MAHARSHI DAYANAND SARASWATI UNIVERSITY
AJMER

NOTICE

Copies of the "Syllabus and Courses of Study" prescribed for the Faculties of Arts, Fine Arts, Social Science, Science, Commerce, Law, Education, Management Studies etc. Commencing from July, Can be obtained from our authorised Agent.

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MAHARSHI DAYANAND SARASWATI UNIVERSITY
AJMER

पाठ्यक्रम
SYLLABUS
SCHEME OF EXAMINATION AND COURSES OF STUDY

FACULTY OF SCIENCE

P.G. Diploma in Laboratory Technology and Instrumentation Examination
(w.e.f. 2015-16)

संस्करण
2015

मूल्य : 10/-

महर्षि दयानन्द सरस्वती विश्वविद्यालय, अजमेर

NOTICE

1. Change in Statutes/Ordinances/Rules/ Regulations Syllabus and Books may, from time to time, be made by amendment or remaking, and a candidate shall, except in so far as the University determines otherwise comply with any change that applies to years he has not completed at the time of change. **The decision taken by the Academic Council shall be final.**

सूचना

1. समय-समय पर संशोधन या पुन: निर्माण कर परिनियमों/ अध्यादेशों/नियमों / विनियमों / पाठ्यक्रमों व पुस्तकों में परिवर्तन किया जा सकता है, तथा किसी भी परिवर्तन को छात्र को मानना होगा बशर्ते कि विश्वविद्यालय ने अन्यथा प्रकार से उनको छूट न दी हो और छात्र ने उस परिवर्तन के पूर्व वर्ष पाठ्यक्रम को पूरा न किया हो। **विद्या परिषद द्वारा लिये गये निर्णय अन्तिम होंगे।**

POST GRADUATE DIPLOMA IN LABORATORY TECHNOLOGY AND INSTRUMENTATION

Regulation

The examination shall be conducted at the end of the academic session as Per scheme of Examination. Duration, division and other conditions are specified below:

Eligibility for Admission

A graduate of Science (Biogroup) at least 50% marks in aggregate.

Total number of seats available	20
In general Category	14
Reserved for SC/ST/PH	3 (SC)+2(ST)+1 (PH)

(May be modified as per the current reservation regulation of the university from time to time.)

With minimum 50% of marks

Further the university may take decision at any time for admission test prescribed for the purpose.

Minimum Pass marks & Duration of course

The minimum pass marks required in aggregate are 36% Subject to a minimum of 25% marks for each paper subject to this provision that minimum requirement for a first division= 60% second division 50%. All the rest will be declared to have passed in the examination.

The duration of course is spread over on one academic year.

There will be no supplementary Examination. However, if a student fails, maximum one chance will be given in the next subsequent academci session to pass the examination, but if a student passed in Project/Practical his marks will be carried forward for the next examination and thus he is exempted to reappear in the Project Report and Practicals in the next subsequent session.There will be a practical of 150 marks based on paper I, II, III of 5 hours duration, marks for each theory paper will be 100. There will be 50 marks for Project Report. The maximum time allowed for each paper is three hours in theory. Project report will be submitted at the time of practical examination for evaluation based on field observation including educational tour, laboratory exercise etc. related to problems of laboratory technology, biomedical instrumentation or medical laboratory Technology.

Instrsuction

Medium of instruction in English or Hindi.

Revaluation

Revaluation of papers is allowed only in any one paper, Revaluation in Project Report/ Practicals is not allowed.

Requirement for Attendance

Minimum attendance is required as per University rules.

Examination Fee

Examination fee is prescribed by the university and no carrying forward of fee is allowed on any ground.

Utilization of Faculty Development Fund.

1. Scholarship for 2 toppers based in the marit of the qualifying examination Entrance test, whichever is applicable.
2. Educational Tour.
3. Hospital/Medical college based training expenses.
4. Literature survey based of Internet.

Scheme of Examination	**Time**	**Max. Marks**
Paper - I General Laboratory Technology	3 hrs.	100
Paper - II Instrumentation and Maintenance	3 hrs.	100
Paper - III Special Paper (any one of the following)		
(a) Medical Laboratory Technology	3 hrs.	100
(b) Molecular and Developmental Biology,Laboratory Technology	3 hrs.	100
Practical based on Paper I, II, III and project report.	4 hrs.	50

WORKLOAD
I Theory: Six hours per paper per week.
II Practical: Four hours per paper per week.
III Project: One hour per week for a group of four students Each.

