

Proposal for
Distance Learning Programme under School of Distance Education

Certificate in Extruder Operator for Polymer Industry Applications
(CEOPIA)

Course co-ordinators: Dr. S. Anas

in association with

School of Chemical Sciences

Mahatma Gandhi University

Kottayam, Kerala

**Certificate in
Extruder Operator for Polymer Industry Applications (CEOPIA)
(Distance Learning Programme - Certificate Programme)**

Programme Project Report

Mahatma Gandhi University started the School of Distance Education in 1989 with the vision of providing the opportunity for quality education to all realms of society. Since the beginning, thousands of students have availed themselves of this opportunity for higher education to a great extent throughout Kerala. Many students outside the State have also benefited from this. But after the new directions of the UGC in 2014, the University had stopped all the Off-Campus Centres of the School of Distance Education both inside and outside the State.

Now it is the new endeavour of the School to revamp its functioning by offering different types of Diploma and Certificate programmes very relevant to contemporary society, in addition to the conventional Graduate and Post Graduate programmes. This is being done with the academic and infrastructural support of the eminent Schools and Interdisciplinary Interuniversity Centres of the University. All these Schools/ Centres have already conducted similar Programmes or Post Graduate Programmes in the same area. This Certificate Programme has been designed by the School of Chemical Sciences and to be conducted by the School of Distance Education with the academic support of the School.

The School of Chemical Sciences is one among the initial statutory departments of Mahatma Gandhi University. The academic programmes of the School of Chemical Sciences (SCS) were initiated from the very inception of the university. At present the school offers four different M.Sc. programmes along with M.Phil, M. Tech and Ph.D programmes covering all branches of chemistry and polymer science. The school, since its inception, has been making a steady progress in all spheres of activity and has academic programmes spread in four broad divisions namely Inorganic Chemistry, Organic Chemistry, Physical Chemistry and Polymer Chemistry. In spite of the nationwide diversions of talented students from basic sciences, more than 1000 students appear for our entrance tests to graduate programmes annually. Keeping in view the vision and mission of

the School, the syllabi of the various courses are frequently updated introducing new courses in emerging areas with inter-disciplinary content. The faculty members are actively engaged in research in various branches like synthetic organic chemistry, theoretical and computational chemistry, catalysis, material and solid state chemistry, nanochemistry and technology, photochemistry, polymer composites etc. The school has state-of-the-art instrumentation facility for research activities.

a) **Programme's mission & objectives :**

The aim of the certificate course Extruder Operator through distance learning programme is to prepare students to become experts in extrusion processing. This will develop skills towards professional industrial careers in Plastic industry and students startups. This module will provide the student with an understanding of the various type of plastic extrusion process, equipment, material development for extrusion, troubleshooting in extrusion process and extrusion plant maintenance

b) **Relevance of the program with HEI's Mission and Goals :**

The course focuses on extrusion processing of various type of thermoplastic polymers. This course places a strong emphasis on the professional development of the students. Such a qualification will enable and facilitate career progression for the students. This course will create a confidence to the students start startups.

c) **Nature of prospective target group of learners:**

Students with science/engineering background can join for the programme. Students doing their B.Sc/Diploma/ B.Tech students can join the programme to strengthen their operation skills in extrusion processing.

d) **Appropriateness of programme to be conducted in Open and Distance Learning mode to acquire specific skills and competence :**

This course places a strong emphasis on the professional development of the students. Such a qualification will enable and facilitate career progression for the students. On successful completion of this module, a student will be able to (i) Understand the various kind of extrusion process in the polymer industry. (ii) Understanding the plastic compounding (iii) Theoretical education for understanding and troubleshooting in extrusion process (iv) provide practical training of extrusion processes

- e) **Instructional Design :**
The course is of 6 months which includes theory and practicals.

Structure of the Course

Duration : 6 months
Credits : 20
Contact Hours - Theory : 48 hrs
Contact Hours - Practicals : 90 hrs

Course Code	Course Type	Course Name	Credits	Contact classes (hours)	Internal Marks	External Marks	Total Marks
SDE-SCS-	Common Core course (Theory)	Introduction of Thermoplastic Materials	4	12	30	70	100
SDE-SCS-	Common Core course (Theory)	Introduction to Plastic Compounding	4	12	30	70	100
SDE-SCS-	Common Core course (Theory)	Introduction to Extruders	4	12	30	70	100
SDE-SCS-	Common Core course (Theory)	Introduction to Extrusion process	4	12	30	70	100
SDE-SCS-	Common Core course (Practical)	Plastic Compounding, Extrusion profiles and trouble shooting in extrusion processing/ Project	4	90	30	70	100
Total			20	138	150	350	500

*T : Theory; P : Practical

Course Design

For practicals, 20% will be virtual and remaining will be by direct laboratory work. This course will have three types of graded activities that will be included in overall course grade. These include: **Assignments:** Answer monthly quizzes that account for 20% of the course total grade.

