A COMPREHENSIVE NOTE ON

POST GRADUATE DIPLOMA

in

CHEMICAL TECHNOLOGY MANAGEMENT

Institute of Chemical Technology,
(University Under section-3 of UGC act 1956)

Matunga, Mumbai 400 019

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Appendices:

1. Preamble

Institute of Chemical Technology (University Under section-3 of UGC act 1956) intends to start Post Graduate Diploma in Chemical Technology Management at Institute of Chemical Technology (ICT), Matunga, Mumbai 400019. This part time course will be conducted on Saturday and Sundays.

In 2001, a Certificate course in Chemical Technology Management was introduced at then Institute of Chemical Technology, under University of Mumbai (MUICT) specifically for students carrying out Ph.D. studies at MUICT. The course of 3 semesters, each of 45 hours (30 sessions), was conducted on second and fourth Saturdays of a month. The objective of this course was to enrich the Ph.D. scholars in Business Management topics related to Chemical technology. The intention was to inculcate among them leadership qualities and business abilities required by Indian Chemical Industry and for entrepreneurship.

Each year 20 students were admitted and 5 batches have come out so far. The course was well received by the students and more so by the Industry as the students were well versed to provide technology managers.

ICT, in its senate meeting has decided now to introduce this course under its new status. Hence the course was reviewed and it was felt that the scope and contents of the course be widened to strengthen University - Industry interaction. The new course will be a **Post Graduate "Diploma" in Chemical Technology Management**. In view of the national interest and needs, the course will not be restricted to Ph.D. scholars of ICT only. It will be opened to other scholars pursuing Ph.D. programs anywhere in India. For scientists in Industry this will be continuing education program.

The pertinent details of the course structure, its duration, admission qualifications, examinations rules and regulations etc are presented in this note.

2. Objective

The origin of the course lies in the observation that the Ph.D. scholars must not restrict themselves to R&D work in industry or academic institutes but should convert innovations into a commercial success. In fact, Ph.D.'s have provided leadership in technology management and entrepreneurship in the other developed countries. Two excellent examples are Jack Welch of GE and Andy Grove of Intel - both Ph.D. in Chemical Engineering.

With the growing emphasis of the private sector Indian and overseas industry and also various initiatives by the Government of India on technology development, implementation and its business management, the demand for such trained personnel with strong research background will increase exponentially. Knowledge and understanding of commercial aspects will accelerate technological growth.

ICT produces ~100 Ph.D.'s every year. The number is expected to rise to 150 soon. The certificate course was started for them with that thought in mind. After seeing the success of that course and benefits derived by the students and the chemical industry, it was felt that the scope of the course and the in-take of the students should be widened.

Objective *of Post Graduate "Diploma in Chemical Technology Management" course remains the same as before, that is,* ***to give research scholars and personnel, an orientation in business and technology management and to sharpen entrepreneurship skills.***

3. Course Content

This syllabus for the new course leading to Post Graduate Diploma in Chemical Technology Management is developed on the following basis. Several faculties who were teaching certificate course were involved in the syllabus preparation.

- The Diploma course runs into 4 semesters
- The first 3 semesters are each of 96 hours spent at 6 hours per day and for 16 week-ends per semester
- The last semester entirely devoted to project is of 72 hours.
- Thus the entire course is covered in 96 × 3 = 288 + 72 = 360 hours.
- There will be 4 or 5 subjects per semester for examinations.
- Case studies will be an important part of learning. A 60-70:40-30 ratio is recommended between classroom learning (L) and practicing (P).
- Lectures will be conducted on week-ends (Saturdays and Sundays).

Subjects & Methods

Following are main subject headings with suggested L/P ratio in bracket:

1. Chemical Technology Management, (70:30)
2. Product/Process Design and Development, (60:40)
3. Finance Management, (60:40)
4. Marketing management, (70:30)
5. Intellectual Property Rights and other laws,(70:30)
6. Communication, (30:70)
7. Human Resources Development, (60:40)
8. Project Management, (70:30)
9. Team and Organization Management, (30:70)

It is expected that in practicing hours, its faculty is present to guide in the assignments or case studies. The computer facility is to be arranged so that the work can be done by students at any time and not to have to borrow their section PC's.

There may not be "sit-and-write" examinations in subjects where practice forms more than 50% of the course, e.g. Communication and Team & Organization Management (TOM). The students are to be judged and evaluated or graded as per the quality of assignments, presentation etc. for these courses. The case studies / assignments are to be documented for course assessment and revision.