Paper I General Laboratory- Technology

Unit I

GLT 101 Introduction & importance of microtechniques, collection, fixation and preservations of biological material - principle of fixation, fixatives, and methods of fixation, post-fixation and preservation.

GLT 102 Preparation of permanent slides: preparation for mounting, mounting media and procedure for whole mounts.

GLT 103 Microtomy Principles and techniques. Preparation of tissues for thin and ultra thin sectioning, fixation, dehydration, clearing, infltration and embedding.

GLT 104 Staining techniques, principles and various types of strains including natural and synthetic dyes.

GLT 105 In- toto staining of biological specimen. Alizarin and Victoria blue & double staining Techniques.

Unit- II

GLT 106 Epoxy resin embedding technique. Various types of epoxy resin, catlyst, accelarators of.

GLT 107 Dark room techn[illegible] Still and time lapse photography developing and processing of [illegible]hic film and printing Autoradiography- principle and tech[illegible]lysis of autoradiography.

GLT 108 Laboratory Management : Laboratory classification designing and Layout of hightech laboratories and medical laboratory system designing and data management, personel management. Concept of technician and technologist.

GLT 109 Lving Resource material for Biomedical Sciences Design and layout of animal breeding and maintenance centre, care and breeding of common laboratory animals. Frog, Fish, Drosophila, Mouse animals laws for biodiversity research laboratories. Preparation of pure culture of Paramecium, Euglena, Amoeba, Hydra, water sponges, Planaria.

Unit- III

GLT 110 Principles of photometry (fundamentals only) colorimetry/ spectrophotometry: Spectro photometer techniques- General principles: types, applications of UV spectrophotometry and semiautoanalyzer. Application and principles of dry biochemistry IR spectrophotometry, ~~ourieular distortion (CD) spectrophotometry.~~ Spectrophotometry / Semiautoanalyzer procedure related to estimation of proteins, carbohydrates, lipids and nucleic acids of a given samples.

GLT 111 Analytical separation methods (Fundamental only). Chromatography : General principle, classification, application and types of column. thin Layer chromatography, partition chromatography, gas liquid, affinity, ~~HPCL (High Performance/Pressure Liquid chromatography).~~

UNIT- IV

GLT 112 Electrophoresis-General principle, application and type: Low voltage thin sheet electrophoresis, high voltage electrophoresis, gel electrophoresis- SDSPAGE, Iso-electro-focussing (IEF): Isotachophoresis Molecular weight estimation elementary Knowledge about DNA hybridization, recombinant DNA technology, polymerse chain reaction. DNA finger printing technique.

GLT 113 Environmental analytical methods : Estimation of pH, CO_2, N_2, Ca, K, P, O_2 ,Fluoride hardness, alkalinity, toxicants in water samples, Waste water treatment technology-solid waste recycling, fundamentals of environmental microbiology and toxicology.

Unit- V

GLT 114 Culture and staining of non-pathogenic and pathogenic Bacteria, Elementary knowledge about Bacteria structure, classification, culture media, techniques of pure culture, staining methods, permanent preparation and application in bio technology.

GLT 115 Cell, tissue, organ and embryo culture: Design and layout of tissue culture laboratory, aseptic techniques: laboratory safty and Bio-hazards, gas phase, temperature, media and supplements, culture techniques, maintenance of cell line, tissue culture, organ and embryo

culture-hanging drop methods, New's ring technique, aurbach's culture method for chick embryos, culture of mammalian embryo. Preparation of polyteone chromosomes of Drosophilla larva using, Salivary gland culture.

Practical based on Paper I

(Practical exercises based on the above mentioned topics will be carried out during the paractical classes.)

PAPER II INSTRUMENTATION MAINTENANCE

Unit I

IM-201 Introduction of Electricity: Modes of conduction, properties of electricity-electromagnetic effect, electrostatic effect, Piezo electric effects, simple electrical circuits, alternation current circuits, advantages of A.C. supply. Reactive load and reactive power and, D.C. supply.

IM-202 Measurement of Electrical parameters: Display devices, current measurement, measurement of resistance, Power: power supply, distribution, grounding, Multimeters: multimeters circuit, protection of multimeter, care and maintenance of multimeters, Relative advantages of different types of multimeters. Identification and measurement of passive component: resistence, capacitors, inductances, transformers, diodes, triodes and pentodes, and I.C. integrated circuit technology.

