

Fatima College

(Autonomous)

Re-Accredited with 'A++' (CGPA 3.61) by NAAC (Cycle- IV)

College with Potential for Excellence (2004 - 2019)

101 - 150 Rank Band in India Ranking 2021 (NIRF)

Mary Land, Madurai - 625 018, Tamil Nadu.



COURSES FOR ADVANCED LEARNERS

DEPARTMENT OF CHEMISTRY

INSTRUMENTATION & EXPERIMENTAL METHODS

II M.SC.

SEMESTER -III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PAPH	19PGSLP1	INSTRUMENTATION AND EXPERIMENTAL METHODS	Core	-	3

COURSE DESCRIPTION

This course enables the students to understand, analyze and implement the fundamental instrumentation and experimental methods of Physics.

COURSE OBJECTIVES

This course introduces the various instrumentation and experimentation methods encompassing data interpretation and analysis, sensors and transducers, vacuum and thin film techniques, ac and dc measurements, signal conditioning and noise

UNIT I: DATA INTERPRETATION AND ANALYSIS

Measurement, result of a measurement, sources of uncertainty and experimental error, Systematic error, random error, Reliability- chi square test, Analysis of repeated measurement, Precision and accuracy, Elementary data fitting.



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UNIT II: SENSORS AND TRANSDUCERS

Transducers, Transducer characteristics, selection of a instrumentation transducer, Transducer as an electrical element, modelling external circuit components, circuit calculations, Sensors and Transducers: Temperature, Pressure, Vibration, Magnetic Field, Force and Torque, Optical.

UNIT III: VACUUM AND THIN FILM TECHNIQUES

Units of pressure measurement, characteristics of vacuum, applications of vacuum, Vacuum pumps: Rotary, oil diffusion, turbo molecular pumps, Ion pumps. Vacuum gauges: Pirani and Penning gauges. Pumping speed of a vacuum pump. Thin film techniques(overview), film thickness monitors, film thickness measurement.

UNIT IV: MEASUREMENTS

Resistance: DC and AC Measurements, Inductance Measurement: The Maxwell Bridge, Parallel Inductance bridge, Anderson bridge. Voltage Measurement: AC and DC, Current Measurement: AC and DC. Resistivity Measurement: 2-probe, 4-probe and Van-der-Paw measurements.

UNIT V: SIGNAL CONDITIONING AND NOISE

Operational amplifiers, Instrumentational amplifiers, precision absolute value circuits, True RMS to DC converters. Phase sensitive detection: Lock in amplifier, Box-car integrator, Spectrum analyzer. Noise in Circuits: Probability Density Functions, The Power Density Spectrum, Sources of noise, Introduction to Digital signal conditioning

REFERENCES

1. Measurement, Instrumentation and Experimental design in Physics and Engineering Michael Sayer and Abhai Mansingh, Prentice Hall of India 2005



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2. Data Reduction and Error Analysis for the Physical Sciences, P.R. Bevington and K.D Robinson, McGraw Hill, 2003
3. Electronic Instrumentation- H.S. Kalsi, TMH Publishing Co. Ltd. 1997
4. Instrumentation Devices and Systems-C.S. Rangan, G.R. Sharma, V.S.V. Mani, 2nd Edition, Tata McGraw Hill, New Delhi, 1997
5. Instrumentation Measurement Analysis-B.C. Nakra, K.K. Chaudhary.

Syllabus for advanced learners and slow learners in PG

- Department of chemistry offers i) Analytical Chemistry –19PG4CE3 for advanced learners and ii) Chemical engineering- 19PG4CE4 for Slow learners based on their previous semester marks for M.Sc., students during their IV semester from the academic year 2017-2018 onwards.

ANALYTICAL CHEMISTRY –19PG4CE3

(For those who joined in 2019)

Semester-IV

5Hrs/week

4 credits

Objective: This paper deals with analytical methods. It also deals with programming in C language and its applications to solve problems in chemistry.

Unit – I	Programming in C Language	15 Hrs
Unit – II	Applications of C Language in Chemistry	15 Hrs
Unit – III	(a) Electroanalytical methods (b) Thermal methods	15 Hrs
Unit – IV	(a) Error Analysis (b) Chromatography	15 Hrs
Unit – V	Spectrophotometric methods and Radiochemical methods	15 Hrs



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UNIT –I

(15 HRS)

Programming in C Language

- (a) Introduction, Character set in C, Style of C Language – Identifiers and Key words – Constants, Variables and Data types, Operators in C.
- (b) Input and Output in C, Control statements in C, Storage classes in C, Functions in C, Arrays and pointers, Preprocessors in C, The type def statement and Files in C language.

