list-style-type: none"> • Lab In charge in gemological laboratory • Gemologist • Self-business • Assistant with mining engineer • Sales man in gemstone shop
No of Students	25
Learning Place	Classroom / Lab / Site

WEEKLY SCHEDULE OF TRAINING

Scheduled Week	Module Title	Learning Units	Remarks
Week1	Introduction	<p>Course Introduction</p> <ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No: 3-4) • Application of the course • Institute/Work ethics (For further detail please see Annexure-II at the end) • Health & Safety <p>Introduction to Gemology</p> <ul style="list-style-type: none"> • Introduction of Gemology • What is gemologist? • What is gemstone? • What is an organic gem? • What is an Inorganic gem? • What are beauty, rarity and durability? • Definition of some physical properties of gemstones such as hardness and hardness scale (Moh's Scale), Toughness, Stability, Fracture, Cleavage, Parting and streak. <p>Basic Terms Use in Gemology</p> <ul style="list-style-type: none"> • Real or Natural Gemstones • Treated gemstones • Synthetic gemstones • Simulant or imitation gemstones • Composite or Assemble gemstones <p>Weight, Pricing and measure</p> <ul style="list-style-type: none"> • Unit of Weigh • Carat / Cents or points <p>Uses of basic tools</p> <ul style="list-style-type: none"> • Tweezers: • Using of different types of tweezers <p>Visual Observations</p> <ul style="list-style-type: none"> • Visual observations techniques <p>Color</p> <p>Description of color</p> <ul style="list-style-type: none"> • Hue • Tone (Value) 	<p>Task-1 (Details may be seen at Annexure 1)</p>

		<ul style="list-style-type: none"> • Saturation <p>Transparency</p> <ul style="list-style-type: none"> • Transparent • Sub transparent • Translucent • Sub translucent • Opaque <p>Luster and type of luster</p> <ul style="list-style-type: none"> • Metallic luster • Adamantine luster • Vitreous luster • Waxy luster • Pearly luster • Silky luster <p>Shape (Cut/ Rough)</p> <ul style="list-style-type: none"> • Faceting, Cabochon, Carving • Parts of faceted stone and number of facets in round brilliant cut and their name • Types of different cut like Round brilliant, Oval brilliant cut, Marquise cut, Heart cut, Mixed cut, pear brilliant cut, Emerald cut etc. • Cabochon, double cabochon, Flat cabochon, Hollow cabochon etc. <p>Rough</p> <ul style="list-style-type: none"> • Identification of mainstream gems in crystal shape (natural form). Such as fluorite crystal, Tourmaline crystal, Topaz crystal, Aquamarine crystal, Quartz crystal etc. 	
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<p>Week 2</p>	<p>Gemstone Testing Instruments & Their use</p>	<p>Crystals and Seven Crystal System Cubic, Tetragonal , Hexagonal, Trigonal, Orthorhombic, Monoclinic, Triclinic</p> <p>The Polariscope</p> <ul style="list-style-type: none"> • Un polarized light • Polarized light • Single Refractiv (SR)/ Isotropic/Isometric • Anomalous double Refraction (ADR) • Double Refractive (DR)/ Anisotropic • Microcrystalline / Polycrystalline /Aggregate reaction • Using of Polariscope and testing techniques <ul style="list-style-type: none"> • How to make sample polariscope at low budget? • Success story (For further detail please see Page No: 4-5) • Video demonstration <p>Polariscope video</p> <ul style="list-style-type: none"> • Practical Demonstration • Students test different type of gems with the help of Polariscope. <ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No:3-4) 	<p>Task-2 (Details may be seen at Annexure 1)</p>
<p>Week 3</p>		<p>The Refractometer its construction, care and use</p> <ul style="list-style-type: none"> • Construction of Refractometer • Sources of illumination (sodium light) • Contact liquid • Using the refractometer • Taking reading • Use of the polarizing filter • Optical Character (SR/DR) • Birefringence <ul style="list-style-type: none"> • Success story (For further detail please see Page No:4-5 and Annexure-III at the end) <p>Construction of Dichroscope and its uses</p>	<p>Task-3 (Details may be seen at Annexure 1)</p>