The details of the course and its spread over the semesters are given in Appendices A and B. The Appendix C deals with the Examination regulations.

4. Course Admissions

Minimum qualification for admission is Post-graduate degree in Chemical Technology (all branches), Engineering, Sciences, Pharmacy, Mathematics and any other equivalent course. All candidates except sponsored candidates from industry must have been registered for Ph.D. degree.

Total admissions every year will be **30 students** as explained below:

A) Research scholars **from ICT** registered for Ph.D. in any of the above subjects. = **10**

B) Research scholars from Institutes **other than ICT,** registered for Ph.D. in above subjects = **10**

C) Persons working in Industry for not less than 3 years with minimum qualification as above **(Sponsored candidates)** = **10**

4.1 ICT/UICT candidates will have to register for Ph.D. before seeking admission to Diploma in CTM.

4.2 Non ICT candidates should furnish a certificate from their supervisor duly signed by HOD, Principal/Director of the Institute where they are conducting their research work.

4.3 The sponsored candidate must have 3 years experience in chemical industry after post-graduation. This will be deemed as equivalent to registration for Ph.D. for this course. They should provide evidence by way of a certificate from the employer.

4.4 The seat allocation for the **20 seats** (A+B) would be as follows:
(% Reservation is as per norms of Maharashtra State):

Reservation	%	Total Seats	Actual ICT		Non-ICT
SC	13	**3**	2	↔	1
ST	7	**1**	1	↔	1
Total	20	**4**	2		2
Open	80	**16**	8		8
Grand Total	100	**20**	10		10

4.5 If we do not get ST candidate, the quota will go to SC. If we do not get SC/ST candidates, the quota will go to open category.

4.6 There will not be any reservation for sponsored (self or industry) candidates.

4.7 If we do not get sponsored candidate, seats will be filled from ICT followed by non ICT candidates and in that case the reservation policy applies as outlined above. If we do not get **non ICT** candidate, seats will be filled from ICT. If we do not get ICT **or** non ICT candidates, the seats will be filled from sponsored candidates (industry or self sponsored) and in that case no reservation policy will be applied.

Admission Criteria:

A written test & interview will be applicable to all. There will be equal weightage to both the tests (50% written test & 50% interview).
The merit list for all above categories will be displayed.

Course Duration:

The course comprises of **Four Semesters** covered over **two** years. It will be conducted on Saturdays and Sundays.

Commencement:

The course will commence from 5th January 2013. The admission procedure may commence from 1st November 2012.

5. Course Fees & Expenses

Fee structure

The total fee for post Graduate Diploma in Chemical Technology Management is divided in three components namely,

- Tuition Fee
- Laboratory / Library Fee
- Development Fee

The students from industry (sponsored candidates) will be charged 3 times those from academics**.**

We propose following Fee Structure

***Students from academia*:**	**Fee per year (₹)**
• Tuition Fee	8,000
• Laboratory/ Library Fee	2,000
• Development Fee.	5,000
Total	**15,000 per year**

(Total Course Fee: ₹ 30,000/-)

***Industry sponsored*:**	**Fee per year (₹)**
• Tuition Fee	24,000
• Laboratory / Library Fee	6,000
• Development Fee.	15,000
Total	**45,000 per year**

(Total Course Fee: ₹ 90,000/-)

For all examinations, the ***Exam Fee 1000/- per semester per student*** for all students irrespective of sponsored or non sponsored.

The following is the breakup of man power:

- The visiting faculty honorarium proposed is **₹ 1000/hr**.

  The lecture is for 1.5 hrs, so the honorarium will be **₹ 1500 per lecture**.

  The honorarium is also applicable to ICT faculty teaching the course/courses.
- One clerk and one attendant (computer assistant) as per ICT norms.

6. Faculty

Almost all the teaching faculty of the Certificate course would be available for the Diploma course. All those teachers are qualified and highly accomplished in their respective fields and have practiced the subject in industry. Those who are associated with ICT are introduced below.

