550 Chem Syllabus

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| **Course Title: Spectrometric Analysis and Automation** |
| **Course Code**: **CHEM 550** |
| **Program**: **Master of Science in Chemistry** |
| **Department**: **Chemistry** |
| **College**: **Science** |
| **Institution**: **King Saud University** |

Course Content:

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| **No** | | **List of Topics** | | **Contact Hours** | |
| **1.** | | Batch methods, segmented continuous flow analyzers-flow injection analysis- Dispersion. | | 2 | |
| **2.** | | Factors affecting dispersion-zone sampling, sample splitting-Relationship between manifold design & chemistry-gradient. | | 2 | |
| **3.** | | Component of Flow injection Analysis (FIA)-Connection tubes, pumps, organic solvent-pump tubes-Injectors. Automated methods of Analysis: Introduction- Advantages and disadvantages automatic analysis-Unit in chemical analysis-FIA Instrumentation sample injectors and detectors-Separation in FIA-Injection analysis- Dispersion- Application of flow injection analysis: Limited dispersion application, medium dispersion application. Stopped flow method-Flow  injection titration-Discrete automatic system automatic sampling. | | 4 | |
| **4.** | | Interaction of electromagnetic radiation w/matter-The electromagnetic spectrum-Absorption of radiation-Electronic spectra and molecular spectra-Kind of transition-Chromophores-Auxochromes-Absorption of isolated conjugated | | 4 | |
|  | | chromophores-Absorption of aromatic compounds-Absorption of inorganic compounds. | |  | |
| **5.** | | Solvent for spectrometry-Quantitative calculations- Transmittance-Absorbance- Absorptivity and molar absorptivity-Beer's law-Mixtures- Examples-Principles of instrumentation-Sources-Monochromators- (Optical filters- Prisms- Diffraction grating)-Cells- Detectors- Slit Width-Types of instruments (Single- Beam  Spectrophotometers& Double Beam spectrometers). | | 2 | |
| **6.** | | Deviation from Beer's law (Chemical deviation)- Calibration methods standard  calibration curve & standard addition method, Application to spectrometry (direct measurement-formation of absorbed complex-Indirect methods). | | 2 | |
| **7.** | | Chemical equilibrium- spectrophotometric-titration-titration curve- & advantage of spectrophotometric titration -Validation of the spectrophotometric methods (Accuracy-Precision-specificity-Limit of detection- Limit quantitation-linearity and range-ruggedness). | | 2 | |
| **8.** | | Fluorescence-Energy- Level diagram for photoluminescence molecules-Rate of absorption and emission-Deactivation processes- Vibrational relaxation- Internal conversion- Intersystem crossing chemical structure and fluorescence-Quantum fluorescence-Practical consideration fluorometry- Relationship between excitation spectra-Relationship between concentration and fluorescence intensity -Fluorescence instrumental-The Chemiluminescence phenomenon- Measurement of Chemiluminescence - Analytical application of Chemiluminescence- Analysis gases, analysis of inorganic species in the liquid  phase, and Analysis of organic species. | | 4 | |
| **9.** | | Atomic spectrometric method: Atomic emission spectra- Atomic Absorption spectra- Atomic fluorescence spectra- Flame atomization- Types of flames- Flame structure- Flame atomizers- Instrumentation for flame atomic emission-  Role of organic solvents in flame spectroscopy flame molecular emission. | | 2 | |
| **10.** | | Atomic absorption spectroscopy: Recitation sources for atomic absorption methods-Hollow cathode lamps- Instruments for atomic absorption spectroscopy- Interferences- (Spectral interferences physical interferences, Chemical interferences- ionic interferences- and self-absorption) Application of atomic absorption spectroscopy- Electro thermal atomizer- advantages electro  thermal atomizers- Flameless Mercury determination. | | 2 | |
| **11.** | | Atomic fluorescence spectroscopy- Types of atomic fluorescence (Resonance, fluorescence, non-resonance, fluorescence including: direct-line fluorescence excited state fluorescence and thermally assisted fluorescence) Instrumentation comparison, atomic absorption and atomic fluorescence methods- Emission  spectroscopy based upon, and spark atomization sample handling. | | 2 | |
| **12.** | | Arc sources and Arc spectra-spark sources-Instrument for Arc and spark source spectroscopy-Photographic detection-Photomultiplier detectors- Emission spectroscopy based on plasma sources- The inductivity coupled plasma source- Sample introduction Plasma appearance and spectra- Analyte atomization and ionization- The direct current argon plasma source- Instruments for plasma  spectroscopy-Quantitative application of plasma source. | | 2 | |
| **Total** | | | | **30** | |
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