UNIT –II

(15 HRS)

Applications of C Language in Chemistry

Writing the Program using the various features of C language – Determination of mass number of any atom-Determination of electronegativity of an atom from bond energy data using pauling's relation, Calculation of ionic strength , Determination of lattice energy of a crystal using Born-Lande equation, Determination of Shapes of molecules or ions using VSEPR Theory, Detemination of Normality, Molarity and Molality of solutions, Determination of half life of a radioactive nucleus.

UNIT – III

(15 HRS)

(a) Electroanalytical methods

Coulometry and coulometric titrations, Cyclic Voltametry.

(b) Thermal methods

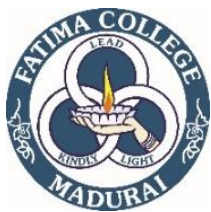
Principles of TGA, and DSC - Applications to simple salts – Oxysalts, Carbonates and complex salts.

UNIT – IV

(15 HRS)

(a) Error Analysis

Accuracy and Precision, Determinate and Indeterminate errors, Significant figures, Ways of expressing accuracy – Absolute and



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relative error, Standard deviation, The confidence limit, Tests of significance – The F test and The student T test, Rejection of a result – The Q test, Linear least squares to plot the data, Correlation coefficient.

(b) Chromatography

Principles, Adsorption, Partition, ion exchange chromatography, HPLC, Paper and Gas Chromatography.

UNIT –V

(15 HRS)

Spectrophotometric methods and Radiochemical methods

Principles and applications of photometry, Flame emission spectrometry, Atomic absorption spectrophotometry – Principles, Instrumentation (Block diagram), Fluorimetry, and photometric titrations.

Reference Books:

Units III to V

1. Douglas A. Skoog, Donald M. West and F. James Holler, Fundamentals of analytical Chemistry, Harcourt Asia Pvt. Ltd., 2001.
2. R.A. Day, Jr. and A.L. Underwood, Analytical Chemistry, Prentice-Hall of India, 2001.
3. H. Kaur, Instrumental methods of chemical analysis, Pragati Prakashan, 2003.
4. G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, Vogel's Textbook of Quantitative Chemical Analysis, Longman Scientific and Technical, 1989.

Units I & II

5. Programming in ANSI C - E. Balagurusamy
6. Computers in Chemistry - K.V. Raman



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CHEMICAL ENGINEERING

(For those who joined in 2019)

Semester-IV

5 Hrs/week

4 credits

Objective: This paper mainly deals with Engineering, analytical and application oriented chemistry. It also deals with programming in C language and its applications to solve problems in chemistry. After successful completion of programme, students will able to

Unit-I Programming in C Language and its applications in Chemistry (15 Hrs)

Introduction, Character set in C, Style of C Language – Identifiers and Key words – Constants, Variables and Data types, Operators in C. Input and Output in C, Control statements in C, Storage classes in C, Functions in C, Arrays and pointers, The type def statement and Files in C language. Writing the Program using the various features of C language -Determination of normality, molarity and molality of solutions – Determination of half life of a radio active nucleus

Unit -II Water Technology (15 Hrs)

Hardness of water-Equivalents of calcium carbonate- units of hardness- Estimation of hardness – Treatment of water for domestic supply –Boiler feed water and its requirements- scale and sludge formation in boilers— Caustic embrittlement-priming and foaming- softening and conditioning methods – External and internal conditioning-Desalination of Brackish water- Reverse osmosis.



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Unit -III Spectrophotometric methods and Radiochemical methods

(15 Hrs)

Principles and applications of photometry, Atomic absorption spectrophotometry – Principles, Instrumentation (Block diagram), Fluorimetry. Turbidimetry, Nephelometry and photometric titrations.

Unit -IV Corrosion and its control

(15 Hrs)

Introduction – dry or chemical corrosion-Wet or electro chemical corrosion – galvanic corrosion –concentration cell corrosion- passivity- pittig corrosion- intergranular corrosion- water line corrosion-stress corrosion- factors influencing corrosion- protection against corrosion- corrosion inhibitors- applications of protective coatings.

Unit-V Polymers

(15 Hrs)

Introduction, Engineering plastic-Rubber or elastomers- Vulcanization of Rubber and important synthetic Rubbers-Individual polymers – Poly methyl methacrylate –poly esters-poly carbonates-poly sulphones-poly imides-poly vinyl acetate-poly butadiene-poly chloro prene-phenol-formaldehyde resin-urea- formaldehyde and melamine formaldehyde resin-epoxy polymers and silicone polymers.