Unit II

IM-203 Safety of laboratory equipments: safety of personnel operating and using instruments, power supply stabilization, environmental conditions, fuses, soldering: solder ally, preparations for soldering, soldering iron, hints for careful soldering practice.

IM-204 Analogue and digital disply devices- Analogous to digital and digital to analogous conversion. Display meters, methods of testing, voltage stabilizers, power supply.

IM-205 Voltage regulators: AC voltage stabilizer, servo stabilizer, resonance type stabilizer electronic voltage stabilizer, DC power unit. Principles and operation.

Unit- III

IM-206 Electric Motors: Basic principles of electric Induction motors, basic principles of magnetism, basic principles of electromagnetism, electromagnets, advantages of electromagnets, Basic principles of induction motor, squirrel cage motor, spilit phase motor, shaded pole motor, SCR regulator. Common defects of the A.C. and D.C. motors and their remedy.

IM-207 Thermal Equipments: Principles and application, Incubators, oven, water bath autoclave, BOD incubators, thermal conductivity of

insulators, control of heating circuits, low temperature thermostates.

IM-208 Balance Principle and operation of single and two pan balances, substitution balance, top loading and analytical balances, electrical weighing system, digital balances. Digital Electronic equipment : Principles and maintenance.

Unit-IV

IM-209 Photo electric equipment: Terminology and basic components of photometer, spectrophotometer, spectrometers, radiant energy sources (types of lamps). Dispersing device, filter, diffracting grating, photoreceptors, barrier layer cell, photo sensitive tubes, photo multiplier tubes (PMT), flame Photometer, Fluoresence measurements, ph meter and maintenance of electrodes, precaution.

IM-210 Elementary concept of the principle and functioning of Microscopes, Monocular and binocular light Microscope, phase contrast Microscope, interference Microscope, polarizing Microscope. Dark field Microscope, Fluorescent Microscope electronmicroscope (TEM & SEM).

IM-211 Microtome and Microtme knives: Maintenance of Microtomes, types of Microtome (rotary, sledge, rocking, freezing, cryostate, ultramicrotome). Maintenance of Moving part, knife, handling and sharpening of knives.

Unit- V

IM-212 Principle and Maintenance of Audio-visual equipments: Types of projector, Maintenance, installation and care of projectors, Modern audiovisual teaching aids.

IM-213 Sterilizatin Equipments: Principle and Maintenance of laminar flow bench (Vertical and horizontal laminar flow), culture hood, auto-clave, hot air oven.

IM-214 Computer application in Science laboratories, fundamentals of computer, History and generation of computers: computers peripherals, elementary idea about comman softwart packages, operating system software. Application system softwares word processing, database . Management, software related to biomedical sciences, Windows 98 or any latest version. Internet and its Application.

Practical Based on Paper- II

(Practical exercises based on the above mentioned topic will be carried out during the practical classess)

Paper III Special Paper Medical Laboratory Technology

Unit I

MLT-301 Heatmatology: E.S.R. Principles and Estimation, Interpretation and

various methods, heamoglobin-formation fate and functions. Principles of various methods in Heamoglobinometry. Theory of blood coagulation, factors involved , extrensic and Intrinsic pathway, cascade theory, Iron Metabolism, total RBC and WBC count, Bleeding time, Cloting time, Prothrombine time, D.L.C. normal abnormal films Platelets-count & functions Packed cell volume.

MLT-302 Blood Bank Techniques and serology, ABO system. Nature of antibodies, Anti A.B.O. Rh grouping system tests, Antibody titrations, reasons and methodology, Immunology: Basic definitions, basic aspects of the immune response: humoral division, cellular division, Types of antigen. Types immunisation Heterophile antigen basic structure, types biological properties of immunobulins, complement, autommunity & immune disease, with special reference to AIDS.

Unit II

MLT-303 Clinical Biochemistry: Principles, Metabolism and clinical interpretation Estimation of bilirubin, creatinine, enzymes alkaline and acid phosphat ase amylase LFT, OT, PT, Lipid profile Glucose, uric acid, serum proteins, Na, K, HCO3, Cholestro, Total Ca, P, Lipids, pH, indicators and Buffers, Introduction to automation in clinical chemistry, Basic concepts, types of analysers, RIA/ELISA Techniques.

Unit-III

MLT-304 Clinical pathology: (i) Urine analysi: Chemical examinaton of urine by strip, specific gravity, pH, Albumin, sugar, principle of Albumin tests with interpretation Principle and interpretation of glucose, Bile salt, Bile pigments, Porphyrines Porphobillinogen, urobilinogen amino acid urea phenyl- keytone based Urea Homogentisic acid and calcium, urine microscopy etc. (2) Stool analysis- Gross and Microscopic (3) Semen analysis.

