

Faculty of Engineering and Technology
P.K.University
Shivpuri (MP)



Evaluation Scheme & Syllabus

Diploma in Chemical Engineering
(II Semester)

(Effective from session 2025-26)

EVALUATION SCHEME

DIPLOMA –CHEMICAL ENGINEERING (2nd SEM)

STUDY AND EVALUATION SCHEME FOR DIPLOMA CHEMICAL ENGINEERING

YEAR-1st /SEMESTER-2nd

SUBJECT CODE	SUBJECTS NAME	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
DAPPLCH201	Applied Mathematics-II	3	1	0	4	30	-	30	70	-	70	100
DAPPLCH202	Applied Physics-II	2	1	0	3	30	-	30	70	-	70	100
DAPPLCH203	Applied Mechanics	3	1	0	4	30	-	30	70	-	70	100
DMECHCH204	Mechanical Operation and Solid Handling	3	0	0	3	30	-	30	70	-	70	100
DAPPLCH205	Applied Mechanics Lab	0	0	2	1	-	25	25	-	25	25	50
DAPPLCH206	Applied Physics–II Lab	0	0	2	1	-	25	25	-	25	25	50
DMECHCH207	Mechanical Operation and Solid Handling Lab	0	0	2	1	-	25	25	-	25	25	50
DWORKCH208	Workshop Practice	0	0	4	2	-	25	25	-	25	25	50
Total		12	3	10	19	120	100	220	280	100	280	600

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I Year II Semester

DAPPLCH201: APPLIED MATHEMATICS –II

L	T	P
3	1	0

1. INTEGRAL CALCULUS - I:

Methods of Indefinite Integration :-

- 1.1 Integration by substitution.
- 1.2 Integration by rational function.
- 1.3 Integration by partial fraction.
- 1.4 Integration by parts.

2. INTEGRAL CALCULUS -II:

- 2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function.
- 2.2 Application : Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution, centre of mean of plane areas.
- 2.3 Simpson's 1/3rd and Simpson's 3/8th rule and Trapezoidal Rule : their application in simple cases.

3. CO-ORDINATE GEOMETRY (2 DIMENSION):

- 3.1 CIRCLE : Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.
- 3.2 Standard form and simple properties
 - Parabola $x^2=4ay$, $y^2=4ax$,
 - Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
 - Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

4. CO-ORDINATE GEOMETRY (3 DIMENSION):

- 4.1 Straight lines and planes in space -Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line and Plane (Different Forms),
- 4.2 Sphere $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz = d$ (Radius, Centre and General Equation)

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L	T	P
2	1	0

DAPPLCH202: APPLIED PHYSICS-II

1. Optics :

Nature of light, Laws of Reflection and Refraction, Snell's Law, Interference (Constructive and Destructive), Diffraction and Polarization (Concept Only), Law of Malus and Polaroid's.

1. Introduction To Fibre Optics :

Critical angle, Total internal reflection, Principle of fiber optics, Optical fiber, Pulse dispersion in step-index fibers, Graded index fiber, Single mode fiber, Optical sensor.

3. Lasers and its Applications :

Absorption and Emission of energy by atom, Spontaneous and Stimulated Emission, Population inversion, Main component of laser and types of laser- Ruby Laser, He-Ne laser and their applications. Introduction to MASER.

4. Electrostatics :

Coulomb's Law, Electric field, Electric potential, Potential energy, Capacitor, Energy of a charged capacitor, Effect of dielectric on capacitors.

5. D.C. Circuits :

Ohm's Law, Kirchhoff's Law and their simple application, Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); Carey Foster's bridge, potentiometer.

6. Magnetic Materials and Their Properties:

Dia, Para and Ferro-magnetism, Ferrites, Magnetic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

7. Semiconductor Physics :

Concept of Energy bands in solids, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semi conductors, Electrons and holes as charge carriers in semiconductors, P-type and N-type semiconductors.

8. Junction Diode and Transister :

Majority and Minority charge carriers P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor-action, Base, emitter and collector currents and their relationship LED's.

9. Introduction To Digital Electronics :

Concept of binary numbers, Inter conversion from binary to decimal and decimal to binary.

Concepts of Gates (AND, NOT, OR).

10. Non-conventional energy sources:

(a) Wind energy : Introduction, scope and significance, measurement of wind velocity by anemometer, general principle of wind mill.

(b) Solar energy: Solar radiation and potentiality of solar radiation in India, uses of solar energy: Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector.

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L	T	P
3	1	0

DAPPLCH203:APPLIED MECHANICS

1. Introduction:

Mechanics and its utility .Concept of scalar and vector quantities. Effect of a force.Tension& compression. Rigid body. Principle of physical independence of force.Principle of transmissibility of a force.

2. A. System of Forces :

Concept of coplanar and non-coplanar forces including parallel forces. Concurrent and non-concurrent forces.Resultant force.Equilibrium of forces.Law of parallelogram of forces.Law of triangle of forces and its converse.Law of polygon of forces.Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a particle, conditions of equilibrium of coplanar concurrent forcesystem.