References:

- 1) K.V. Raman-Computers in Chemistry – Tata Mc Graw- Hill - 2005.
- 2) E. Bala Guru samy – Programming in Ansi-C - Tata Mc Graw- Hill – Sixth edition -2014.
- 3) Jain and jain – Engineering Chemistry –
- 4) Introduction to polymer science-V.R. Gowarikar, N. V.Viswanathan and J.sridhar.willey eastern.
- 5) Analytical Chemistry- Theory and Practice – U. N. Dash – Sultan Chand and Sons- 2013



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THE RESEARCH CENTRE OF ENGLISH & THE DEPARTMENT OF ENGLISH (SHIFT – II) Part II English Syllabi for Advanced Learners 2019-2020

FATIMA COLLEGE (AUTONOMOUS) 19E1LA1- ADVANCED COMMUNICATIVE ENGLISH Semester I No. of Hours: 5 x 15= 75 hours No. of credits: 3 credits

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: use advanced level English in writing

CO2: acquire the techniques of polishing their language skills

CO3: express their mind with rich vocabulary

CO4: distinguish between the wrong and correct usage of phrases and expressions

CO5: speak with eloquence

Unit I:- Listening

[15 hrs]

1. Moana (Movie)

Unit II:- Speaking- 1

[15 hrs]

1. On the Campus
 - a. Making Introductions
 - b. Yes/ No Questions
 - c. Responses
2. At the Post office
 - a. Idioms and phrases
 - b. Obligations
 - c. Conversations

Unit III:- Speaking- 2

[15 hrs]

1. Outside the class
 - a. Informal expressions
 - b. Expressing abilities and possibilities
 - c. Making inferences
 - d. Persuading
 - e. Using modals

Unit IV:- Reading

[15 hrs]

1. Oscar Wilde- Nightingale and the Rose
2. Rudyard Kipling- How the Whale got his throat
3. Ray Bradbury- A sound of thunder

Unit V:- Writing

[15 hrs]

1. At the College
 - a. Framing Questions
 - b. Letter Writing
 - c. Filling forms
2. For Business and Pleasure
 - a. Writing Instructions
 - b. Writing Reviews
 - c. Creating Advertisements

TEXT BOOK:

Krishnaswamy.N & T. Sriraman. *Creative English for Communication*. Macmillan, Hyderabad. 2009. Print.



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FATIMA COLLEGE (AUTONOMOUS) 19E2LA2- ENGLISH FOR CREATIVE WRITING

Semester II

No. of Hours: 6 x 15= 90 hours

No. of credits: 3 credits

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: express their thoughts creatively in English.

CO2: write different forms of continuous writing

CO3: interpret poems and novel

CO4: create cartoons and stories on their own

CO5: cultivate the interest of reading for pleasure

Unit I:- Listening

[15 hrs]

1. Speech of Steve Jobs (on Graduation day)

Unit II:- Speaking- 1

[15 hrs]

1. Are you smart?
 - a. Arguments
 - b. Telephone Conversation
 - c. Reactions
2. Are you Creative?
 - a. Creative excuses
 - b. Advices
 - c. Discussions

Unit III:- Speaking- 2

[15 hrs]

1. How to win?
 - a. Informal dialogues
 - b. Giving Solutions
 - c. Story telling
2. Is it Hard to improve?
 - a. Idiomatic resolutions
 - b. Riddles
 - c. debates

Unit IV:- Reading

[15 hrs]

1. Benyamin- *Goat Days*

Unit V:- Writing

[15 hrs]

1. Snakes and Ladders
 - a. CV preparation
 - b. Description of people
 - c. Description of jobs

Textbooks:

Benyamin. *Goat Days*. Penguin Books. India. 2012

Krishnaswamy.N & T. Sriraman. *Creative English for Communication*. Macmillan, Hyderabad. 2009. Print.



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FATIMA COLLEGE (AUTONOMOUS) 19EILII- INTERMEDIATE COMMUNICATIVE ENGLISH

Semester I

No. of Hours: 5 x 15= 75 hours

No. of credits: 3 credits

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: use intermediate English in writing

CO2: read and interpret texts

CO3: improve their vocabulary

CO4: comprehend and respond to situations

CO5: comprehend and appreciate songs and videos

Unit I:- Listening

[15 hrs]

1. Someone tell me Why
2. Respect the National Anthem

Unit II:- Speaking- 1

[15 hrs]

1. Greeting and parting
2. Accepting and declining invitation
3. On the telephone
4. Visiting a sick friend
5. Making Complaint

Unit III:- Speaking- 2

[15 hrs]

1. Daily Activities
2. What did you do?
3. Asking directions
4. Asking time (1)
5. Asking time (2)

Unit IV:- Reading

[15 hrs]

1. Still I rise
2. Rapunzel! Let down your hair

Unit V:- Writing

[15 hrs]

1. To Dear Jeremy and Sacia
2. Oh Mind! Relax Please!

TEXT BOOKS:

English Matters Volume 1- in-house text book prepared by The Department of English Fatima College, Madurai. 2018.