MLT-305 Bacteriology: Structure and Biology of Bacteria, Bacterial respiration, reduction, nutrition and growth Basic constituents of culture media, liqtid, semisolid and solid different methods of inoculation and streaking, aerobic and anaerobic methods of culture. Sample collection and staining of human pathogenic bacteria, mycobacteria, viruses, fungus, culture of urine, pus, C.S.F. sputum, semen blood, stool, throat swab, Skin scrapping and drug sensitivity tests. Preservation & Stock of cultures. Principle of lyophilization and making of vaccines autovacines.

Unit IV

MLT-306 Parasitology: Protozoa classification and general morphology. Trichomonas, Giardia intestinalis, Plasmodium, Trypanosoma: Entamoeba histolytica, Leishmania.

MLT-307 Helminthology Study of parasitic nematodes, round worm, hook worm, Pin worm, whip worm, tissue nematodes such as Wucheraries and treamatodes Taenia Solium Saginata, Echinococcus.

Unit V

MLT-308 Histopathology: Introduction to Histology Study of normal and pathogenic tissues from permanent slides autopsy & biopsy. Handling of biopsy specimens, malignancy types & detection: Exfoliative cytology FNAC and cell block.

MLT-309 Principles of Radiology: computer Aided Tomograph (CAT) encephalography, sonography, echocardiography, MRI: X-rays technology.

Practicals based on Special Paper-III

(Practical exercises based on the above mentioned topics will be carried out during the practical classes.)

Special Paper-III Molecular and Development Biology Laboratory Technology Molecular Biology Laboratory Technology

Unit-I

MDBLT-301 Radio-isotope techniques in macromolecular synthesis and distribution.

MDBLT-302 Ultra centrifugation: Separation of molecules differing in mass and or density. Sedimentation rate: zonal centrifugation. equilibrium density gradient centrifugation sedimentation constants.

MDBLT-303 Separation methods in moloecular Biology: Liquid chromatography, Paper chromatography, thin layer chromatography, high performance liquid chromatography, Gas chromatography, (principles and techniques). Electrophoretic Techniques, Moving boundary electrophoresis, cellous acetate electrophoresis, rod get electrophoresis, slab gel electrophoresis.

Unit- II

MDBLT-304 Principles and methods of Genetic enginerring: DNA transformation techniques: application in Agriculture, health, medicne and industry. Nucleic acid hybridization techniques,southern blot and Nothern blot techniques.

MDBLT-305 Recombinant DNA techniques- DNA damage and repair, amplification, sequence re-arrangement.

MDBLT-306 Regulation of Gene expression: DNA methylation.

Unit- III

MDBLT-307 Molecular biology of cancer, oncogenes: chemical carcinogenesis.

MDBLT-308 Lysogeny and lytic cycle in bacteriophages: bacterial transformation host cell restriction: transduction;

complementation, molecular recombination and genomic libraries, DNA ligases, topoisomerases, gyrases, methylases nucleases, restriction endonucleases, plasmids, cosmids, charron phases and their use in gene cloning for CDNA libraries and genomic libraries.

Unit- IV

DEVELOPMENTAL BIOLOGY: **Laboratory Technology**

MDBLT-309 Induced spawning in anurans/fish: principle & methods.

MDBLT-310 In vitro Fertilization of eggs and study of early development using suitable experimental model.

MDBLT-311 Cell, Tissue, Organ and embryo-culture-Techniques. Micromanipulator techniques; Nuclear transplantation experiments. Primary culture, cell line, cell clones soma clonal variations, Gene transfers by micro injection.

Unit- V

MDBLT-312 Cryoperservation techniques embryo-bio-technology. Tissue transplantation technology. Preparation of host and graft transplantation and development of graft.

MDBLT-313 Demonstratin of cell death in developing limb of chick embryo. Genetic control of development. Effect of retinoids on development of vertebrates, hormonal control of insect and frog metamorphosis, teratogenesis.

MDBLT-314 Wound healing, dedifferentation, redifferenation, pattern formation in vertebrate limb regeneration. Homeotic transdifferentation. Exo-utero development and Intra-amniotic surgial techniques in chick and manmalian embryos.

Practical based on Special Paper- III

(Practical exercieses based on the above mentioned topics will be carried out during the practical classes).