- Professor Bhagwat S.S., a faculty member from ICT and is main course coordinator.
- Professor Mahajani V.V., has about eight years Industrial experience in production, planning, corporate research and project engineering before 21 years as Chemical Engineering teaching at the same institute namely, ICT.
- Dr. Ravi Mohan is adjunct professor in ICT who was active in teaching for certificate course and currently is faculty member for the subject of Product Designing & Development.
- Dr. Atul Kaji was the head of H.R. in Hindustan Unilever currently teaches subjects of Human Resource Management and Communication.
- Dr. V.S. Bhakre is an expert faculty member for subject of Marketing.
- Mrs. Svetlana Tatuskar and Mr. K.P. Chaudhary are Chartered Accountants and teach the subjects related to Finance.
- Dr. Mangesh Mokashi is Adjunct Professor of IPR, alongwith his team at IPR cell of ICT teach the subject of Intellectual Property & Patents.
- Mr. S.M. Mokashi is the Honorary Professor. He was the course coordinator for the earlier certificate course. He has about 40 years experience mainly in Project engineering involving project management before retiring as Director of a multinational organization. He has to his credit course of London Business School.
- All technology related subjects will be by taught by present ICT faculty if need arise.
- Alongwith the above mentioned faculty members many guest lecturers in the field of management are a part of this course.

7. Infrastructure

- ICT is a well established, 75 years old, academic Institute of international repute. It has very good class rooms, conference rooms with powerpoint facilities.

- ICT has an excellent library facility with about 100 management books and subscribes to International journals on project, product and business management. Apart from this there are various technical journals in various technology branches including Chemical Engineering. The library is open on public holidays also.

- Computers are available in large numbers and almost individually. The internet facilities are provided for further global access via our centralized Information Processing Centre (IPC).

- Existing administrative and accounts department has spare capacity to provide similar services to conduct this course and related examinations.

- Additional steno-/clerk dedicated to this course and keeping all records pertaining to this course will be made available in our office.

- Conducting the course on Saturdays & Sundays is possible with all above facilities.

8. Course Perspective

8.1 Marketing the Course

Financial sustainability and success of the course depends on receiving student support from the chemical industry as well.

This could be done through letters to industry, presentations to major R&D houses. Institute has a large well-placed alumni and Alumni Association is active in all respects. The UAA has agreed to support this course in whatever form as it did for the certificate course. The course timing is to made convenient for outside candidates as well as the research students as the lectures will be conducted on Saturdays and/or Sundays.

8.2. Long Term Vision

A long term plan for development of the course should be kept in perspective. From that point of view, ICT will develop a department for chemical industry economics and management. This will built a database for the industry and will act as an incubation cell for chemical research conducted at ICT and for development of chemical technologies through Technology Incubation Centre.

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Appendix A

Spread of Syllabus over the Semesters

Course Contents	Contact Hours		Marks	CREDITS
	Hrs-L/P	*Hrs-Exam*		
SEMESTER I				
1. Technology Management	12 / 6	2	50	3
2. Marketing	12 / 6	2	50	3
3. Project Management	9 / 6	2	50	3
4. Communication	6 / 9	-	50	3
5. IPR[+] & Laws	9 / 6	2	50	3
6. TOM*	6 / 9	-	50	3
Sub Total	54/42	8	300	**18**
SEMESTER II				
1. Product D&D[#]	11 / 7	2	50	3
2. Finance	12 / 6	2	50	3
3. HRD	9 / 6	2	50	3
4. Communication	3 / 3	Included in TOM		-
5. TOM*	3 / 6	-	50	3
6. Marketing	9 / 6	2	50	3
7. Technology	9 / 6	2	50	3
Sub Total	56/40	10	300	**18**
SEMESTER III				
1. Product D&D[#]	11 / 7	2	50	3
2. Project Finance	12 / 6	2	50	3
3. HRD	9 / 6	2	50	3
4. Safety Laws	9 / 6	2	50	3
5. Finance	9 / 6	2	50	3
6. Communication	3 / 6	Included in TOM		-
7. TOM*	3 / 3	-	50	3
Sub Total	56/40	10	300	**18**

[+] IPR: Intellectual Property Rights

[#] Product D&D: Product Design and Development

* TOM: Team and Organization Management

Out of 50 marks for each subject, 20 marks are for internal assessment and 30 marks are for the final examination.

Semester IV: Project

The Project work deals with a real life assignment from and in association with ICT, CSIR and industrial laboratories. It may be related to technology development, application etc. and will include preliminary feasibility report/technology marketing report.

- The topics will be given by Faculty members but the course coordinators will select the same.

