T.Y. B.Sc. Geology **Course SGEO060AC**
Title: Gemmology

Learning Objectives:
To study and understand the evolution of gemstones and gem materials

PREREQUISITE : Courses SGEO03 and SGEO04

Number of lectures: 60

Unit 1 **(15 lectures)**
The Geological Sources of Gems
Rocks and processes that formed them.
Gem regions. Gem recovery methods
Cryptocrystalline, massive and metamict states
Hardness**:** definition, Mohs' scale, Cleavage: definition, description, importance in gemmology and lapidary work
Specific Gravity: Definition, Heavy liquids (bromoform, methylene iodide, sodium polytungstate and Clerici solution)
Luminescence: Fluorescence and phosphorescence, photoluminescence and Stoke's law,
Thermal conductivity and thermal conductivity meter, 10 X lens, Chelsea colour filter

Unit 2 **(15 lectures)**
Optical Properties
Nature of colour: absorption of light, allochromatism, idiochromatism
Lustre, sheen, chatoyancy and asterism in gemstones, play of colour, dispersion, metamerism, use of, cross filter test.
Polarization and absorption of light
Nature and production of polarized light, design and construction of polariscope and its use in gemmology. Differential absorption of light, pleochroism, dichroscope, construction and use;
Spectroscope – construction and use, absorption spectra,
Reflection: laws of reflection, importance in gemmology.
Refraction: laws of refraction, refractive index, total internal reflection, use and design of refractometer, measurement of R.I. and birefringence by refractometer and other methods. Isotropism and Anistropism in gemstones, anomalous double refraction, optic axes

Unit 3 **(15 lectures)**
Fashioning of gemstones
Cutting styles, critical angle, composite stones, gemstone polishing, lapidary techniques and gemstone carving.
Diamonds: Diamond cutting and polishing methods, diamond grading including cut, colour, clarity and carat weight.
Diamond synthesis, thin diamond films, chemical vapour deposition (CVD)
Gemstone simulants: Glass, plastics, diamond simulants, assembled or composite stones
Metric carat, pearl grain, kilogram, gram, milligram, meter, millimeter, micrometer, nanometer, Angstrom, litre, milliliter

Unit 4 **(15 lectures)**

Gemstone synthesis and treatments

Methods of staining, heat treatment, diffusion treatment, fracture filling, cavity filling, coatings, dyeing, laser drilling, atomic irradiation and their detection

Synthesis of gemstones:

Methods of manufacture: flame-fusion (Vernueil), flux-melt, hydrothermal, crystal-pulling (Czochralski), skull-crucible method, zone melting.

Reference Books:

1. Read, P.G (2005) Gemmology 3rd edition, Elsivier, Butterworth Heinemann.
2. Anderson, B. W. (1990) Gem testing, 10th edition, Butterworth, London.
3. Schumann, W. (2009) Gemstones of the world, 5th edition, Sterling New York
4. O'Donoghue, M. and Louise, J. (2003), Identification of gemstones, Elsivier, Butterworth Heinemann.
5. O'Donoghue, M. (2006) Gems, Elsivier, Butterworth Heinemann.
6. Liddcoat, R. (1989) Handbook of gem identification, 12th edition, GIA, Santa Monica, CA.
7. Matlins, AL and Boananno, A. C. (2016) Gem identification made easy, 6th edition, Gemstone Press
8. Robbins, M. (1994) Fluorescence: Gems and minerals under ultraviolet light, Geoscience Press
9. Arem. J. E. (1987) Color encyclopedia of gemstones 2nd edition, Van Nostrand Reinhold Company, New York.
10. Renne, N. (2016) Gemstone buying guide, 3rd edition, International Jewelry Publications
11. Korbel, P. and Novàk, M. (2002) The complete encyclopedia of minerals, Chartwell books
12. Schneider, S. (2011) Collecting fluorescent minerals Schiffer Publishing Ltd.

Practical Course:

Gem Properties and Characteristics

1. Hand specimen of gem minerals
2. Specific gravity problems.
   a) Hydrostatic method, b) comparison of specific gravity of gemstones.
3. Refractive Indices problems
   a) Isotropic stones, b) Uniaxial stones, c) Biaxial stones.
4. Weight Estimation Problems
5. Problems on design, gemstone cuts.
   a) Light ray path through a profile of cut; b) facet patterns and facet tally of various types of cuts; c) cabochon cuts.
6. Procedures of distinguishing, different gemstones using a dichroscope, polariscope and a loupe, on the basis of their various physical and optical characters
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Evaluation: Applied Component –GEMMOLOGY
(Theory) Total marks 100.
CIA- 40 marks
CIA 1: Written test -20 marks
CIA 2: Assignment /MCQ -20 marks
End Semester Examination – 60 marks
One question from each Unit for 15 marks, with internal choice. Total marks per question with choice -20 to 22.

(Practicals) Total 50 marks.
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Template for SGEO06AC course End Semester examination in Semester 6

UNITS	KNOWLEDGE	UNDERSTANDING	APPLICATIONS and ANALYSES	TOTAL MARKS- Per Unit
1	08	04	03	15
2	08	04	03	15
3	08	04	03	15
4	08	04	03	15
-TOTAL - Per objective	32	16	12	**60**
% WEIGHTAGE	53	27	20	**100%**

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