Spoken English- in-house text book prepared by Ms. S. Aarthi, The Research Centre of English Fatima College, Madurai. 2015

English Matters Volume 1 Workbook- in-house work book prepared by The Department of English Fatima College, Madurai. 2018.



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FATIMA COLLEGE (AUTONOMOUS) 19E2LI2- ENGLISH FOR EMPOWERMENT

Semester II

No. of Hours: 5 x 15 = 75 hours

No. of credits: 3 credits

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1: write contents for blogs and web pages
- CO2: listen to speeches and stories and comprehend them
- CO3: appreciate plays
- CO4: improve their conversational skills
- CO5: pen down their travel experiences

Unit I:- Listening [15 hrs]

- 1. Love is natural
- 2. Obama on climate change

Unit II:- Speaking- 1 [15 hrs]

- 1. Seeking advice and giving opinion
- 2. At the office- Seeking permission
- 3. Congratulating and wishing well
- 4. Attending an Interview
- 5. Getting to know each other

Unit III:- Speaking- 2 [15 hrs]

- 1. Days and dates
- 2. At the post office
- 3. Time and Calendar
- 4. Asking about prices
- 5. Immediate family relatives

Unit IV:- Reading [15 hrs]

- 1. Your turn to ask
- 2. Damon and Pythias

Unit V:- Writing [15 hrs]

- 1. Explore to be enlightened
- 2. Unleashing Creativity

TEXT BOOKS:

English Matters Volume 1- in-house text book prepared by The Department of English Fatima College, Madurai. 2018.

Spoken English- in-house text book prepared by Ms. S. Aarthi, The Research Centre of English Fatima College, Madurai. 2015

English Matters Volume 1 Workbook- in-house work book prepared by The Department of English Fatima College, Madurai. 2018.



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FATIMA COLLEGE (AUTONOMOUS) 19E1LB1- BASIC COMMUNICATIVE ENGLISH

Semester I

No. of Hours: 5 x 15= 75 hours

No. of credits: 3 credits

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: use basic English in writing

CO2: read texts and comprehend passages

CO3: develop their vocabulary

CO4: comprehend and respond what they listen at the basic level

CO5: comprehend and appreciate songs and cartoons

Unit I:- Listening

[15 hrs]

1. I have a Dream
2. Dennis the Menace

Unit II:- Speaking- 1

[15 hrs]

1. Greeting and parting
2. Accepting and declining invitation
3. On the telephone
4. At the Library

Unit III:- Speaking- 2

[15 hrs]

1. Daily Activities
2. What did you do?
3. Asking directions
4. Asking time (1)
5. Asking time (2)

Unit IV:- Reading

[15 hrs]

1. Our Happiness
2. At the tea stall

Unit V:- Writing

[15 hrs]

1. A Barber and Stranger
2. Jones' Suitcase

TEXT BOOK:

Getting Ahead- in-house text book prepared by The Department of English Fatima College, Madurai. 2001



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FATIMA COLLEGE (AUTONOMOUS) 19E2LB2- ENGLISH FOR EFFECTIVE COMMUNICATION

Semester II

No. of Hours: 5 x 15= 75 hours

No. of credits: 3 credits

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: develop reading skills and reading speed in an effective way

CO2: write formal writings in an effective way

CO3: comprehend academic writings effectively

CO4: read and understand newspaper articles

CO5: develop effective writing skills to report events/ happenings

Unit I:- Listening

[15 hrs]

1. The Sun
2. On smiling

Unit II:- Speaking- 1

[15 hrs]

1. Hire purchase
2. Asking about a course
3. Visiting a sick friend
4. Persuading a friend
5. Making complaints

Unit III:- Speaking- 2

[15 hrs]

1. Days and dates
2. At the post office
3. Time and Calendar
4. Asking about prices
5. Immediate family relatives

Unit IV:- Reading

[15 hrs]

1. Black and White
2. Experiment and Experience

Unit V:- Writing

[15 hrs]

1. Little Dora
2. The Spirit's Pilgrimage

TEXT BOOK:

Getting Ahead- in-house text book prepared by The Department of English Fatima College, Madurai. 2001