- The candidate will be supervised by one or two Faculty members (inclusive of all previous three semesters). In the case of sponsored candidate one of the supervisors may be from his establishment (Industry/Institute/Laboratory) and the other from teaching Faculty. Each Supervisor can have maximum 5 candidates.

- At the end of the assignment, the candidate shall submit two spiraled bound hard copies and one soft copy in the PDF format (CD). There will be oral examination which will include presentation by the candidate at a notified date.

- *The evaluation will be on following lines:*

Marks for continuous assessment during the semester to be given by the supervisor (s) ----------	50
Marks for the report after the assessment by the examiners (Other than the supervisor) ----------	100
Marks for the oral examination (Supervisor and one / two External examiners) ----------	50
TOTAL	**200**

Over the semester 72 hours & 200 marks ***Credits: 18***

Hours & Marks Allotment

Summary of subject wise allotment of hours and marks over the entire period is given below.

	Subject	Total L	Total P	Total H	Total M
1.	Technology	21	12	33	100
2.	Marketing	21	12	33	100
3.	Finance	21	12	33	100
4.	Legal	18	12	30	100
5.	Product Design	22	14	36	100
6.	HRD	18	12	30	100
7.	Project etc.	21	12	33	100
8.	Communication	12	18	30	100
9.	TOM	12	18	30	100
10.	Assignments			72	200
	TOTAL	**166**	**122**	**288/360**	**900/200**

For the final result "Credit System" will be adopted.

Each semester will have 18 Credits, thereby, total credits = 4 x18 = 72

Appendix B

Detailed Course Content

SEMESTER I

1. Technology Management (Lectures: 12 hrs; Case Studies: 6 hrs)

- Chemical Technology
- Technology Evaluation
- Effectiveness in Technology
- Networking in Technology
- Commercialization of technology
- Interfaces between R&D and others
- Pilot Plant & Scale up
- Technology Forecasting
- Customer Focused Technology

BOOKS:

- *Research in Education, Best, John W., New Delhi, 2000,7th Ed.*
- *Introducing Management, Schermerhorn, John R., New York, 2000*
- *Information Technology for Management, Lucas, Henry C.,New Delhi, 2000,7th Ed.*
- *The Fragrance of Success:Nurturing The Family managed Business, Kelkar Govind, Mumbai, 2002*
- *Chemical Project Economics, V.V. Mahajani and S.M. Mokashi, Macmillan India Ltd., 2005*

2. Marketing (Lectures: 12 hrs; Case Studies: 6 hrs)

- Principles of Marketing
- Evolution of Marketing, Marketing Concepts, Markets in 21st Century
- Marketing Mix (Controllable / Non-controllable), Marketing plan,
- Industrial Marketing, Consumer Market
- Product, Price & Placement, Pillars of Marketing – Segmentation, Target Markets, Differentiation & Position *(Lectures 6 and Case study 3)*
- New Product Marketing
- Corporate Strategy for Product Planning
- New Product Decision Product Introduction
- New Product Development & Promotion
- Market Potential for New Products *(Lectures 6 and Case study 3)*

BOOKS:

- *Marketing Management, Kotler, Philip. New Delhi, 2001, 10th Ed.*
- *Strategic Market Management, Aaker, David A., New York, 1998, 5th Ed.*
- *Marketing Research, Luck, David J., New Delhi, 2001, 7thEd.*
- *Marketing: A Managerial Introduction, Gandhi, J. C., New Delhi, 2001*
- *Chemical Project Economics, V.V.Mahajani and S.M.Mokashi, Macmillan India Ltd., 2005*

3. Project Management (Lectures: 9 hrs; Case Studies: 6 hrs)

- Project identification / evaluation, process selection, site selection
- Elements of Project Management
- Construction of Project networks, PERT / CPM techniques
- Time limited scheduling, Project crashing
- Time & Resource analysis
- Project monitoring. Computers in project scheduling

BOOKS:

- *Chemical Project Economics, V.V.Mahajani and S.M.Mokashi, Macmillan India Ltd 2005*
- *Count your Chikens before they Hatch, Chaudhuri Arindam. Delhi, 2001*
- *Effective Project Management, Wysocki, Robert K., New York, 2002, 2nd Ed.*
- *Project Management, Choudhury, Tata McGraw Hill*
- *Project Management, Vasant Desai, Himalaya*

4. Communication (Lectures: 6 hrs; Case Studies: 9 hrs)

- Grammar: Forming grammatically correct sentences
- Vocabulary**:** Roots of words, synonyms and antonyms, choice of words from alternatives, commonly confused words
- Comprehension: Précis writing
- Phonetics & Pronunciation**:** Use of a dictionary
- Basic process of communication, Types of communication, Channels of Communication, Barriers to communication; Business letters; Technical report writing, Minutes of meetings, Assertiveness, Presentations.

