

UNIVERSITY OF MUMBAI



**Scheme of Instructions and Examination
(RR-2007)**

For

**The Second Year
(Semester IV)**

of the

**B.E. Degree Course
In
Civil Engineering**

(With effect from academic year 2008-2009)

UNIVERSITY OF MUMBAI
SCHEME OF INSTRUCTIONS AND EXAMINATION
(RR-2007)

SECOND YEAR ENGINEERING: (Civil Engineering)

Semester III

	Subjects	No. of periods per week (60 minutes each)			Duration of theory paper (hours)	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical	Oral	Total
1.	Applied Mathematics-III*	4	-	-	3	100	-	-	-	100
2.	Surveying-I*	3	3	-	3	100	25	-	-	125
3.	Strength of Materials*	4	2	-	3	100	25	-	25	150
4.	Building Materials and Construction*	4	2	-	3	100	25	-	25	150
5.	Engineering Geology*	3	2	-	3	100	25	-	25	150
6.	Presentation and Communication Techniques@	2	-	2	-	-	50	-	-	50
7.	Fluid Mechanics-I*	3	2	-	3	100	25	-	-	125
Total		23	11	2	-	600	175	-	75	850

* Common to Construction Engineering

@Common to all branches

Semester - IV

	Subjects	No. of periods per week (60 minutes each)			Duration of theory paper (hours)	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical	Oral	Total
1.	Applied Mathematics-IV*	4	-	-	3	100	-	-	-	100
2.	Surveying-II*	3	3	-	3	100	25	-	25 [§]	150
3.	Structural Analysis-I*	5	-	2	3	100	25	-	25	150
4.	Building Design and Drawing-I*	1	3	-	4	100	25	-	25 [#]	150
5.	Concrete Technology*	4	2	-	3	100	25	-	25	150
6.	Fluid Mechanics-II*	3	2	-	3	100	25	-	25	150
Total		20	10	2	-	600	125	-	125	850

* Common to Construction Engineering

§ Oral & Practical

Oral & Sketching

Class -SE(Civil/Construction)		Semester IV	
Subject:- Applied Mathematics IV			
Periods/week- each period of 60 minutes duration	Lecture	4	
	Practical	-	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical	-	-
	Oral	-	-
	Term Work	-	-
	Total		100

Detailed Syllabus

Module	Topics	No of lectures
1.	Vector calculus and analysis	10
	1.1 Recall Gradient, Curl and Divergence (with properties). Conservative, Irrotational and Solenoidal fields	3
	1.2 Line integrals, properties of line integral, Green's theorem in plane	3
	1.3 Stoke's theorem and Gauss divergence theorem (without proof). Related identities and deductions.	4
2.	Statistics and probability	18
	2.1 Measures of central tendency(mean, median, mode, quartiles, deciles, percentiles, only introduction no questions to be asked).	1
	2.2 Measures of dispersion(mean deviation, quartile deviation, standard deviation). coefficient of variation	1
	2.3 Covariance & correlation .Karl Pearson's coefficient & spearman's rank coefficient (with proofs) (repeated and non-repeated ranks)	2
	2.4 Regression analysis(Linear and multiple)	2
	2.5 Introduction to probability and conditional probability, Baye's theorem	2
	2.6 Discrete and continuous random variable, Probability mass function & probability density function. Probability distribution for random variables.	2
	2.7 Expected value, Variance, Moments and Moment generating function.	3
	2.8 Binomial, Poisson and Normal distribution for detailed study.	4
	2.9 Central limit theorem (only statement) & problems based on it .	1
3	Sampling theory & testing of hypothesis	10
	3.1 Population and sample. Sampling with & without replacement. Random samples. Population parameters, Sample statistics	1
	3.2 Sampling distributions. Sample mean Sampling distribution of means. Sampling distribution of proportions.	2

	The sample variance. Sampling distribution of variances.	
	3.3 Cases where population variance is unknown. Sampling distribution of ratios of variances. Other statistics	1
	3.4 Statistical decisions. Statistical hypothesis. Null hypothesis and alternate hypothesis.	1
	3.5 Test of hypothesis and significance. Type I & Type II errors. Level of significance. One-tailed and two-tailed tests.	1
	3.6 Tests of significance for large samples (between sample & population mean, difference between the means of two samples)	2
	3.7 Tests of significance for small samples (t-test, paired t-test, F-test). The χ^2 test for goodness of fit and contingency tables.	2
4	Estimation theory	4
	4.1 Unbiased estimates and efficient estimates. Point and interval estimates	2
	4.2 Confidence interval estimates of population parameters. Confidence interval for means, proportions, variance ratios. Maximum likelihood estimates.	2
5	Complex variables	8
	5.1 Line integral for a complex valued function. Cauchy's integral theorem and Cauchy's integral formula (with proofs)	3
	5.2 Singularities and poles. Taylor's & Laurent's series (without proof). Cauchy's residue theorem	3
	5.3 Evaluation of real integrals of the form $\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta$ & $\int_{-\infty}^{\infty} f(x) dx$ using residue theory	2

Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus

Recommended Books :

1. "Vector calculus" by Shanti Narayan & J.N.Kapur, S.Chand & company Limited
2. "Probability & statistics for engineers" by Richard Johnson & Gupta, Pearson Education
3. "Probability & statistics" by Murray Spiegel, Schaum series
4. "Complex variables" by Churchill & Brown, Tata Mcgraw Hill

Class:-SE (Civil/Construction)		Semester IV	
Subject:- Surveying - II			
Periods/week- each period of 60 minutes duration	Lecture	03	
	Practical	03	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical & Oral	-	25
	Term Work	-	25
	Total		150

Detailed Syllabus

Module	Topics	No. of lectures
1	<p>Curves</p> <p>Definitions of different terms, necessity of curves and types of curves</p> <p>(i) Simple circular curves and compound curves, office and field work, linear methods of setting out of curves, Angular methods for setting out of curves, two theodolite and Rankine deflection angle methods.</p> <p>(ii) Reverse and transition curves, their properties and their advantages, design of transition curves, shift, spiral angle.</p> <p>Composite curves – office and field work, setting out of curve by angular method, composite curve problems.</p> <p>(iii) Vertical curves – definitions, geometry and types, tangent correction and chord gradient methods, sight distance on a vertical curve, difficulties in setting out curves and solutions for the same.</p>	12
2	<p>Tacheometric surveying</p> <p>Principles and uses, advantages, stadia formula, different methods of tachometer, subtense bar method, location details by tachometer, stadia diagram and tables, error and accuracy in tacheometric survey work.</p> <p>Application in plane table and curve setting</p>	10
3	<p>Setting out works</p> <p>General horizontal and vertical control, setting out of foundation plan for load bearing and framed structure, batter board, slope and grade stakes, setting out with theodolite.</p> <p>Setting out of sewer line, culvert.</p> <p>Setting out centre line for tunnel, transfer of levels of underground work.</p> <p>Project / route survey for bridge, dam and canal.</p> <p>Checking vertically of high rise structures</p>	07

4	Modern surveying instruments Electronics in surveying, general principles used in the instruments. Electronic distance measurements – types, principles, applications in surveying, corrections for field observations. Electronic digital theodolite – types, uses and application, concept of total station-uses and application. Use of computer in survey work for level computation and plotting contour plan using Software. Introduction of GPS	05
5	Precision leveling Precise level and leveling staff, field procedure for precise leveling, field notes.	05

Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Oral and Practical Examination:-

Oral examination will be based on entire syllabus and practical examination will be based on one experiment performed from the list of experiments given below. The distribution of marks shall be as follows

Oral – 15 Marks
 Practical – 10 Marks

List of Practicals:-

1. To set out circular curves by linear and angular methods.
2. Setting out a composite curve by angular method.
3. To find the constants of a tachometer and to verify field distances.
4. Height and distance problems in tachometric surveying.
5. Use of theodolite for one plane and two plane methods.
6. Study of modern surveying instruments.
7. Setting out a simple foundation plan in the field.

Term Work:

Each student has to appear for at least ONE written test during the term.

The term work shall consist of:

- Three A1 size drawing sheets comprising of practical work on: Longitudinal section and cross sections, block contouring and tachometric survey.
- Assignments consisting of minimum twenty problems covering all topics,
- Office and field work for minimum two types of curves by angular method, plotting of a contour plan on computer using suitable software,
- Graded answer paper of written test.

The distribution of term work marks shall be as follows:

Laboratory work (Drawing sheets, assignments and computer output)	: 10 marks
Written test (at least one)	: 10 marks
Attendance (Practical and theory)	: 05 marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and at least minimum passing in the term-work.

Recommended Books:

1. "Surveying and levelling" Vol-I&II, by Kanetkar and Kulkarni, Pune Vidyarthi Griha, Pune.
2. "Surveying and levelling" by N N Basak, Tata McGraw Hill New Delhi.
3. "Surveying" by R. Agor, Khanna Publishers.
4. "Surveying" Vol-I by Dr. K.R. Arora, Standard book house.

