

<b>School: Science</b>	<b>Programme: Master of Science (M.Sc.) in Analytical Chemistry</b>
<b>Year : Second Year</b>	<b>Semester - III</b>
<b>Course: Analytical Toxicology and Food Analysis</b>	<b>Course Code: PCA301</b>
<b>Theory: 4 Hrs/Week</b>	<b>Max. University Theory Examination: 50 Marks</b>
<b>Max. Time for Theory Exam.: 3 Hrs</b>	<b>Continuous Internal Assessment: 50 Marks</b>

<b>Course Objectives</b>	
<b>1</b>	To study an analytical toxicology and food analysis.
<b>2</b>	To understand a various scientific terms-acute poisoning, clinical toxicology.
<b>3</b>	To understand a narcotics and psychotropic substances act and its related terms.
<b>4</b>	To study a different biomolecules: carbohydrates, proteins and lipids.
<b>5</b>	To understand a term food preservatives and its related concepts.

<b>Unit Number</b>	<b>Details</b>	<b>Hours</b>
<b>1</b>	Diagnosis of acute poisoning, Treatment of acute poisoning, Genotoxic compounds-definition, The role of the clinical toxicology laboratory, laboratory management and Practice, Color Test, Pretreatment of sample, Thin layer chromatography, Ultraviolet and visible spectrophotometry.	<b>12</b>
<b>2</b>	<b>Toxicology:</b> Isolation, identification and determination of following 1) Narcotics- heroin and cocaine. 2) Stimulants- caffeine, amphetamines. 3) Depressants- Barbiturates, Benzodiazepines	12
<b>3</b>	<b>Narcotics and Psychotropic substances Act.:</b> Definitions- addict, cannabis (hemp), Coca derivative, coca leaf, Manufacture medicinal cannabis, narcotic drug, opium, opium derivative, opium poppy, poppy straw, psychotropic substance, Illicit traffic, Prohibition control regulation offence and penalties  <b>Carbohydrates:</b> Definition, classification, and functions; Analysis of carbohydrates from food sample by different methods i) volumetric determination by Fehling's solution, ii) Colorimetric analysis of carbohydrates by Folin Wu method, Nelson Somyogi method, iii) total carbohydrates by Anthrone method, iv) Estimation of starch by anthrone method, v) Determination of amylase, vi)	12

	Estimation of pectic substances (gravimetric and colorimetric method), vii) Estimation of crude fibers	
<b>4</b>	<p><b>Proteins:</b> Definitions and functions, Analysis of proteins by Kjeldahl's method, analysis of protein by Lowry method, Estimation of amino acids by colorimetric method, Estimation of food grain for methionine content, Protein digestibility in vitro, Protein efficiency and net protein ratio, Determination of net protein utilization, digestibility and biological value, polyacrylamide gel electrophoresis of proteins.</p> <p><b>Analysis of Lipids:</b> Estimation of oil in oilseeds, Estimation of free fatty acids, Saponification value of oils, iodine value, Determination of acid value of oil, determination of peroxide value of oil, identification and quantification of fatty acids.</p>	12
<b>5</b>	<p><b>Determination of food preservatives:</b> Definition, SO<sub>2</sub> registration and determination by Tanners method, nitrate and nitrites registration and determination, boric acid registration and determination, benzoic acid registration and determination, 4-hydroxybenzoate registration and determination, ascorbic acid registration and determination. <b>Sweeteners:</b> Saccharine identification and determination, <b>Colours:</b> Identification by general methods, Natural colours.</p> <p><b>Milk :</b> Analysis of milk and milk products: Composition of milk, analysis of milk with respect to pH, acidity, fates, casein content, lactose content, mineral content, adulteration of milk.</p>	12
<b>Total</b>		<b>60</b>

Resources	
<b>Recommended Books</b>	
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Practical Biochemistry in clinical Medicine- R. L. Nath, Academic Publishers, 2nd Edn (1990)</li> <li>2. Textbook of forensic pharmacy- B. M. Mithal 9th Edn (1993) National Centre, Calcutta.</li> <li>3. V. Malik, Drug and Cosmetics Act.</li> <li>4. Forensic pharmacy by B.S. Kuchekar, and A.M. Khadatare (NiraliPrakshan).</li> <li>5. Shreves' Chemical Process Industries fifth edition by George Austin McGraw Hill.</li> <li>6. Practical Pharmaceutical Chemistry by Beckett</li> </ol>