BOOKS:

- *Body Language: A Guide for Professional, Lewis, Hedwig, New Delhi, 2000, 2ndEd.*
- *Managing Presentations: Communicating with Impact, Wakhlu, Savita Bhan,*

New Delhi, 2000

- *Communication Skills for Engineers and Scientists, Venables J. Warwickshire, 2002, 3rd Ed.*

5. Intellectual Property Rights, IPR (Lectures: 9 hrs; Case Studies: 6 hrs)

- IPR – Patents & Copy rights (General)
- Patents and Patenting – Rules and Regulations
- Use of Patents in Research
- Patents - Reading & Writing
- Patentability and Validity
- Valuation and Commercialization of patents in business
- Case studies, assignments, Group Discussions

BOOKS:

- *Patents for Chemical, Pharmaceutical and Biotechnology: Fundamentals of Global Law, Practice and Strategy, Grubb, P. W., 4th Ed., New Delhi, 2006*
- *The Patents Act, 1970 and the Patents Rule, 2003, Mumbai, 2007*
- *All the Government of India Acts on IP to be found at* www.ipindia.nic.in and copyright@nic.in
- *WIPO DL – 101 Course on IP, WIPO, Geneva, Switzerland*
- *Intellectual Property: Licensing and Joint Venture, Profit Strategies, Smith, G.V., New York, 1998, 2nd Ed.*
- *Patent Fundamentals for Scientists and Engineers, Gordan, T. T. and Cookfair, A. S., New York, 2000*

6. Team and Organization Management (Lectures: 6 hrs; Case Studies: 9 hrs)

- What is in it for me?
- The attitudes of pro-activity & Accountability
- Positive attitudes
- Self awareness
- Living one's life according to one's values
- Creative thinking
- Creative tools
- Creative problem Solving
- Finding one's life purpose
- Time management

- How to plan and prioritize
- Organizing – People, work, time and Content

BOOKS:

- *Production & Operation Management, Goel, B.S., Meerut, 2001, 16th Ed.*
- *Organisations and Development: Strategies, Structures and Processes, Dale, R., New Delhi, 2000*
- *Change Management: Guide to Effective Implementation, Paton, Robert A., New Delhi, 2000, 2nd Ed.*
- *Organizational Behavior, Robbins, S.P., New Delhi, 2000 9th Ed.*

SEMESTER II

1. Product Design and Development (Lectures: 11 hrs; Case Studies: 7 hrs)

- Definition of Chemical Product design as a 4-step process
- Stage-Gate Process
- Customer Needs analysis
- Product specification and benchmarking
- Brainstorming for ideas, sorting of ideas
- Selection of ideas for working
- Risk assessment in Product development
- Definition of result of Product development e.g. through Formulation
- Viability analysis

BOOKS:

- *E.L. Cussler (Univ of Minnesota) & G.D. Muggeridge (Univ of Cambridge) CHEMICAL PRODUCT DESIGN, Cambridge Univ. Press*
- *Supply Chain Management - Strategy, Planning & Operation, Sunil Chopra (Kellogy Graduate School of Management) & Peter Meindl (iz Technologies), Pearson Education Asia, 2001*
- *Commercializing New Technologies, Vijay K. Jolly, (IMD Switzerland) Harvard University School Press, 1997*
- *Research & Development Management in the Chemical & Pharmaceutical Industry, Peter Bamfield (ICI, U.E) Wiley–VCH, 2003*
- *Marketing Management, Philip Kotler (North Western University), Prentice Hall of India Pvt. Ltd., The Millenium Edition. 2001*

2. Finance (Lectures: 12 hrs; Case Studies: 6 hrs)

- Basic concepts in Finance Accounting - Assets & Liabilities
- Expenses & Income, Depreciation, Cash–Mercantile Accounting
- Preparation of Receipts/Payment, Balance Sheet, and Income/Expenditure Sheets
- Exposure to Accounting system (Double entry Book-keeping)
- Financial Performance Appraisal using Ratio Analysis, Fund flow Analysis & Cash Flow Analysis
- Valuation of tangible and intangibles-DCF, other methods
- Corporate Taxation – Direct and indirect