	<p>Job Search & Entrepreneurial Skills</p>	<ul style="list-style-type: none"> • What is Pleochroism? • Dichroism, trichroism • What is Dichroscope? • Types of Dichroscope and their construction <ol style="list-style-type: none"> 1. Calcite Dichroscope 2. London (polarizing) dichroscope • Proper use and possible observations • Practical Demonstration • Students test, check and observe the pleochroism in different type of gems with the help of dichroscope. <p>The use of Chelsea Color Filter in Gemology</p> <ul style="list-style-type: none"> • The use of Ultra violet lamp in gems identification • What is Fluorescence? • What is Phosphorescence? • What is Tenebrescent? • Long waves • Short Waves • Uses of ultra violet lamp • Precaution • Use of Hydrostatic balance for Specific Gravity determination. <p>Spectroscope</p> <ul style="list-style-type: none"> • How the spectroscope works • Types of Spectroscope <ol style="list-style-type: none"> 1. Diffraction grating spectroscope 2. Prism Spectroscope • Construction of spectroscope • A session on <ul style="list-style-type: none"> • Local Job market • Job related skills. • Interpersonal skills • Communication skill 	
<p>Week 4</p>	<p>Gemstone Testing Instruments & Their use</p>	<p>Gemological Microscope and Use of Illuminations techniques in Gemological Microscope</p> <ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No: 3-4)The use of magnification (microscope) in gemology • Features of the gem microscope • Types of illumination <ol style="list-style-type: none"> i) Reflected/incident illumination ii) Dark field illumination iii) Direct light field illumination 	<p>Task-4 (Details may be seen at Annexure 1)</p>

	<p>Inorganic Gemstones, Identification and their treatment.</p>	<p>iv) Diffused illumination using white/blue filter</p> <p>v) Immersion</p> <ul style="list-style-type: none"> • Treatment and Enhancement of Gemstones and their detection • Natural gems • Treated gems • Purpose of enhancement or treatment • Treatment and pricing • Types of treatment : Painting, Foiling or Coating, Dyeing, Impregnation and Filling using oiling, waxing, resin and polymer fillers, Laser treatment, Heat treatment and surface diffusion, Irradiation • Success story (For further detail please see Page No:4-5 and Annexure-III at the end) <ul style="list-style-type: none"> • Corundum (Ruby and Sapphire) • Chemistry: • Crystal system and habit Varieties • Phenomena: • Occurrence: • Physical properties • Optical properties • Spectrum • Fluorescence • Inclusions in nature corundum • Enhancement (treatment) in corundum and their detection • Manufacture processes of synthetic corundum • Inclusions in synthetic corundum • Fashioning/ cut • <u>Video Demonstrations</u> • How to Grow Synthetic Crystals • Beryl (Goshenite, Aquamarine, Emerald etc) • Chemistry: • Crystal system and habit • Varieties • Phenomena: • Occurrence: • Physical properties • Optical properties 	
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<p>Week 6</p>	<p>Plan cabochon making. Sketching</p> <p>Trimming. Grinding & Reshaping Sanding, Buff Polishing</p> <p>Job Search & Entrepreneurial Skills</p>	<ul style="list-style-type: none"> • Selection stone for Cabochon. • Trimming of stone slab. • Sketching on stone with the help of template. Trimming stone according to sketch. • Grinding for cabochon shape. • Sanding and polishing of cabochon. • Used Safety precaution during stone trimming. • Session on CV Building. • How to make notable CV. • Dos and Don'ts of CV making. • Case Study (For further detail please see Page No: 5-6) 	<p>Task-7 (Details may be seen at Annexure 1)</p>
<p>Week 7</p>	<p>Prepare Carving design on Cabochon top Uses of different Diamond Carving wheels</p>	<ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No: 3-4) • 1st make plan Cabochon • Draw required carving design in cabochon top with permanent pencil. • Make carving with carving wheels use sanding paper and buff with cotton buff and polishing wax 	<p>Task-8 (Details may be seen at Annexure 1)</p> <p>Midterm Exam during 7th week</p>
<p>Week 8</p>	<p>Balls and Bead making</p> <p>Job Search & Entrepreneurial Skills</p>	<ul style="list-style-type: none"> • Trimming cubes blocks • Grinding of cube corner edges make round shape • Sanding and polishing • . Session on Self-Employment • How to start a Business. • Requirements (Capital, Physical etc) • Benefits/Advantages of self-employment • Journalizing • Case Study (For further detail please see Page No: 5-6) 	<p>Task-9 (Details may be seen at Annexure 1)</p>
<p>Week 9</p>	<p>Eggs making</p>	<ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No:3-4) • Trimming cubes blocks • Grinding of cube corner edges make round shape • Sanding and polishing • Success story (For further detail please see Page No: 4-5) 	<p>Task-10 (Details may be seen at Annexure 1)</p>

		Country Specific Labor laws, entry and exit requirements (Legal age requirements, Health Certificate, Police Clearance & Travel Insurance etc.).	
Week 13	Final Assessment	Revision of the course, practice on skills acquired and final Assessment	

TASKS FOR GEMOLOGY/GEMSTONE CARVING

Note: The following home assignment/tasks are required to be performed multiple times by each trainee/group until sufficient proficiency level is acquired. The trainer is required to determine the number of times the task needs to be repeated by a trainee as per his/her low/medium/high level of skill and proficiency during any stage of the course.

