

**SARDAR PATEL UNIVERSITY**  
**Programme: MSc (Genetics)**  
**Semester: II**  
**Syllabus with effect from: June 2010**

<b>Paper Code:</b> PS02CGEN02	<b>Total Credits: 4</b>
<b>Title Of Paper:</b> Cytogenetics	

Unit	Description in detail	Weightage (%)
<b>1</b>	<p><b>Introduction, chromosomal staining, banding and FISH techniques:</b>            An over view of Cell cycle, Mitosis and Meiosis, Global structure of Chromosomes, ISCN nomenclature system            Image Analysis System: Charge-coupled device cameras, Image analysis Systems. Interpretation and reporting of chromosomal analysis            Conventional staining (Giemsa and aceto-orcein), Giemsa banding, Quinacrine banding, Constitutive heterochromatin banding            Reverse banding,            Nucleolar organizing region staining            Sister chromatid exchange            Miscellaneous/Other banding Techniques            Applications of fluorescence <i>in situ</i> hybridization to chromosome analysis            Latest techniques- Fiber FISH, Spectral karyotyping and Chromosomal painting (WCP &amp; PCP).</p>	<b>25 %</b>
<b>2</b>	<p><b>Human Cytogenetics:</b>            Collection , transport and storage of samples for cytogenetic analysis            Morphology and classification of human chromosomes            Numerical chromosomal aberrations (Aneuploidy and Euploidy)            Structural chromosomal abnormalities (Translocations, Inversions, Deletions, Insertions Duplications, Dicentric and Isochromosomes, Ring chromosomes, Chromosomes breaks, gaps and fragile sites, Marker chromosomes)</p>	<b>25 %</b>
<b>3</b>	<p><b>Cytogenetics of pregnancy, cancer and cell lines:</b>            Lymphocyte culture, Amniotic fluid cell culture,            Chorionic villus culture, Establishing fibroblast culture,            Cytogenetic analysis of human sperm, oocyte and embryo,            Chromosomal abnormalities in malignant disease (CML, AML, ALL etc.),            Cytogenetic characterization of various cell lines</p>	<b>25 %</b>
<b>4</b>	<p><b>Applications of cytogenetics in Humans, Domestic animals &amp; Plants</b></p> <p><b>Humans:</b>            Individual with clinical features of Genetic diseases during the following:            (Embryonic period, Neonatal period, During early childhood level, During puberty and secondary sexual development, During adulthood, During infertility or reproductive failure)</p> <p><b>Domestic animals:</b>            Normal chromosomal complements in cattle, buffalo, sheep, goat, horse, pig, cat, dog and poultry; Importance of cytogenetic investigations in domestic animals.</p> <p><b>Plants :</b>            Role of cytogenetics in plants, Types of polyploidy, Artificial induction of polyploidy in plants, Polyploidy in Triticum spelta, Gossypium hirsutum and Triticosecale wittmack, Phenotypic effects of polyploidy.</p> <p><b>Genotoxicity testing</b></p>	<b>25 %</b>



## Basic Text & Reference Books:

- Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by P S Verma and V K Agrawal (Multicolour/14<sup>th</sup> Edition) Published by S. Chand and company Ltd., New Delhi (ISBN: 81-219-2442-1).
- Human Cytogenetics: Constitutional analysis by D. E. Rooney. Oxford University Press. New York (ISBN: 0-19-96384-3 (Hbk.)).
- Essential of Human Genetics (4<sup>th</sup> edition) by S. M. Bhatnagar, M. L. Kothari and L. A. Mehta (ISBN: 81-250-1426-8).
- Genetics in Medicine (3<sup>rd</sup> Edition) by Thompson and Thompson, W B Saunders and company, West Washington square, Philadelphia, PA-19105 (ISBN: 0-7216-8857-8).
- Genetics (2<sup>nd</sup> Edition) by Jan M Friedman, Fred J Dill, Michael R Hayden and Barbara C McGillivray, B I Waverly Pvt. Ltd., New Delhi, Noida, U.P. (ISBN: 81-7431-025-8).
- Essential of Modern Genetics by V C Shah. Nirav Prakashan, Ahmedabad.
- Cytogenetics in Animal reproduction by W. C. D. Hare and Elizabeth L. Singh, published by Commonwealth Agricultural Bureaux (ISBN: 0 85198 444 4)
- The AGT Cytogenetics Laboratory Manual Barch, Margaret J. / Knutsen, Turid./ Spurbeck, Jack L. (eds.) 3<sup>rd</sup> edition, Lippincott\_raven Publishers, Philadelphia, 1997 ISBN 0-397-51651-7 (New updated edition is about to release)
- Human Cytogenetics: Malignancy and acquired abnormalities. A Practical Approach. 3<sup>rd</sup> edition, Oxford University Press, 2001, ISBN 1-19-963842-X (Hardback) / ISBN 1-19-963841-1 (Paperback).
- Verma, Ram S. / Babu, Arvind, Human Chromosomes, Principles and Techniques 2nd edition, Mc Graw-Hill, Inc., New York, 1995, ISBN 0-07-105432-4
- Hema Purandare & Amit Chakravarty, Bhalani Publishing House, Mumbai. Human Cytogenetic Techniques & Clinical Applications, 2000, ISBN 81 85578 41 9
- Lisa G. Shaffer, Marilyn L. Slovak, Lynda J. Campbell. International System for Human Cytogenetic Nomenclature: ISCN 2009, S. Karger Publishers, ISBN 978-3-8055-8985-7
- Borgaonkar, Digamber S., Chromosomal Variation in Man: A Catalog of Chromosomal Variants and Anomalies 8th edition, Wiley-Liss, New York, 1997, ISBN 0-471-24332-9