CLASS : SE (Civil /Construction)		Semester - IV	
Subject:- Structural Analysis - I			
Periods/week-each period of 60 minutes duration	Lectures	05	
	Practical	-	
	Tutorial	02	
Evaluation System		Hours	Marks
	Theory	03	100
	Practical	-	--
	Oral	-	25
	Term Work	-	25
	TOTAL	-	150

Detailed Syllabus

Module	Topics	No. of lectures
01	Axial force, shear force and bending moment Axial force, shear force and bending moment diagrams for statically determinate frames with and without internal hinges.	06
02	General theorems Theorems relating to elastic structures, principle of virtual work, strain energy in elastic structures, stresses due to axial load & impact load, complementary energy, Castigliano's theorem, Betti's and Maxwell's reciprocal theorems, principle of superposition.	04
03	Unsymmetrical bending Flexural stresses due to bending in two planes for symmetrical sections, bending of unsymmetrical sections.	04
04	Deflection of statically determinate structures Deflection of cantilevers, simply supported and overhanging beams for different types of loadings using following methods - Double integration, Macaulay's method, Moment area, Conjugate beam, Principle of virtual work (unit load method) and Castigliano's theorem. Deflection of determinate pin jointed and rigid jointed frames by principle of virtual work (unit load method) and Castigliano's theorem.	16
05	Influence lines for statically determinate structures Influence lines for cantilevers, simply supported, overhanging beams and pin jointed warren truss, criteria for maximum shear force and bending moment, absolute maximum shear force and bending moment under moving loads (udl and series of point loads) for simply supported beam.	08

06	Elastic arches Determination of normal thrust, shear force and bending moment for parabolic, braced and segmental three hinged arches, influence lines for normal thrust, shear force and bending moment for three hinged parabolic arch.	08
07	Suspension bridges Simple suspension cable, different geometries of cables, minimum and maximum tensions in the cable supported at same/different levels, anchor cable, suspension cable with three hinged stiffening girder, influence line diagram for horizontal tension in the cable, shear force and bending moment at any section of the stiffening girder.	08
08	Struts Struts subjected to axial loads, concept of buckling, Euler's and Rankine's design formulae for strut with different support conditions. Struts subjected to eccentric and lateral loads, struts with initial curvature.	06

Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Oral Examination:-

Oral examination will be based on entire syllabus.

Term Work:

Each student has to appear for at least ONE written test during the term.

The term work shall consist of:

At least 25 problems covering entire syllabus,

Graded answer paper of written test.

The distribution of marks for term work shall be as follows.

Assignments	: 10 marks
Written test (at least one)	: 10 marks
Attendance (tutorial and theory)	: 05 marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and at least minimum passing in the term-work.

Recommended books:

1. "Basic structural analysis" by C.S.Reddy, Tata McGraw Hill New Delhi
2. "Theory of structures" by Timoshenko & Young, Tata McGraw Hill New Delhi.
3. "Structural mechanics" Vol I & II by Junnarkar S.B., Charotar Publisher.
4. "Elementary structural analysis" by Norries & Wilbur, McGraw Hill.
5. "Structural analysis" by Laursen H.I., McGraw Hill Publishing Co.
6. "Structural analysis" by Bhavikatti, Vikas Publishers
7. "Structural theorems and their application" by B.G. Neal, Pergaman Press.
8. "Structural analysis" by Hibbler, Prentice Hall International
9. "Structural analysis" by Chajes, ELBS London
10. "Structural analysis" by Kassimalli, TWS Publications
11. "Comprehensive structural analysis" vol-I&II by Vaidyanathan R. and Perumal R., Laxmi Publications.
12. "Fundamentals of structural analysis" by K. M. Leet, C. M. Uang and A.M. Gilbert, Tata McGraw Hill New Delhi.
13. "Structural analysis" by Devdas Menon, Narosa Publishing House
14. "Elementary theory of structures" by Hseih, Prentice Hall

Class:- SE (Civil / Construction)			Semester – IV	
Subject:- Building Design and Drawing - I				
Periods/week-each period of 60 minutes duration:	Lecture	01		
	Practical	03		
	Tutorial	-		
		Hours	Marks	
Evaluation System	Theory	04	100	
	Practical	-	-	
	Oral & Sketching	-	25	
	Term Work	-	25	
	TOTAL		150	

Detailed Syllabus

Module	Topics	No. of lectures
01	Planning and preparing of working drawings of residential structures of all types such as bungalows, row houses, duplex, apartment houses etc., and principles of planning, relevant knowledge of building bylaws, code of practice for architectural drawings as per IS 962 and related causes of local D.C. rules.	8
02	Constructional details and drawings of foundations, floors, roofs – flat and pitched, doors and windows, staircases, plumbing items, columns, beams and slabs as per current practice.	5

Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Oral and Sketching Examination:-

Oral and sketching examination will be based on entire syllabus.