Each quiz includes 20 multiple choice questions that examines your understanding of the learning materials. **Open-ended Questions:** Answer two open-ended questions that account for 80% of the course total grade. The questions encourage creative thinking, and their answers are based on the knowledge gained in the course. **Final project:** At the end of the course the candidate will be asked to complete a final project. It will consists of a written report that focuses on the utilization of analytical techniques for various applications. The final project will be graded and will contribute to 25%.

f) **Procedure for admissions, curriculum transaction and evaluation:**

Any student with minimum +2 Science can apply. The student has to pay an amount for the programme which is decided by the University. The course contents will be delivered online. For practical's, 20% will be virtual and remaining will be by direct laboratory work. This course will have three types of graded activities that will be included in overall course grade. These include: **Assignments:** Answer monthly quizzes that account for 20% of the course total grade. Each quiz includes 20 multiple choice questions that examines your understanding of the learning materials. **Open-ended Questions:** Answer two open-ended questions that account for 80% of the course total grade. The questions encourage creative thinking, and their answers are based on the knowledge gained in the course. **Final project:** At the end of the course the candidate will be asked to complete a final project. It will consists of a written report that focuses on the utilization of analytical techniques for various applications. The final project will be graded and will contribute to 25% of the overall course grade.

Evaluation of the courses shall be done by the faculty themselves on the basis of internal assessment and end semester examinations. 20% of the marks will be decided by the internal evaluations and the remaining 80% by the end semester examinations which will be conducted by the University. The performance of a student in each course will be evaluated in terms of percentage of marks obtained with a provision for its conversion to grade points.

Each student shall be required to do one Assignment/Book Review/Debate/Seminar/ Presentation of the case study for each course. Assignments/Book Review after valuation shall be returned to the students. The teacher shall define the expected quality of the above in terms of structure, content, presentation and the like, and inform the students of the same.

Grading System will be followed for the evaluation on a ten point scale. The details of the grading system are given in the following Table.

Percentage Equivalence of Grade:

Range of % of Marks	Grade Letter	Performance	Grade Point
95 - ≤ 100	O	Outstanding	10
85 - < 95	A plus	Excellent	9
75 - < 85	A only	Very Good	8
65 - < 75	B plus	Good	7
55 - < 65	B only	Above Average	6

45 - < 55	C	Average	5
40 - < 45	P	Pass	4
< 40	F	Fail	0
Absent	Ab	Absent	0

'P' grade is required for a minimum pass in a course. The minimum GPA required for a pass in the Certificate programme is 4.

Calculation of Grade Point Average (GPA) :

Credit Points for the Course = (No. of Credits assigned for the course x Grade Point secured for that course).

GPA indicates the performance of a student in the programme. GPA is based on the total **credit points** earned by a student in all the courses divided by the total number of credits assigned to the courses required in the programme.

Note: GPA is computed only if the candidate passes in all the required courses (gets a minimum required grade for a pass in all the required courses as per the curriculum).

GPA =

$$\text{GPA} = \frac{\text{Total credit points earned by the student from all the required courses of the programme}}{\text{Total credits of all courses required in the programme}}$$

This formula shall be printed on the Grade Card issued to the student with a note that it could be used to convert the grades into mark-percentages. (The details of the grading system as indicated above shall also be printed on the Grade Card).

Conversion of GPA to Grade

GPA	Grade
10	O
9.0 - < 10	A plus
8.0 - < 9	A only
7.0 - < 8	B plus
6.0 - < 7	B only
5.0 - < 6	C
4.0 - < 5	P
< 4	F
Absent	Ab

Conversion of GPA to percentage

$$\text{Equivalent Percentage} = (\text{GPA obtained}) \times 10$$

g) **Requirement of the laboratory support and Library Resources:**

To handle the practical components in syllabus, technicians and consumables are required. The Laboratory facility of the school shall be provided to the students during holidays and vacation. Certain level of the practical would be conducted and performed by applying virtual reality methods.

Mahatma Gandhi University Library and Information System consists of University Library, libraries of the Schools and 4 study centre Libraries. The University Library was established in 1989. The University Library which is situated in the main campus occupies purpose-built accommodation, and provides a variety of facilities and has a user-friendly environment. These include individual work spaces, room for group study and teaching, audio-visual access and online information retrieval system. The building of the University Library is 2000 sq.m in area consisting of the cellar, the ground floor and the first floor.

Academic as well as public users are given the facility to use the library. Special category membership is provided to journalists. The library is providing service from 8 am to 8 pm in three shift timings for its staff. The library functions on an average of 345 days in a year. The libraries of teaching departments are open during working hours of the Schools. Reading space is provided in all the three floors housing the various sections of the library. The library provides reading facility to the visually impaired users too. For this, an electronic lab custom made for visually and physically challenged users has been set up during 2016.

The University Library has a Library Advisory Committee. It is an 18 member committee with Vice-Chancellor as Chairman and University Librarian as Convener.