Additional Note: The trainer should also work on combination of stones (other than those mentioned in curriculum) and assign trainees with the task of performing activities related to basic gemology like physical properties, cutting etc. This exercise must be repeated at least four times to familiarize the trainees with the maximum possible stones so that their training becomes more value added and worthwhile in the market.

S. No.	Tasks
1	Student should be familiar with the gemstones names in Urdu (used in local market). Take weight of gemstone in weighing balance Identification of Gemstones (coral, rough calcite, pyrite) with visual observation
2	With the help of Polariscope identify the gemstone (Tourmaline, Topaz, Fluorite) is single Refractive or double refractive.
3	With the help of dichroscope identify the colored gemstone (Tourmaline) is Single refractive or double refractive.
4	Set the gemstones (natural ruby, natural Sapphire) in Gemological microscope and study the internal inclusions of natural ruby/natural sapphire.
5	Select a stone and describe its value chain from raw form to finished product. The trainees should be given a stone and they are required to present the profile of the stone from extraction, raw form, cutting polishing and final shape till the market where it is highly demanded
6	<ul style="list-style-type: none"> • Marking and sawing of stone • Mark stone for cutting • Cut the marked stone with trim saw machine
7	With the help of different type of machines prepare simple cabochon.
8	<ul style="list-style-type: none"> • Prepare Cabochon Mark stone for Cabochon making Cut the marked stone with trim saw machine

	<ul style="list-style-type: none"> • Template marking on stone <p>Select size of cabochon on template Perform template marking Prepare Cabochon as per template marking</p> <ul style="list-style-type: none"> • Ensure adequate water supply for cutting process <p>Make necessary arrangements in workstation Prepare cabochon with grinding machine</p> <ul style="list-style-type: none"> • Doping and course grinding of stone <p>Arrange material for doping process Fix stone on dope stick Make smooth surface of stone Perform course grinding at grit #180/#220/#260/#320</p>
9	<p>Trimming cubes for making of beads / balls/ sphere Grinding of cube edges for making of beads/balls/sphere Sanding & Polishing of beads/balls/sphere</p>
10	<p>Prepare marble Egg using all the necessary machines & accessories with safety precautions</p>
11	<p>Prepare frog using all the necessary machines & accessories with safety precautions</p>
12	<p>Prepare Elephant from marble stone using all the necessary machines & accessories with safety precautions.</p>

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 importance of work and manifested by determination or desire to work hard.

The following ten work ethics are defined as essential for employee's 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 own weight and help others who are struggling. Recognize when to speak up with an ideas 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 life time

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. Takes 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 workplace 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.

SUGGESTIVE FORMAT AND SEQUENCE ORDER OF SUCCESS STORY

S. No	Key Information	Detail/Description
1.	Self & Family background	<ul style="list-style-type: none"> • Self-introduction • Family background and socio economic status, • Education level and activities involved in • Financial hardships etc
2.	How he came on board NAVTTC Training/ or got trained through any other source	<ul style="list-style-type: none"> • Information about course, apply and selection • Course duration, trade selection • Attendance, active participation, monthly tests, interest in lab work
3.	Post training activities	<ul style="list-style-type: none"> • How job / business (self-employment) was set up • How capital was managed (loan (if any) etc). • Detail of work to share i.e. where is job or business being done; how many people employed (in case of self-employment/ business) • Monthly income or earnings and support to family • Earning a happy life than before
4.	Message to others (under training)	<ul style="list-style-type: none"> • Take the training opportunity seriously • Impose self-discipline and ensure regularity • Make 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 a number of ways/forms in a NAVTTC skill development course as under: -

1. To call a passed out successful person of institute. He/she will narrate his/her success story to the trainees in his/her own words and meet trainees as well.
2. To see and listen to a recorded video/clip (5 to 7 minutes) showing a successful person 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 per month etc) and narrates his/her story in teacher's own motivational words.