	<ol style="list-style-type: none"><li>7. Basic Analytical Toxicology Published by WHO, By R. J. Flanagan, R. A. Braithwaite, S. S. Brown Available Online</li><li>8. Biochemical Methods, Third Edition, By S Sadashivan, A. Manickam; NEW AGE International (P) limited, PUBLICATION</li><li><b>9. Pearson's chemical analysis of food</b></li></ol>
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<b>School: Science</b>	<b>Programme: Master of Science (M.Sc.) in Analytical Chemistry</b>
<b>Year : Second Year</b>	<b>Semester - III</b>
<b>Course: Pharmaceutical Analysis</b>	<b>Course Code: PCA302</b>
<b>Theory: 4 Hrs/Week</b>	<b>Max. University Theory Examination: 50 Marks</b>
<b>Max. Time for Theory Exam.: 3 Hrs</b>	<b>Continuous Internal Assessment: 50 Marks</b>

<b>Course Objectives</b>	
<b>1</b>	To understand a concept of pharmaceutical analysis.
<b>2</b>	To know about FDA and understand the role of FDA in pharmaceutical industries.
<b>3</b>	To study a biological tests and assay in concern of pharmaceutical industries.
<b>4</b>	To study analysis of vegetable drugs.
<b>5</b>	To study standardization and quality control of different raw materials and dosage form

<b>Unit Number</b>	<b>Details</b>	<b>Hours</b>
<b>1</b>	<b>A) Apparatus for test and assay</b> , cleaning of glassware's. <b>B) Role of FDA in Pharmaceutical Industries:</b> Definitions of Drug & Cosmetics, Substandard Drugs, Role of FDA, Introduction to New Drug, Development of New Drugs- Selection of Area, Phase I, Phase II and Phase III. Application to FDA for formulation and marketing for new drug. Stability studies and Self life fixation. <b>C ) Biological Tests &amp; Assay :</b> Introduction to biological assay, Biological assay of Heparin sodium, Determination of Amylase activity, Determination of Photolytic Activity, Test for Insulin in solution, Biological Assay of Tetanus Antitoxin, Test for Undue Toxicity.	<b>12</b>
<b>2</b>	<b>Microbiological Tests and Assays :</b> Microbiological test for Antibiotics Standard preparation and units of activity, Test organisms and Inoculums, Cylinder-plate assay receptacles, Turbidimetric assay receptacles, Assay Designs, Cylinder plate or Cup-plate method, Two level fractional assay, Test for Sterility	<b>10</b>
<b>3</b>	<b>Physical Test, Determinations, Limit tests and Sterilization :</b> a)Disintegration Test for Tablets and Capsules, b) Dissolution Test for Tablets and Capsules, c) Determinations of moisture / water content by Karl-Fischer titration, Limit tests for arsenic, heavy metals, iron, lead, sulphate, chloride, ash and sulphated ash, e) Methods for Sterilization: Steam Sterilization, Dry heat sterilization, Sterilization by Filtration,	<b>10</b>

	Gas Sterilization, Sterilization by Ionizing radiation, Sterilization by heating with Bactericides, Water for Pharmaceutical use.	
<b>4</b>	<b>Analysis of Vegetable Drugs :</b> <b>Vegetable drugs:</b> Sampling, foreign organic matter, ash value, acid soluble ash, acid insoluble ash, sulphated ash, extraction of alkaloids. Sources of Impurities in Pharmaceutical raw materials & finished products, Shelf life of pharmaceutical product, Raw materials, Method of manufacture, Atmospheric contaminations, Cross contamination, Microbial contamination, Container contamination, Packaging errors, Chemical instability, Temperature effect and Physical changes, Shelf life of pharmaceutical product and determination of shelf life.	<b>10</b>
<b>5</b>	<b>Standardization and quality control of different raw materials and dosage form:</b> Analysis of raw materials with respect to identification, other or related substances, loss on drying, and Assay as per IP, i) adrenaline, ii) Niacinamide iii) Cephalexin, iv) ferrous fumarate, v) isoniazid and vi) paracetamol. Problems based on assay of these materials. Brief introduction to different dosage forms with the IP requirements. Analytical methods for the following- Tablets, different types of tablets, uniformity in weight (aspirin) additives used in tablet manufacture, capsules, types of capsules, (Rifampicin), Powders (Sodium benzoate), Solutions (saline NaCl) Suspensions (barium sulphate –limit test for impurity), Mouthwashes, Ointments (salicylic acid) and creams (Dimethicone), Injections (Mannitol), ophthalmic preparations (sulphacteamine), Aerosols (salbutamol), Blood products and reporting protocols. Problems based on assay of these materials.	<b>18</b>
<b>Total</b>		<b>60</b>

