

FORENSIC SCIENCE UNIT
Department of Chemistry
Osmania University

Changes incorporated in M. Sc. (Forensic Science) III & IV Semester syllabus
Applicable for the academic year 2011 – 2012 only

SEMESTER – III

FS 301 Forensic Chemistry	4	20 marks	80 marks	100 marks	4
FS 302 Forensic Toxicology	4	20 marks	80 marks	100 marks	4
FS 303 IPR, Entrepreneurship, Ethics & Research Methodology	4	20 marks	80 marks	100 marks	4
*FS 304 Legal and Social Aspects Of Forensic Science	4	20 marks	80 marks	100 marks	4
FS 351 Seminar	2			25 marks	1
FS 352 Forensic Chemistry Lab	9			100 marks	4
FS 353 Forensic Toxicology Lab	9			100 marks	4
Total				625 marks	25

* In place of ID paper of 2010 -2011

SEMESTER - IV

FS 401 Biochemistry & Biochemical Techniques	4	20 marks	80 marks	100 marks	4
FS 402 Forensic Serology & DNA Fingerprinting	4	20 marks	80 marks	100 marks	4
FS 403 Imprints, Impressions & Questioned Documents	4	20 marks	80 marks	100 marks	4
*FS 404 Choice based paper i) Molecular Biology & Immunology ii) Advanced Instrumental Methods in Forensic Chemistry	4	20 marks	80 marks	100 marks	4
FS 451 Seminar	2			25 marks	1
FS 452 Serology & DNA Lab	9			100 marks	4
*FS 453 Biochemistry Lab	9			100 marks	4
Total				625 marks	25

Grand total marks and credits:

2500 marks 100

* In place of ID paper and 'Project' respectively

FS 304: Legal and Social Aspects of Forensic Science

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	100 Marks 4 Credits

Unit I:

Legal aspects of forensic science – Legal position of forensic science laboratories and experts – Government and private forensic science laboratories – Government and private experts
Court testimony – Admissibility of expert – Testimony – Qualifications – Experience – Education / training – Membership of professional bodies – Scrutiny of an expert – Weight of evidence – Court manners and demeanor – Pre-court trials – Testimony procedure – Direct examination – Cross examination – Defense experts – legal knowledge – lay witness and expert witness – Amicus curie

Unit II:

Forensic science laboratories and society – Impressions of forensic science laboratories on society – Transparency in the working of forensic science laboratories – Degree of openness permissible – Effect of openness on investigation and modus operandi
Media management in the forensic science laboratories – Authorization for interacting with media – Publicity impulse – Technical issues and media – Check over media interaction – positive and negative aspects of media coverage – Image of the forensic scientists, forensic science laboratory, police and the Government.

Unit III:

Human rights – Theory – Historical development – Philosophy – Classification of human rights – International law – Universal declaration of human rights – Treaties – Humanitarian law – Indian law on human rights – International organizations – UN Human rights council and other bodies – Non governmental organizations – Universalism vs. cultural relativism – Legal issues – Human rights and national security – Human rights violations – Substantive rights – Environmental, future generations, lesbian, gay, bisexual, transgender, crime and punishment, fetal and reproductive rights.

Unit IV:

Forensic science as a profession – Forensic science education – problems and solutions – Generalist vs. specialist – Identity crisis for the forensic science – Scientific culture – Control of forensic science laboratories – Limitations of forensic science – Validation and acceptability of results – principles of Fry's & Daubert's standards – Accreditation of forensic science laboratories – Need for

development and research – Development of infrastructure – Human resources – Information resources – laboratory resources –Training of forensic scientists - Funding of forensic science laboratories

The syllabus shall also include Seminars and Tutorials

Suggested Reading:

1. Saferstein R., Forensic Science Hand Book, Prentice Hall, 1982
2. DEA Manuel, Drug Enforcement Administration, USA, 1978
3. Nabar, B. S., Forensic Science in Crime Investigation, 3rd. Edn. Asia Law House, 2002
4. James, S. H. & Nordby J. J., Forensic Science- An Introduction to Scientific & Investigative Techniques, 2nd. Edn., CRC Press, 2005
5. Thilagaraj R., Human Rights & Criminal Justice Administration, APH Pub. Corp, 2002.
6. Roberts D. L. & Subramanian S., Hand Book of International Humanitarian Law

FS 404 – Choice Based Paper I: MOLECULAR BIOLOGY & IMMUNOLOGY

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	100 Marks / 4 Credits

Unit I:

Regulation of gene expression – Regulation by operons in prokaryotes – lac operon – Catabolite repression – Attenuation – promoter flipping – Central dogma and levels of gene regulation by chromatin remodeling – Transcriptional regulation by transcription factors – Post transcriptional regulation by alternate splicing – Translational regulation – Post translational modifications to modulate gene product activity

Unit II:

Recombinant DNA technology – Overview of cloning – History of rDNA technology – Bacterial and eukaryotic vectors – Restriction enzymes for production recombinant DNA – Polymerases, kinase and ligase for production of recombinant DNA – Preparation of cDNA and genomic DNA libraries – Screening to select clone of interest – Over expression of cloned proteins in bacteria – Production of transgenic animals – production of transgenic plants – Silencing using RNAi

Unit III:

Immunology – Organization of the immune system – Haematopoiesis – Production and differentiation of the immune cells - Cells of the immune system – Primary and secondary lymphoid organs - Innate immunity – Specific acquired immunity – Active and passive immunity - Cell mediated immunity – Humoral immunity – Structure of a typical immunoglobulin - Classes of immunoglobulins – Genetics of Antibody production – Generation of Antibody diversity - Antigens and immunogens – Super antigens - Auto immune disorders – Blood group antigens – Vaccines and their types

Unit IV:

Immuno technology – Antigen-Antibody interaction - Precipitation and agglutination of the Ag –Ab – Mancini's Radial immunodiffusion - Ouchterlony's Double diffusion – Haemagglutination – Agglutination inhibition – Passive agglutination - Immuno electrophoresis – Rocket immuno electrophoresis – RIA – ELISA – Western blot – Complement fixation test – Inhibition of complement fixation – Direct and indirect Coomb's test - Immediate and delayed Hypersensitivity – Generation of Monoclonal antibodies – Generation of Polyclonal antibodies – Abzymes

The syllabus shall include Seminars and Tutorials on important cases on topics covered in this paper.

Suggested reading:

1. Kindt T. J., Osborne B. A. & Goldsby R. A: Kuby Immunology, 6th Edition, 2006
2. Roitt I: Essential Immunology, 8th Edition, Blackweell, 1994
3. Nelson D. L., Cox M. M: Lehninger's Principles of Biochemistry, Mcmillan, 2000
4. Glick B. R & Pasternak J. J.: Molecular Biotechnology – Principles and applications of Recombinant DNA, ASM Press, 1998
5. Watson, J. D., Baker T. A., Bell S. P., Gann A., Levine M. & Losick R: Molecular Biology of the Gene, 5th Edition, 2003
6. Alberts B, Bray D., Lewis J & Raff M: Molecular Biology of the Cell, 3rd Edition, Garland Pub., 1994
7. Brown T. A: Gene Cloning and DNA Analysis, 6th Edition, Wiley – Blackwell, 2010

**FS 404 – Choice Based Paper II: Advanced Instrumental Methods
in Forensic Chemistry**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	100 Marks / 4 Credits

Unit I:

Stable Isotope Ratio Mass Spectrometry – Introduction – Basics of mass spectrometry – Gas source (Stable isotope) – Static gas (noble gas) – Solid source (Radiogenic isotope) Mass spectrometry – Multiple Collector Inductively Coupled Plasma Mass Spectrometry (MC-ICP-MS) – Moving wire Isotope Ratio Mass Spectrometry) – Accelerator Mass Spectrometry – Geological, food, biochemical, pharmaceutical and forensic applications

Unit II:

Surface Enhanced resonance Raman Spectroscopy – Introduction – Historical – Basics of Raman Spectroscopy – Principle of resonance – principles – mechanisms – Electromagnetic theory – Chemical theory – Surfaces – Selection rules – Applications

Unit III:

Chemiluminescence Methods – Introduction – Principles – Chemical reactions – Instrumentation – Sample and reagent introduction – Detection of emitted light – Electro generated luminescence – Techniques of qualitative and quantitative analysis - Applications

Unit IV:

Ion Mobility Spectrometry – History – Ion mobility – Instrumentation – Ionization – Analyzer – Time of flight ion mobility spectrometry – DMS – DMA – Drift gas detector – Ion traps –Hyphenated ion mobility spectrometry – GC-IMS,IMS-MS, LC- IMS, LC-IMS-MS – Applications

The syllabus shall include Seminars and Tutorials on important cases on topics covered in this paper.

Suggested reading:

1. Skoog, D. A., Holler, J. F., and Neiman, T. A.: Principles of Instrumental Analysis, Thomson, 1997.
2. Settle, F. A.: Hand Book of Instrumental Techniques for Analytical Chemistry, Prentice Hall, 1997
3. Townsend Allen (Ed.): Encyclopedia of Analytical science, 2nd Edition , Academic Press, 2005
4. Gross J. H & Roepstorff P.: Mass Spectrometry – A Text Book, 2nd Edition, Springer, 2011
5. Platzner I. T.: Modern Isotope ratio Mass Spectrometry, J. Wiley, 1997
6. Schcker S & Kiefer W.: Surface Enhanced Raman Spectroscopy: Analytical, Biophysical and Life Science Applications, Wiley VCH, 2011
7. Aroca R.: Surface Enhanced Vibrational Spectroscopy, J. Wiley, 2006
8. Moskovits M. & Knepp H.: Surface Enhanced raman scattering – Physics and Applications, Springer, 2010
9. Campbell A. K.: Chemiluminescence: principles and Applications in Biology and Medicine, VCH, 1988
10. Garcia – Campana A. N. & Bayeyens W. R. G. (Eds.): Chemiluminescence in Analytical Chemistry, Dekker 2001
11. Van Dyke K.(Ed.): Bioluminescence and Chemiluminescence: Instrumentation and Applications, CRC Press, 1985
12. Eiceman G. A., & Karpas Z.: Ion Mobility Spectrometry, 2nd Edition, CRC Press, 2004

FS 453: BIOCHEMISTRY LAB

Instruction

6 Periods per week

Duration of University Examination

6 Hours

University Examination

100 Marks / 4 Credits

1. Estimation of proteins by biuret method
2. Estimation of proteins by Folin's method
3. UV absorption studies on proteins
4. Identification of amino acids by colour tests
5. Separation of amino acids by paper chromatography
6. Assay of amylase
7. Assay of urease
8. Assay of catalase