Term Work:

Each student has to appear for at least ONE written test during the term.

The term work shall consist of:

Report on planning and design of two residential buildings (one designed as load bearing structure having ground plus one floor with pitched roof, other shall be designed as RCC framed structure having ground plus one floor)

Two A1 size drawing sheets, drawn independently for the two structures designed as mentioned above, showing following details drawn to scale as per standard practice : site plan, ground floor plan, first floor plan, elevation, section, door and window schedule

One A1 size drawing sheet, drawn for one of the two structures designed as mentioned above, showing following details drawn to scale as per standard practice : roof plan and its section, foundation, plan and its section, stair and its section, typical door and window details including section, and any other specific detail
Graded answer paper of written test.

The distribution of term work marks shall be as follows:

Drawings and report on planning and design of buildings	: 10 marks
Written test (at least one)	: 10 marks
Attendance (Practical and theory)	: 05 marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and at least minimum passing in the term-work.

Recommended Books:

1. "Building drawing" by M. G. Shah, C. M. Kale, S. Y. Patil, Tata McGraw Hill, Delhi
2. "Civil engineering drawing" by M. Chakraborty, Monojit Chakraborty Publication Kolkata.
3. "Building drawing and detailing" by BTS Prabhu, K. V. Paul and C. Vijayan. SPADES Publication Calicut.
4. "Planning and designing buildings" by Y. S. Sane, Modern Publication House Pune.

Class:- SE (Civil / Construction)			Semester – IV	
Subject:- Concrete Technology				
Periods/week-each period of 60 minutes duration	Lecture	04		
	Practical	02		
	Tutorial	-		
		Hours	Marks	
Evaluation System	Theory of Examination	03	100	
	Practical	-	-	
	Oral Examination	-	25	
	Term Work	-	25	
	TOTAL	-	150	

Detailed Syllabus

Module	Topics	No. of lectures
01	Aggregates: Properties of coarse and fine aggregates and their influence on properties of concrete	03
02	Cement: Physical properties of cement as per IS Codes, types of cements and their uses and uses	05
03	Concrete: Grades of concrete, Manufacturing of concrete, importance of w/c ratio. Properties of fresh concrete- workability and factors affecting it, consistency, cohesiveness, bleeding, segregation Properties of hardened concrete- Compressive, Tensile and Flexural strength, Modulus of Elasticity, Shrinkage and Creep Durability- Factors affecting durability, laboratory tests on durability such as Permeability test, Rapid chloride penetration test Concreting in extreme weather conditions, under-water concreting.	08
04	Concrete mix design: Mix design for compressive strength by I.S. method and DoE method. Mix design for flexural strength.	05
05	Admixtures: Plasticizers, Superplasticizers, Retarders, Accelerators, Mineral admixtures and other admixtures, test on admixtures, chemistry and compatibility with concrete.	06
06	Ready mix concrete: Advantages of ready mix concrete, components of RMC plant, distribution and transport, handling and placing, mix design of RMC.	03
07	High performance and High strength concrete: Constituents of high performance and high strength concrete.	05

	various tests and their applications.	
08	Special concretes: Light weight concrete, High density concrete, No fines concrete, Fiber reinforced concrete, Polymer concrete-types, Ferrocement, Shotcrete, Self compacting concrete, Reactive powder concrete, Bendable concrete.	06
09	Repairs and rehabilitation of concrete structures: Distress in concrete structures, causes and prevention, damage assessment procedure, crack repair techniques	04
10	Non-Destructive testing of concrete: Hammer test, ultrasonic pulse velocity test, load test, carbonation test, $\frac{1}{2}$ cell potentiometer test, core test and relevant provisions of I.S. codes.	04

Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Oral Examination:-

Oral examination will be based on entire syllabus.

List of Practicals:-

1. Effect of w/c ratio on workability (slump cone, compaction factor, V-B test, flow table)
2. Effect of w/c ratio on strength of concrete.
3. Mix design in laboratory
4. Modulus of rupture of concrete.
5. Study of admixtures & their effect on workability and strength of concrete
6. Secant modulus of elasticity of concrete & indirect tensile test on concrete
7. Permeability test on concrete.
8. Rapid chloride penetration test
9. Tests on polymer modified concrete/mortar.
10. Tests on fiber-reinforced concrete.
11. Non destructive testing of concrete – some applications (hammer, ultrasonic)

Term Work:

Each student has to appear for at least ONE written test during the term.