B. General Condition ofEquilibrium:

General condition of equilibrium of a rigid body under the action of coplanar forces, statement of force law of equilibrium, moment law of equilibrium, application of above on body.

3. Moment & couple:

Concept of Varignon'stheorem.Generalised theorem of moments. Application to simple problems on levers-Bell crank lever, compound lever, steel yard, beams and wheels, lever safety valve, wireless mast, moment of a couple; Properties of a couple ; Simple applied problems such as pulley and shaft.

4. Friction:

Types of friction:static,limiting and dynamical friction, statement of laws of sliding friction, Coefficient of friction, angle of friction; problems on equilibrium of a body resting on a rough inclined plane, simple problems on friction. Conditions of sliding andtoppling.

5. Machines:

Definition of a machine.Mechanical advantage, velocity ratio, input, output, mechanical efficiency and relation between them for ideal and actual machines. Law of a machine Lifting machines such as levers, single pulley, three system of pulleys. Weston differential pulley, simple wheel and axle, differential wheel and axle.Simple screw jack, differential screw jack, simple worm and worm wheel.

6. Centre of Gravity:

Concept, definition of centroid of plain figures and center of gravity of symmetrical solid bodies. Determination of centroid of plain and composite lamina using moment method only, Centroid of bodies with removed portion. Determination of center of 'gravity' of solid bodies - cone, cylinder, hemisphere and sphere, composite bodies and bodies with portion removed.

7. Moment of Inertia:

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical section : rectangle, triangle, circle (without derivations). Second moment of area for L, T, I and channel section, section of modulus.

8. Beams & Trusses:

Definition of statically determinate and indeterminate trusses. Types of supports. Concept of tie & strut, Bow's notation, space diagram, polar diagram, funicular polygon; calculation of reaction at the support of cantilever and simply supported beams and trusses graphically and analytically; graphical solution of simple determinate trusses with reference to force diagram for determining the magnitude and nature of forces in its various members. Analytical methods: method of joints and method of sections. (simple problems only)

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L	T	P
3	0	0

DMECHCH204: MECHANICAL OPERATION AND SOLID HANDLING

1. INTRODUCTION:

Concept and role of unit operation in Industries.

2. CHARACTERISATION OF SOLID PARTICLES:

Characterization of solid particles, screening equipment's, standard screens, screen analysis, Grizzlies, trammels.

3. SIZE REDUCTION:

Theory of crushing, Rittinger's law, Kick's law, Bonds Law, Crushing And grinding machinery; their classification, general description of jaw crusher, gyratory crusher, roller crusher, hammer mills, ball mills, open circuit and closed circuit Systems.

4. CONVEYING OF SOLID PARTICLES:

Conveying equipments, their classification general construction and industrial application, Belt conveyors, chain conveyors and screw conveyors.

5. MECHANICAL SEPARATIONS:

- (i) Types of filtration equipment, their application and operation, sand filters, filter press, leaf filters, rotary filters, filter aids. Centrifugal filtration.
- (ii) Classifiers.
- (iii) Thickener
- (iv) Cyclones.

6. MIXING EQUIPMENTS:

Details of mixing equipment, Homogeneous mixing equipment, Mixing equipment's used for liquid-liquid, liquid-solid and liquid-gas system.

7. Fluidization

REFERENCE BOOKS

- 1. Unit operation of chemical engineering by McCabe & Smith
- 2. Mechanical Operation for Chemical Engineers by C.M. Narayan and B. C. Bhattacharya
- 3. Chemical Engineering Vol. II by Richardson & Coulson.
- 4. Momentum Transfer Operation By S. K. Gupta, TMC, 1979

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L	T	P
0	0	2

DAPPLCH205: APPLIED MECHANICS LAB

1. To verify the law of Polygon of forces.
2. To verify the law of parallelogram and triangle of forces.
3. To verify the law of principle of moments.
4. To find the coefficient of friction between wood, steel, copper and glass.
5. To find the reaction at supports of a simply supported beam carrying point load only.
6. To find the forces in the jib & tie of a jib crane
7. To find the forces in the members of a loaded roof truss. (King / Queen posttruss)
8. To find the mechanical advantage, velocity ratio and efficiency of any three of the following machines:
 - (i) Simple wheel & axle
 - (ii) Differential wheel & axle
 - (iii) Differential pulley block
 - (iv) Simple Screw jack
 - (v) Simple Worm & worm wheel
 - (vi) System of Pulleys (any type).
9. To find out center of gravity of regular lamina.
10. To find out center of gravity of irregular lamina

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DAPPLCH206:APPLIED PHYSICS-II LAB

L	T	P
0	0	2

Note: Any 4 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.
1. Determination of 'g' by plotting a graph T^2 versus l and using the formula $g = 4\pi^2 / \text{Slope of the graph line}$
3. Determine the force constant of combination of springs incase of 1. Series 2. Parallel.
4. To verify the series and parallel combination of Resistances with the help of meter bridge.
5. To determine the velocity of sound with the help of resonance tube.
6. Determination of viscosity coefficient of a lubricant by Stoke's law.
7. Determination of E_1/E_2 of cells by potentiometer.
8. Determination of specific resistance by Carry Foster bridge.
9. Determination of resistivity by P.O.Box.
10. Verification of Kirchhoff's Law.
11. To draw Characteristics of p-n Junction diode.
12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

NOTE :

Students should be asked to plot a graph in experiments (where possible) and graph should be used for calculation of results. Results should be given in significant figures only.