BOOKS:

- *Chemical Project Economics, V.V. Mahajani and S.M.Mokashi, Macmillan India Ltd., 2005*
- *Financial Management: Principles and Problems, Srivastava, R.M., Meerut, 7th Ed., 2000*
- *Valuation of Intellectual Property and Intangible Assets, Smith, G.V., New York, 2000*
- *Introduction to Management Accounting, Homgren, Charles T., New Delhi, 2001*

3. Human Resources Development (HRD) (Lectures: 9 hrs; Case Studies: 6 hrs)

- HRD as a business function. Spectrum of HRD activities
- Organizational structures. Job roles and job descriptions
- Human Resource Planning. Recruitment and selection
- Performance Management
- Remuneration Management

BOOKS:

- *Career Management for Scientists and Engineers, Borchardt, John K., Oxford, 2000*
- *Leveraging Knowledge: Consultancy Capabilities and Needs of CSIR, Gupta, V.K.*
- *Managing Technical People, Humphrey, Watts S., Delhi, 2001*
- *Developing the Leader within You, Maxwell, J.C., Mumbai, 2001*

4. Communication (Lectures: 3 hrs; Case Studies: 3 hrs)

Group discussions

5. **Team & Organization Management (Lectures: 3 hrs; Case Studies: 6 hrs)**

- Overview of Leadership & Team Building
- Benefits & applications to the world of Business
- Leadership Qualities
- Developing these skills
- Facilitating team work
- Team Problem Solving

BOOKS:

- *Production & Operation Management, Goel, B.S., Meerut, 2001, 16th Ed.*
- *Organizations and Development: Strategies, Structures and Processes, Dale,R., New Delhi, 2000*
- *Change Management: Guide to Effective Implementation, Paton, Robert A., New Delhi, 2000 2nd Ed.*
- *Organizational Behavior, Robbins, S.P., New Delhi, 2000 9th Ed..*

6. Marketing (Lectures: 9 hrs; Case Studies: 6 hrs)

- Market Demand & Supply
- Market Research
- Demand Forecasting
- Consumer Research / Buyer Behavior
- Advertising / Personal Selling
- Distribution Decision
- Logistic & Supply Chain

BOOKS:

- *Marketing Management, Kotler, Philip., New Delhi, 2001, 10th Ed.*
- *Strategic Market Management, Aaker, David A., New York, 1998, 5th Ed.*
- *Marketing Research, Luck, David J., New Delhi, 2001, 7th Ed.*
- *Marketing: A Managerial Introduction, Gandhi, J. C., New Delhi, 2001*
- *Chemical Project Economics, V.V. Mahajani and S.M. Mokashi, Macmillan India Ltd., 2005*

7. Technology (Lectures: 9 hrs; Case Studies: 6 hrs)

- Technology Pricing
- Royalty Payment
- Development of process Scheme
- Technology Transfer
- Technology Absorption / Adoption / up gradation
- Quality through process

BOOKS:

- *Chemical Project Economics, V.V. Mahajani and S.M. Mokashi, Macmillan India Ltd., 2005*
- *Handbook of Financing Energy Projects, Georgia, 2005*

SEMESTER III

1. Product Design and Development (Lectures: 11 hrs; Case Studies: 7 hrs)

- Product commercialization
- Relationship to process design
- Scale-up and economics
- Marketing of new product developments
- Case studies from Univ. of reading

BOOKS:

- *Quality Planning and Analysis: From Product Development Through, Juran, J.M., and Gryna, F.M., New Delhi, 2001 3rd Ed.*
- *Introduction to Materials Management, Tony Arnold, J.R., Delhi, 2001 4th Ed.*
- *Management Systems: Quality, Environment, Health and Safety, Nag, P K., Mumbai, 2002*
- *Production and Operations Management: An Applied Modern Approach, Martinich, Joseph, New York, 1997*

2. Project Finance (Lectures: 12 hrs; Case Studies: 6 hrs)

- Project feasibility study (including market, technical and financial analysis)
- Project planning market and technical analysis,
- Project financing, financial projections
- Project cost estimation and budgeting
- Working capital management- estimation & financing

Books:

- *Chemical Project Economics, V.V. Mahajani and S.M.Mokashi, Macmillan India Ltd., 2005*
- *Financial Management: Principles and Problems, Srivastava, R.M., Meerut, 7th Ed., 2000*
- *Valuation of Intellectual Property and Intangible Assets, Smith, G.V., New York, 2000*
- *Introduction to Management Accounting, Homgren, Charles T., New Delhi, 2001*

3. Human Resources Development (Lectures: 9 hrs; Case Studies: 6 hrs)

- Competency assessment.
- Training & development.
- Leadership, team working
- Motivation, delegation
- Time management
- Organizational development
- Change management
- Legal aspects of employee relations

BOOKS:

- *Career Management for Scientists and Engineers, Borchardt, John K., Oxford, 2000*
- *Leveraging Knowledge: Consultancy Capabilities and Needs of CSIR, Gupta, V. K.*
- *Managing Technical People, Humphrey, Watts S., Delhi, 2001*
- *Developing the Leader within You, Maxwell, J. C., Mumbai, 2001*

4. Safety Laws (Lectures: 9 hrs; Case Studies: 6 hrs)

- Safety includes personal, plant and environmental safety.
- Material hazards, process hazards and plant safety - general
- Factories act and rules
- Fire safety, petroleum storage
- Environmental laws – water, air, solid waste
- Environmental impact assessment

BOOKS:

- *Loss Prevention in Process Industries, Lees F.P., Vol. I & II, 1980*

5. Finance (Lectures: 9 hrs; Case Studies: 6 hrs)

- Cost accounting / pricing
- Sources of finance - Short/long term, domestic/foreign, equity/borrowing/mixed etc.
- Cost of capital and capital-structure planning, capital budgeting
- Investment decision analysis
- Venture capital

BOOKS:

- *Introduction to Management Accounting, Homgren, Charles T., New Delhi*
- *Chemical Project Economics, V.V. Mahajani and S.M. Mokashi, Macmillan India Ltd., 2005*

6. Communication (Lectures: 3 hrs; Case Studies: 6 hrs)

Constructing a CV and Personal Interviews.

7. Team and Organization Management (Lectures: 3 hrs; Case Studies: 3 hrs)

- Interpersonal skills managing conflict
- Interpersonal problem solving
- Negotiation skills
- Managing change in groups/communities/organizations

BOOKS:

- *Production & Operation Management, Goel, B.S., Meerut, 2001, 16th Ed.*
- *Organisations and Development: Strategies, Structures and Processes, Dale,R., New Delhi, 2000*
- *Change Management : Guide to Effective Implementation, Paton, Robert A., New Delhi, 2000, 2nd Ed.*
- *Organizational Behavior, Robbins, S.P., New Delhi, 2000 9th Ed.*

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Please note that the books indicated are those available with us at ICT library. As the course progresses, teacher might recommend different books which will be procured in due course of time.

Appendix C

Examination: The Rules and Regulations

1. The minimum passing marks required for any individual subject are at 40% of the subject marks (i.e.20 out of 50). However, for passing the entire semester the candidate must secure 50% of the total marks. In the case of semester IV Project, the candidate must secure 50% of the allotted marks (100 out of 200).

2. The result will be declared within three weeks from the end of examination day. A supplementary examination will be conducted for the failed candidates within one month of the declaration of the result.

3. If the candidate has failed in **one or two** subjects he/she has to undertake the repeat examination **only for those** subjects. In such a situation he/she can attend the classes (courses) for the next semester.

4. If candidate has failed in **three or more** subjects the candidate needs to undertake the examination of that semester in **all the subjects**. The candidate can continue to attend classes of the immediate next semester or can carry out the Project assignment (Semester IV).

The candidate will not be allowed to appear for the examination unless he has successfully cleared the previous semester examination.

5. In case the candidate has failed to clear the project assignment with more than 50% marks a new assignment will be given.

6. If failure is due to not having aggregate 50%, the candidate can upgrade the marks in that semester by choosing the papers again.

7. Failed candidate has to clear the semester before appearing for the next exam. Student can attend lectures of the next semester after failure in any one semester. Maximum one attempt after the supplementary examination will be permitted to clear the semester. No supplementary examination will be held for that attempt.

8. In case a student backs out in mid course due to failure or any other reason, fees will not be refunded.

9. The credit system would be implemented as in the case of degree course.

10. The number of attempts will not be mentioned on the certificate.

11. Even if the candidate is reappearing for one subject the entire fee for Examination (₹ 1000/- in year 2011; might be revised) will be required to be paid.

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