<b>Resources</b>	
<b>Reference Books</b>	1) Indian Pharmacopeia Volume I and II. 2) Practical Pharmaceutical chemistry by A.H.Beckett&J.B.Stenlake 3 <sup>rd</sup> edition, volume 1. 3) Remington’s Pharmaceutical sciences. 4) Ansel’s Pharmaceutical Analysis.

<b>School: Science</b>	<b>Programme: Master of Science (M.Sc.) in Analytical Chemistry</b>
<b>Year : Second Year</b>	<b>Semester - III</b>
<b>Course: Analytical Spectroscopy</b>	<b>Course Code: PCA303</b>
<b>Theory: 4 Hrs/Week</b>	<b>Max. University Theory Examination: 50 Marks</b>
<b>Max. Time for Theory Exam.: 3 Hrs</b>	<b>Continuous Internal Assessment: 50 Marks</b>

<b>Course Objectives</b>	
<b>1</b>	To study a principle, instrumentation and applications of electronic spectroscopy and X-ray analysis.
<b>2</b>	To study a microscopy.
<b>3</b>	To study a various types of electronic excitations.
<b>4</b>	To learn a principle and applications of nuclear magnetic resonance spectroscopy.

<b>Unit Number</b>	<b>Details</b>	<b>Hours</b>
<b>1</b>	<b>Electron spectroscopy:</b> Introduction, principle of ESCA, electron spectroscopy for chemical analysis, ESCA satellite peaks, spectral splitting, ESCA chemical shifts, Apparatus used for ESCA, X-ray source, samples, Analyzers, Detectors, Chemical analysis using ESCA, Applications, Auger electron microscopy, Ultraviolet photoelectron spectroscopy. ESR (only introduction).	<b>10</b>
<b>2</b>	<b>X- ray Methods of Analysis:</b> Principle, Theory- X-ray spectral lines, X-ray tube, X-ray emission, <b>Absorptive apparatus:</b> Sources, Collimation, sample handling, wavelength dispersive devices, Energy dispersive devices, detectors, readout device, Chemical analysis using X-ray absorption, <b>X-ray Fluorescence-</b> instrumentation and chemical analysis, X-ray Diffraction, Chemical analysis with X-ray diffraction, numerical problems	12
<b>3</b>	<b>An introduction to Microscopy (Surface characterization techniques):</b> Limitations of the Human Eye, the X-ray Microscope, The Transmission Electron Microscope, The Scanning Electron Microscope, Scanning Transmission Electron Microscope, Analytical Electron Microscopy, Scanning-Probe Microscopes, Transmission electron microscope.	10
<b>4</b>	<b>Chemiluminescences:</b> Introduction, principle, types. Measurement of chemiluminescence, Instrumentation quantitative	14

	chemiluminescences. Gas phase chemiluminescence's analysis. Chemiluminescences titrations, Electro-chemiluminescence. <b>Fluorescence and phosphorescence:</b> Introduction, Fluorescence, photo luminescent theory, electron transitions during photoluminescence, factors affecting photoluminescence, luminescent apparatus, optical extractive sources, wavelength selectors, detectors and readout devices, photo luminescent spectra, photo luminescent analysis, analysis of non-photoluminating compounds, determinations of mixtures, specific examples of analysis using photoluminescence, problems.	
5	<b>Nuclear magnetic resonance spectroscopy: <sup>1</sup>H-NMR:</b> Introduction, theory, Instrumentation, Chemical shifts, spin-spin splitting, protons on heteroatom's, coupling protons with other nuclei, solvents, qualitative and quantitative analysis, problems. <b><sup>13</sup>C NMR:</b> Introduction, interpretation <sup>13</sup> C NMR spectra, Chemical shifts, Spin coupling, quantitative analysis, problems. <b><sup>2</sup>-D NMR:</b> introduction, <sup>1</sup> H - <sup>1</sup> H connectivity, <sup>1</sup> H - <sup>13</sup> C connectivity, <sup>13</sup> C - <sup>13</sup> C connectivity, Through space <sup>1</sup> H - <sup>1</sup> H proximity, option and how to use them, problems.	14
<b>Total</b>		<b>60</b>