The library has a collection of 59,000 books, 232 journals, 2,135 Ph.D. theses and has access to 15000+ e-journals under E-Shodh Sindhu. The activities of the Library are comprehensively automated using open source library management software KOHA. OPAC, Journal Article Index, By monthly Bibliography compilation and Literature Search Service are also available

The library is a member of the INFLIBNET Centre, Ahmedabad as well as DELNET (Developing Library Network). As a member of these networks, the library provides access to the resources of other major libraries in the country. In addition to the access to UGC INFONET consortium, it has access to major online databases, such as EBSCO, ProQuest dissertations and theses, Oxford Scholarship Online, IEEE All Society Periodicals Package etc. Mahatma Gandhi University had won the State IT Award during the year 2009 in the e-learning category for its university online theses digital library. The various department libraries have a good collection of subject specific books and journals.

A. MAHATMA GANDHI UNIVERSITY LIBRARY	
Category	No.
Books	59000
Journals	232
Bound Journals	7500
Ph.D Theses	2135
E-Journals (in UGC-Infonet, renamed as E-ShodhSindhu)	15000
Online databases (in UGC Infonet)	11
Online Archives subscribed	185 Titles
Online databases subscribed	4

E-books	7338
DVDs: Educational Videos	293

B	Name of School/Centre	Total No. of books
	School of Chemical Sciences	4100

h) **Cost estimate of the programme and the provisions:**

The budget details for the course is given in the following Table.

Budget Estimate

S. No.	Item	Amount (Lakhs)
1	Online study materials	2
2	Staff Salary(Teaching and Laboratory)	5
2	Online virtual lab.	3
3	Online assignments/evaluation	2
4	Laboratory demonstrations	3
5	Books and periodicals	1
6	Contact classes	1
	TOTAL	17 Lakhs

Total Programme fee: Rs.17500/-

i) **Quality assurance mechanism and expected programme outcomes:**

The quality of the programme will be ensured through strict monitoring by an executive committee including the Co-ordinator of the programme, the subject experts, Director, School of Distance Education and Head of the School of Chemical Sciences. The Co-ordinator of the programme shall ensure the regular student feedback of courses, teachers and programme in the prescribed format towards the end of the semester and the same shall be analysed to draw conclusions for effecting improvement. Periodical review meetings on the programme efficacy will be held in which the remarks of teachers on curriculum, syllabi and methods of teaching and evaluation will be given due importance. Moreover, the progress and the quality of the programme will be monitored by the Internal Quality Assurance Cell of the University from the outcome and feedback of the learners as well as the proper documentation maintained in the Centre

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Syllabus

Certificate Programme in Extruder Operator for Polymer Industry Applications

Month 1: Introduction of Thermoplastic Materials

Commodity plastics :-(Monomer preparation, polymer preparation, properties and application)

- Polyethylene: LDPE ,HDPE, LLDPE ,XLDPE ,UHMWPE
- Polypropylene: Isotactic, syndiotactic and atactic polypropylene.
- Polystyrene, Toughened poly styrene HIPS AND ABS –Expanded polystyrene
- Polyvinyl chloride (PVC)
- Acrylic plastics -PMMA, PMA

Engineering plastics: – (Monomer preparation, polymer preparation, properties and application)

- Different types – Nylon 6,6-nylon 6-nylon 6,10,
- Polyesters : PET and PBT
- Polycarbonate

Month 2: Introduction to Plastic Compounding

Compounding ingredients – fillers, Stabilisers, coupling agents, plasticisers, Impact modifiers, antidegradents, UV absorbers, flame retardants and blowing agents, cross linking agents, Processing aids, Lubricants, Extenders and Pigments. Typical plastic product formulations, plastic compounding equipments.

Month 3-4: Introduction to Extruders

Extrusion Definition, Extruder classification- cold feed, hot feed, Ram and screw extruders with sketches, L/D ratio, Single screw extruder, T-head, dual, twin screw, vented extruder. Extruder parts, accessories, ancillary equipment, sizing. Sketches of various type of extruders. Extruder screw design for various types of plastics, extruder temperature control

Month 4-5: Introduction to Extrusion process

Extrusion line, mixing zones, process. Die swell, Melt fracture & shark skin. Factors affecting the output of an extrusion process variables in extrusion, back pressure & its effect on extrusion process Extrusion of tubing and pipe, profile extrusion, wires and cables. Extrusion dies, important aspects of die design, Trouble shooting in extrusion processes

Extrusion Plant & Maintenance: power supply and control system, drive mechanism, hydraulics, pneumatics and electrical circuits. Gear box, clutches, pumps and safety features. Identification of faults, trouble shooting. Preventive maintenance, planning and safety.

Month 5-6: Plastic Compounding, Extrusion profiles and trouble shooting in extrusion processing

Design various a plastic formulation (PVC pipe, PE tube, etc.)

Extrusion of various type of profiles

References

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3. Fisher, E.G., 1976. Extrusion of plastics.
4. Levy, S., 2012. *Plastics product design engineering handbook*. Springer Science & Business Media.
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6. Crawford, R.J., 1998. *Plastics engineering*. Butterworth-Heinemann.
