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<tr><td>Level</td><td colspan="6">Level - 05</td></tr>
<tr><td>Course Synopsis Course Code</td><td colspan="6">CYU 5308</td></tr>
<tr><td>Course Title</td><td colspan="6">Instrumental methods of Chemical Analysis</td></tr>
<tr><td>Credit value</td><td colspan="6">03</td></tr>
<tr><td>Core/Optional</td><td colspan="6">Optional</td></tr>
<tr><td>Prerequisites</td><td colspan="6">CYU 5302- Analytical Chemistry</td></tr>
<tr><td>Hourly breakdown</td><td colspan="2">Theory</td><td>Practical</td><td>Independent Learning</td><td>Assessment</td><td>Total</td></tr>
<tr><td></td><td>16 Sessions x 02hrs.= 32 hrs</td><td>3DS x 4 hrs.= 12 hrs.</td><td>5 days Lab x 7 hrs.= 35 hrs</td><td>16 Sessions x 03 hrs. + on line and other resources = 68rs.</td><td>(2CATs x 1 hr.) + (PA -1 hr.) = 03 hrs</td><td>150 hrs</td></tr>
<tr><td>Course Aim/s.</td><td colspan="6">To be engaged in scientific thinking to develop an experimental procedure with an understanding of the theory related, to follow it using correct techniques and record scientifically: ability to decide on the options of different methods of analysis based on the requirement, benefits and limitations</td></tr>
<tr><td>PLOs addressed</td><td colspan="6">PLO1:Theoretical Knowledge: Explain the fundamental, principles and broader knowledge pertaining to the chosen sciencedisciplines offered for the BSc degree.
PLO2: Practical Knowledge and Application. Acquire competency in practical skills and the necessary knowledge to appropriately use these skills.
PLO3: Communication: Communicate reliably, efficiently and effectively to present information, ideas and concepts to the scientific community as well as to the wider society.
PLO4: Individual Work, Team Work and Leadership: Function effectively as an individual, and as a team member, sharing work and experiences, leading and managing assigned tasks to completion on time, demonstrating leadership to address situations in diverse and multi-disciplinary environments in day to day life.
PLO5: Creativity and Problem Solving: Identify problems and argue out and analyze such problems using qualitative and/or quantitative practical approaches in scientific methodology to provide valid conclusions
PLO6: Adaptability and Flexibility: Develop appropriate strategies to adapt to changing environments.
PLO7: Information and communication technology literate
PLO9: Lifelong Learning: Foresee new trends and recognize their impact, and update knowledge and develop new skills to meet future changes and challenges.</td></tr>
<tr><td>Course Learning Outcomes (CLO)</td><td colspan="6">After completing the course student will be able to:
CLO1. describe the factors to be considered when selecting a method of analysis.(PLO 1)
CLO2. describe the limitations and the requirements of the following methods of analysis – Spectroscopic methods (AAS, AES, FS, IR, NMR, Raman, Mass),Electro analytical methods (Voltametry, Polarography, Coulometry, Electrogravimetry),Thermal methods (Thermogravimetry, Differential thermal methods, DSCChromatographic methods (GC, HPLC, Ion exchange and gel permeation), Radio analytical techniques (Radio carbon dating, Isotope dilution method, Gamma ray spectroscopy, Neutron activation analysis)),(PLO 1& 2)
CLO3. suggest the most suitable method from above for an analysis and justify the selection.(PLO 3,4,5& 9)
CLO4. carry out analysis using an instrument following the manual and using standards.(PLO 2,3,5,6)
CLO5. identify the function of parts in the instrument using.(PLO 1,2&4)
CLO6. record results scientifically, draw a standard curve using EXEL and do the necessary calculations.(PLO 1 &3)</td></tr>
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	CLO7. suggest ways of improving separation in chromatographic methods.(PLO 1,2 & 5) CLO8. identify the possible systematic and random errors in the above methods and minimize them.(PLO 1, 3& 4) CLO9. communicate and work as a team.(PLO 3,4,7) CLO10. Ability to read, understand and develop a procedure, write a flow chart, follow it accurately within a given time and record.(PLO 3,4,7 & 9)	
Content **(Main topics, sub topics)**	**Theory-** Spectroscopic methods (UV/Visible, IR, NMR, Mass, Raman, AAS, AES, AFS), Electro anqalytical methods (Voltametry, Electro gravimetry, Coulometry,Polarography) Chromatographic methods (TLC, Paper, HPLC, Electrophoresis) Radoanalytical methods(Isotope dilution method, gammaray spectroscopy) **Practical-**Hands on experience onpreparation calibration standards and using Flame photometer, UV/Visible spectrophotometer (both manual and computerized)and Conductivity meter; Preparation of a buffer using pH meter; Demonstrations on AAS, GC, HPLCand radio analytical techniques; Packing of ion- exchange column, finding the capacity of an ion exchanger resin and using it for ion determination; drawing of calibration curve using EXEL.	
Teaching Learning methods	Self- learning: Course material (12 Sessions), Recommended readings, CATs Compulsory contact sessions: Laboratory classes, Laboratory reports, Presentations, Practical tests	
Assessment Strategy	Overall Continuous Assessment Mark (OCAM): 40%	Final Assessment: 60 %
	Practical Assessment Mark (P.A.M): $P.A.M. \geq 50\%$ Theory Assessment Mark (T.A.M.): $T.A.M. \geq 35\%$	Final Evaluation Theory examination – 2h
Recommended Readings:	1. Mendham J., Denney R. C., Barnes J. D., Thomas M.J.K., (1989),Vogel's Qualitative Chemical Analysis John Wiley and Sons Inc., 6th Ed. 2. Svehla G., (1996), Vogel's Quantitative Chemical Analysis, Prentice Hall 7th Ed. 3. Harris D. C., Solution manual for quantitative chemical analysis W.H. Freeman, 8th Ed. 4. Vitha M. F., (2016), Chromatography: Principles and Instrumentation Wiley, 1st Ed. 5. Ballinger J., Gershon shugar, (2011), Chemical technicians' ready reference hand book, McGraw Education.	