Resources	
<b>Reference Books</b>	1) Introduction to instrumental analysis by R. D. Braun, MC. Graw Hill- International edition. 2) Analytical spectroscopy by Kamalesh Bansal- 1 <sup>st</sup> edition. 3) Instrumental methods of chemical analysis by Willard, Dean and Meritsee- 6 <sup>th</sup> edition. 4) Analytical chemistry principles by John H. Kenedey, 2 <sup>nd</sup> edition, Saunders college publishing. 5) Spectroscopic identification of organic compounds by Silvestrine, Bassler, Morrill, John Wiley and sons, 5 <sup>th</sup> edition. 6) Analytical Chemistry, Ed. by Kellner, Mermet, otto, Valcarcel, Widmer, Second Ed. Wiley –VCH. 7) Vogel's Textbook of quantitative Chemical Analysis by Mendham, Denney, Barnes, Thomas, 6 <sup>th</sup> Ed., Pub: Pearson Education. 8) Electron microscopy in the study of material by P. J Grundy and G. A Jones, Edward Arnold.

<b>School: Science</b>	<b>Programme: Master of Science (M.Sc.) in Analytical Chemistry</b>
<b>Year : Second Year</b>	<b>Semester - III</b>
<b>Course: Carbon Nanostructures, Pollution Monitoring and Control</b>	<b>Course Code: PCA304</b>
<b>Theory: 4 Hrs/Week</b>	<b>Max. University Theory Examination: 50 Marks</b>
<b>Max. Time for Theory Exam.: 3 Hrs</b>	<b>Continuous Internal Assessment: 50 Marks</b>

<b>Course Objectives</b>	
<b>1</b>	To study a carbon molecules, carbon nanostructures and application of carbon nanotubes.
<b>2</b>	To study a biomedical applications of nano-materials.
<b>3</b>	To study an environmental impacts of nanotechnology
<b>4</b>	To study a removal of heavy toxic metals, particulate matters, sulphur dioxide and nitrogenous materials.

<b>Unit Number</b>	<b>Details</b>	<b>Hours</b>
<b>1</b>	<b>Carbon Nanostructures:</b> Introduction, carbon molecules, carbon clusters, carbon nanotubes (CNT), application of carbon nanotubes.	<b>10</b>
<b>2</b>	<b>Biomedical applications:</b> Introduction, biological sciences, photodynamic therapy in targeted drugs, advances in manufacturing, biomedical sensor and biosensors, quantum dot technology in cancer treatment, nanoparticle as a drug carrier.	14
<b>3</b>	<b>Environmental impacts of nanotechnology:</b> Introduction, engineered nanomaterial's in the body, routes of entry, toxic mechanisms, environmental implications of nanoparticles, toxicological health effects, relevant parameters in nanoparticle toxicology, integrated concept of risk assessment of nanoparticles	10
<b>4</b>	<b>Removal of Heavy Toxic Metals:</b> Chromium, mercury, lead, cadmium, Arsenic; analytical methods of determination of small amount of the metal pollutants, copper recovery, treatments of waste to remove heavy metals, recovery techniques. <b>Removal of Particulate matters:</b> Particulate matter and dynamics of particles separation, Particulate matter in gas stream, filtering gravity separation, liquid scrubbing cyclones separation, electrostatic precipitations safety of workers analysis of particulate matter.	14
<b>5</b>	<b>Removal of sulphur dioxide and nitrogenous materials:</b>	12