The term work shall consist of:

Report of minimum 08 experiments.

At least 10 assignments covering entire syllabus,

Graded answer paper of written test.

The distribution of term work marks shall be as follows:

Laboratory work (Experiments and assignments)	: 10 marks
Written test (at least one)	: 10 marks
Attendance (Practical and theory)	: 05 marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and at least minimum passing in the term-work.

Recommended Books:

1. Concrete Technology, A. R. Shanthakumar, Oxford University Press.
2. Concrete technology theory and practice Shetty MS., S. Chand.
3. Properties of concrete, Neville, Isaac Pitman, London
4. Relevant I.S. codes, Bureau of Indian standard.
5. Special Publication of ACI on Polymer concrete and FRC.
6. Proceedings of International Conferences on Polymer Concrete and FRC.
7. Concrete Technology Gambhir M.L., Tata McGraw Hill, New Delhi.
8. Concrete Technology, Neville A.M. & Brooks. J. J., ELBS-Longman.
9. Tentative Guidelines for cement concrete mix design for pavements (IRC:44-1976), Indian Road Congress, New Delhi.
10. Repairs and rehabilitation – Compilation from Indian congress Journal – ACC Pub.

Class:-SE (Civil/Construction)		Semester IV	
Subject:- Fluid Mechanics - II			
Periods/week- each period of 60 minutes duration	Lecture	03	
	Practical	02	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical	2	-
	Oral	-	25
	Term Work	-	25
	Total		150

Detailed Syllabus

Module	Topics	No. of lectures
1	Flow through pipes: Loss of head through pipes, Darcy-Weisbach equation, minor losses, total energy line, hydraulic gradient line. Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles.	12
2	Analysis of pipes network: Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three reservoir problem.	07
3	Compressible flow: Basic equation of flow (elementary study), Velocity of sound or pressure wave in a fluid, Mach number, Mach cone, area-velocity relationship, stagnation properties, flow of compressible flow through discharge measuring devices	05
4	Laminar flow: Reynolds experiment, Critical velocity, Steady laminar flow through: circular pipes, annulus, parallel plates: stationary and moving, kinetic energy correction factor, momentum correction factor, Dash pot.	07
5	Turbulent flow through pipes: Causes of turbulence, instability, mechanism of turbulence. Reynolds stresses. Semi-empirical theories of turbulence, Prandtl's mixing length theory. Universal velocity distribution equation, resistance equation, applications, Moody diagram.	07

Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Oral Examination:-

Oral examination will be based on entire syllabus.

List of Practicals:-

1. Reynolds's experiment
2. Determination of viscosity of fluid
3. Friction loss through pipes
4. Laminar flow through pipe
5. Minor losses
6. Velocity distribution in circular pipe
7. Turbulent flow through pipe.
8. Viscous flow through pipe etc.

Term Work:

Each student has to appear for at least ONE written test during the term.

The term work shall consist of:

Report on minimum six experiments conducted.

Assignments consisting of minimum 15 problems covering entire syllabus

Graded answer paper of written test.

The distribution of term work marks shall be as follows:

Laboratory work (Experiments and assignments)	: 10 marks
Written test (at least one)	: 10 marks
Attendance (Practical and theory)	: 05 marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and at least minimum passing in the term-work.

Recommended Books:

1. "Hydraulics and fluid mechanics" by Dr. P. M. Modi and Dr. S. M. Seth, Standard Book House.
2. "Theory and applications of fluid mechanics" by K. Subramanya, Tata McGraw Hill New Delhi.
3. "Fluid mechanics" by Dr. A. K. Jain, Khanna Publishers.
4. "Fluid mechanics and fluid pressure engineering" by D. S. Kumar, F. K. Kataria and sons.
5. "Fluid mechanics" by R.K. Bansal, Laxmi Publications (P) Ltd.
6. "Fluid mechanics" by Frank M. White, Tata McGraw-Hill.
7. "Fluid mechanics" by Streeter, Wylie, Bedford, McGraw-Hill International Edition
8. "Fluid mechanics with engineering applications" by R. L. Daugherty, J. B. Franzini, E. J. Finnemore, Tata McGraw-Hill New Delhi.
9. "Fluid mechanics" by Joseph Spurk, Springer
10. "Mechanics of fluids" by Potler, Wigger, Prentice-Hall International.