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L	T	P
0	0	2

DMECHCH207:

MECHANICAL OPERATION AND SOLID HANDLING LAB

List of experiments

1. To draw a layout of Chemical Engineering lab.
2. To analyses the given sample on a set of screens and report the analysis.
3. To determine the critical speed of a ball mill.
4. To determine the efficiency of disintegrator.
5. To determine filtration constant by a plate and frame filter press.
6. To determine the rate of settling of slurries of various concentration draw a height VS time curve.
7. To determine the efficiency of Jaw crusher.
8. To study and sketch a Rotary filter.

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DELEMCH208
ELEMENTARY WORKSHOP TECHNOLOGY LAB

L	T	P
0	0	4

DETAILED CONTENTS

1. Carpentry Shop :

- EX-1 Introduction & demonstration of tools used in carpentry shop and different types of joints, types of wood, seasoning and preservation of wood
- EX-2 Planning and sawing practice
- EX-3 Making of lap joint
- EX-4 Making of mortise and tenon joint
- Ex-5 Making of any one utility article such as wooden- picture frame, hanger, peg, name plate, etc.

2. Painting and Polishing Shop:

- EX-1 Introduction of paints, varnishes, Reason for surface preparation, Advantage of painting, other method of surface coating i.e. electroplating etc.
- EX-2 To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.
- Ex-3 To prepare metal surface for painting, apply primer and paint the same.
- EX-4 To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

* **The sequence of polishing will be as below:**

- i) Abrasive cutting by leather wheel.
- ii) Polishing with hard cotton wheel and with polishing material.
- iii) Buffing with cotton wheel or buff wheel.

3. Sheet Metal and Soldering Shop :

- EX-1 Introduction and Types of sheets, measuring of sheets
- EX-2 Study and sketch of various types of stakes/anvil.
- EX-3 Introduction & demonstration of tools used in Sheet metal working shop.
- EX-4 Cutting, shearing and bending of sheet.
- EX-5 To prepare a soap case by the metal sheet.
- EX-6 To make a funnel with thin sheet and to solder the seam of the same.
- EX-7 To make a cylinder and to solder the same.
- EX-8 Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.
- EX-9 To braze small tube/conduit joints.

4. Fitting Shop, Plumbing Shop & Fastening Shop:

- EX-1 Study of materials, limits, fits and tolerances.
- EX-2 Introduction & demonstration of tools used in Fitting Shop.
- EX-3 Hacksawing and chipping of M.S. flat. Filing and squaring of chipped M.S. job. Filing on square or rectangular M.S. piece.
- EX-4 Making bolt & nut by tap and die set and make its joints
- EX-5 To drill a hole in M.S. Plate and tapping the same to create threads as per need.
- EX-6 Utility article-to prepare double open mouth spanner for 18" hexagonal head of a bolt.
- EX-7 Cutting and threading practice for using socket, elbow And tee etc. and to fit it on wooden practice board.
- EX-8 Study of bib cock, cistern or stop cock, wheel valve and gate valve etc.
- EX-9 Practice of bolted joints
- EX-10 To prepare a riveted joint
- EX-11 To make a pipe joint
- EX-12 To make a threaded joint
- EX-13 Practice of sleeve joint

5. Foundry Work

- Ex-1 Study of metal and non metals
- Ex-2 Study & sketch of the foundry tools.
- Ex-3 Study & sketch of cupola & pit furnace.
- Ex-4 To prepare the green molding sand and to prepare moulds (single piece and double piece pattern sweep mold)
- Ex-5 Casting of non ferrous (lead or aluminum) as per exercise 3.

6. Smithy Shop :

- EX-1 Study & Sketch of Tools used in smithy shop.
- EX-2 To prepare square or rectangular piece by the M.S. rod.
- EX-3 To make a ring with hook for wooden doors.
- EX-4 Utility article-to prepare a ceiling fan hook.

7. Welding Shop :

- EX-1 Introduction to welding, classification of welding, types of weld joints.
- EX-2 Welding practice-gas and electric.
- EX-3 Welding for lap joint after preparing the edge.
- EX-4 Welding of Butt joint after preparation of the edge.
- EX-5 'T' joint welding after preparation of edge.
- EX-6 Spot welding, by spot welding machine.

8. Machine Shop

- EX-1 Study & sketch of lathe machine.
- EX-1 Study & sketch of grinders, milling M/c, Drilling M/c and CNC Machines
- Ex-2 Plain and step turning & knurling practice.
- Ex-3 Study and sketch of planing/Shaping machine and to plane a Rectangle of cast iron.