	Origin of SO <sub>2</sub> and its hazards, analysis of SO <sub>2</sub> control methods, desulphurization of fuels, Indian coal and Indian crude oil. Economics of SO <sub>2</sub> control measures. NO <sub>x</sub> , dissolved NO <sub>x</sub> , nitrites, ammonia, urea and other nitrogen compounds in the effluent fertilizers, explosive, industrial effluents, effluents from nitro aromatic industries, analytical methodology and photochemistry of air pollutions.	
<b>Total</b>		<b>60</b>
<b>Resources</b>		
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Introduction to nanotechnology by C.P. Poole, Jr &amp; F. J. Owens, John Wiley and Sons (2009).</li> <li>2. Nanobiotechnology by Subbiahbalagi, MJP Publishers, India (2010).</li> <li>3. Pollution control in processes industries, S.P. Mahajan (J.W).</li> <li>4. Air pollution control and design hand book by P.N. Chennsiof and R.A. Young.</li> <li>5. Refuse recycling and recovering (J.W).</li> <li>6. Resources recovery and recycling hand book and industrial wastes, M. Sitting (NDS).</li> <li>7. Sulphur in enviorment by J.O. Niagh, Vol. I and II.</li> <li>8. The Industry/EPA confrontation, P.S. Minor (MGH).</li> <li>9. Toxic and harazdous waste disposal by R.B. Pojasehc, Vol. I, (AAS).</li> <li>10. Environmental pollution analysis by S.M. Khopkar.</li> <li>11. Environmental pollution analysis by A.K. Dee.</li> <li>12. Industrial safety handbook by W. Handley.</li> <li>13. Inorganic chemistry by J.E. Huheey et al, 1993.</li> </ol>	

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<b>Year: Second Year</b>	<b>Semester-III</b>
<b>Course: Analytical Toxicology and Pharmaceutical Analysis Laboratory</b>	<b>Course Code: PCA311</b>
<b>Practical: PG – 4 Hrs/Batch (20 Students)</b>	<b>Practical Examination: 50 Marks</b>
	<b>Term Work: 50 Marks</b>

<b>Objectives</b>	
1	To learn an analysis of different types of materials.
2	To understand an alloy analysis.
3	Estimation of a chemical compounds using spectrophotometry and volumetry.
4	Separation of a compounds using chromatography.

<b>Sr. No.</b>	<b>Description</b>
1	<p><b>Analysis of Materials (Any Eight)</b></p> <p><b>A. Alloy Analysis (any Two)</b></p> <ol style="list-style-type: none"> <li>1. Analysis of Bronze with respect to Copper and Tin.</li> <li>2. Determination of aluminium and magnesium from Magnalium alloy.</li> <li>3. Analysis of Dolomite ore for Ca, Mg and Silicate material.</li> <li>4. Analysis of nicrome alloy with respect to nickel and chromium.</li> </ol> <p><b>B. Spectrophotometry (any Two)</b></p> <ol style="list-style-type: none"> <li>5. Determination of alcohol from given sample by Spectrophotometrically.</li> <li>6. Spectrophotometric determination of lead in leaves using dithizone-chelating agent.</li> <li>7. Analysis of Salbutalsulphate from asthma inhaler by UV spectrophotometry.</li> <li>8. Estimation of Cu and Fe(III) by spectrophotometric titration. (Standardization of EDTA is expected).</li> <li>9. Spectrophotometric determination of aluminum using eriochrome Cyanine R</li> </ol> <p><b>C. Volumetry (Any One)</b></p> <ol style="list-style-type: none"> <li>10. Determination of Phosphate from fertilizer sample by volumetric method.</li> <li>11. Analysis of copper ferrite (CuFe<sub>2</sub>O<sub>4</sub>) and determine amount of copper and iron volumetrically.</li> </ol> <p><b>D. Chromatography (any One)</b></p> <ol style="list-style-type: none"> <li>12. Removal of dyes on activated charcoal by column chromatography.</li> <li>13. Determination of anion exchange capacity of anion exchange resin.</li> <li>14. Determination of total cation concentration in waste water sample by cation exchange resin.</li> </ol> <p><b>E. Any Two</b></p> <ol style="list-style-type: none"> <li>15. Analysis of Cement with respect to SiO<sub>2</sub>, Calcium, Iron, Magnesium and Aluminium.</li> <li>16. Determination of Nitrogen from Fertilizer sample.</li> </ol>

	<p>17. Determine amount of magnesium from given talcum powder.</p> <p>18. Determination of Titanium from pigment/raw material.</p> <p>19. Determination of organic carbon in soil.</p> <p>20. To determine phosphoric acid in cold drink by molybdenum blue method.</p>
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#### **Term Work:**

Term Work assessment shall be conducted for the Project, Tutorials and Seminar. Term work is continuous assessment based on work done, submission of work in the form of report/journal, timely completion, attendance, and understanding. It should be assessed by subject teacher of the institute. At the end of the semester, the final grade for a Term Work shall be assigned based on the performance of the student and is to be submitted to the University.

#### **Notes**

1	The experiments from the regular practical syllabus will be performed (30 Marks).
2	The regular attendance of students during the syllabus practical course will be monitored and marks will be given accordingly (10 Marks).
3	Good Laboratory Practices (10 Marks)

#### **Practical/Oral/Presentation:**

Practical/Oral/Presentation shall be conducted and assessed jointly by internal and external examiners. The performance in the Practical/Oral/Presentation examination shall be assessed by at least a pair of examiners appointed as examiners by the University. The examiners will prepare the mark/grade sheet in the format as specified by the University, authenticate and seal it. Sealed envelope shall be submitted to the head of the department or authorized person.

#### **Notes**

1	Two experiments from the regular practical syllabus will be conducted. (Total 40 Marks).
2	Complete laboratory journal/records (05 Marks).
3	Viva-voce (05 Marks).

<b>School: Science</b>	<b>Programme: Master of Science (M.Sc.) in Analytical Chemistry</b>
<b>Year: Second Year</b>	<b>Semester-III</b>
<b>Course: Analytical Spectroscopy and Carbon nanostructures Laboratory</b>	<b>Course Code: PCA312</b>
<b>Practical: PG – 4 Hrs/Batch (20 Students)</b>	<b>Practical Examination: 50 Marks</b>
	<b>Term Work: 50 Marks</b>

<b>Objectives</b>	
1	To understand a various methods of estimation of compounds.
2	Determination of concentration of chemical compounds using modern analytical techniques.

<b>Sr. No.</b>	<b>Description</b>
1	<p><b>Instrumental Analysis: (Any Eight)</b></p> <ol style="list-style-type: none"> <li>1. Estimation of aspirin from given tablet by spectrophotometry.</li> <li>2. Spectrophotometric determination of inorganic phosphorous in human serum or urine.</li> <li>3. To determine chloride and iodide from given mixture by potentiometry.</li> <li>4. Analysis of Riboflavin from vitamin supplementary capsules / syrup / tablet sample by Photofluometry.</li> <li>5. Determination of relative strength of acetic acid, chloroacetic acid and trichloroacetic acid through measuring their <math>K_a</math> value by conductivity measurement method.</li> <li>6. Determination of boric acid by conductometry.</li> <li>7. Determination of Na and K from water sample by flame photometry binary method/internal standard method.</li> <li>8. Determination of <math>SO_4^{2-}</math> and <math>Cl^-</math> by turbidimetric method (turbidimetric titration or calibration curve method).</li> <li>9. Estimation of micronutrient from food by AAS (any two elements such as Fe, Cu, Zn, Mo, B, Mn).</li> <li>10. Determination of Cu and Zn in brass alloy by polarography.</li> <li>11. Analysis of paracetamol by HPLC.</li> <li>12. Determination of purity of sugar sample by optical rotation by polarimetry.</li> <li>13. Estimation of micronutrient from soil by AAS (any two elements).</li> <li>14. Analysis of alcohol from wine by GC.</li> <li>15. Separation of proteins by gel filtration chromatography thereby determination molecular weight of protein sample by gel filtration chromatography.</li> <li>16. To determine amount of each p-nitrophenol and m-nitrophenol from the given mixture by spectrophotometric titration using standard NaOH solution (<math>\lambda_{max}</math> 280 nm).</li> <li>17. To study the stoichiometry of ferric sulphate complex by Job's method.</li> <li>18. To determine concentration in mg/lit of sulphate in given water sample by Nephelometrically.</li> <li>19. To determine constant of ferric thiocyanate complex by Ostwald method Spectrophotometrically.</li> </ol>

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**Notes**

1	The experiments from the regular practical syllabus will be performed (30 Marks).
2	The regular attendance of students during the syllabus practical course will be monitored and marks will be given accordingly (10 Marks).
3	Good Laboratory Practices (10 Marks)

**Practical/Oral/Presentation:**

Practical/Oral/Presentation shall be conducted and assessed jointly by internal and external examiners. The performance in the Practical/Oral/Presentation examination shall be assessed by at least a pair of examiners appointed as examiners by the University. The examiners will prepare the mark/grade sheet in the format as specified by the University, authenticate and seal it. Sealed envelope shall be submitted to the head of the department or authorized person.

**Notes**

1	Two experiments from the regular practical syllabus will be conducted. (Total 40 Marks).
2	Complete laboratory journal/records (05 Marks).
3	Viva-voce (05 Marks).