



**BHARATHIDASAN UNIVERSITY
TIRUCHIRAPPALLI- 620 024**

B.Sc Interior Design

(For the candidates admitted from the academic year 2014 -15 onwards offered through
Centre for Distance Education)

Course Duration: 3 Years – (Non-Semester System)

Eligibility: Passed in Higher Secondary (+2)

Year	Paper	Title of the Paper	Exam Hours	Marks
I	Part I Language Paper – I		3	100
	Part - II Language Paper - II		3	100
	Major Paper -I	Principles of Interior Design	3	100
	Major Paper –II (Practical –I)	Fine Arts – Drawing and Painting	3	100
	Major Paper -III	Building materials and components	3	100
	First Allied Paper	Principles of Commerce	3	100
II	Part I Language Paper – II		3	100
	Part II Language Paper – II		3	100
	Major Paper –IV	Planning residential space	3	100
	Major Paper –V	Mechanical services in interior design	3	100
	Major Paper –VI (Practical II)	Draftsmanship	3	100
	Major Paper VII	Ergonomics in Kitchen Design	3	100
	Second Allied Paper	Marketing	3	100
				700
III	Major Paper –VIII	Furnishing the Interior	3	100
	Major Paper –IX	Floriculture and landscaping	3	100
	Major Paper –X	Commercial design and Auto Cad	3	100
	Major Paper –XI	Green building technology	3	100
	Major Paper –XII	Professional practice and Entrepreneurial development	3	100
		Total		1800

- Note**
- 1: FOR ALL THEORY and PRACTICAL PAPERS passing minimum is 40 %.**
 - 2. Compulsory Record should be submitted at the time of practical examination.**
 - 3: Environmental Studies UGC paper is compulsory to study in Ist year**

Paper –I
PRINCIPLES OF INTERIOR DESIGN

Objectives:

1. Develop Knowledge and understand the principles of art.
2. Help learn skills in using the principles and methods of creating beautiful interiors.
3. Apply the theoretical knowledge to practical situation.
4. Be conscious of aesthetics.

Unit I

Development of interior design concepts - a historic review. Place of interior in the modern era-changing trends and salient features, objectives of aesthetic planning - Beauty, expressiveness, functionalism, economy Role of good taste – meaning and importance. Need for developing skill in aesthetics.

UNIT-II

Design –Definition, meaning, purpose, Types - Structural and decorative, characteristics, classification of decorative design - Naturalistic, conventional, geometric, abstract, historic, biomorphic - Elements of design - Line and direction, form and shape, size, colour, light, pattern, texture and space - application of elements to form designs.

UNIT-III

Principles of design –Balance, rhythm, emphasis, harmony, proportion - meaning and application of design concepts in the interior and exterior houses and other commercial buildings. Development of design from motifs and application.

UNIT- IV

Colour in the home –concept, qualities – Hue, value, intensity classification of colors, Prang color system, color harmonies – Related and contrasting color harmonies, psychology of color. Application of colour in interiors. Lighting in interiors – importance, classification based on sources, uses, illumination, factors to be considered in lighting for different areas of house.

UNIT-V

Man as a consumer of design, qualities and role of a good interior designer, interior design - career options. Application of design in interior decoration.

Related Experience

- Draw different types of design using principles of design – Structural and decorative design develop design by using motifs applying the principles of design.
- Application of art principles in arrangement of living room, drawing room, pooja room, bedroom, adolescent boys or girls room, children’s room and birthday party. –
- Collection of related pictures and photographs and maintain an album.

REFERENCES:

1. Faulkner, S.-and Faulkner,R,(1987), Inside Today’s Home, Rine hart publishing company, Newyork.
2. Caroline cliften et. al., The complete Home Decorator, Portland House New York.
3. Seetharaman, P and Pannu, P. Interior Design and Decoration, CBS publishers and Distributors, New Delhi
4. Pratap R.M (1988), Interior Design principles and practice, standard publishers distribution, Delhi.
5. Goldstein, Art in Everyday life, Oxford and IBH publishing house.

Paper II
FINE ARTS – DRAWING AND PAINTING

Objectives:

1. Explore a variety of drawing media and techniques
2. Develop skill in drawing using different tools.

Unit I

Developing design on various supports - Canvas, boards, panels and papers using different brushes for water colour and oil painting.

Unit II

Drawing using different tools - pencils, charcoal, pastels, crayons, pen and ink, markers and fibre tip pens.

Unit III

Painting media- Developing wall hangers - using water colour, tempera and acrylics, oils, paints with binders, diluents and mediums.

Unit IV

Developing greeting cards using different techniques - line, dots, template, shading, spraying texturing.

Unit V

Colour and composition – Colour language, tonal value, mixing, colour expression and colour contrast. –

Related Experience

- Composition – creating focal points .
- Evaluating three famous artists work
- Submission of record.

REFERENCES:

1. Rangawala, S.C Engineering Materials, Charter publishing house, Anand 1963.
2. Rangawala, S.C, Building construction, Charter publishing house, Anand 1963
3. Rangawala .S.C., Water supply and sanitary Engineering, publishing house, Roorkee.
4. Pratap R.M (1988) Interior Design Principles and practice, Standard publishers distribution, Delhi.

Paper III
BUILDING MATERIALS AND COMPONENTS

Objectives:

1. Become aware of the existing building materials and finishes.
2. Develop aesthetic concept of using finishes in building

Unit -I

Building materials and finishes - Types and uses of stone, brick, timber, cement, mortar, concrete, plastics, glass, wood based materials, metals - ferrous and nonferrous, wall, floor and ceiling finishes.

Unit-II

An introduction to building components and construction techniques, components. Foundation –deep and shallow – Wall masonry – stone, brick bonds- stretcher, header, English and Flemish. Arches, lintels, staircase, cladding, flooring, roofing and ceiling. Methods of construction- types of construction, meaning, basic knowledge in types of construction – load bearing and non load. Cast in site and Prefabrication – advantages and limitations.

Unit III

Details of doors, windows, cupboards, partitions and joineries.

Unit IV

Plumbing and sanitary services - water supply within buildings, drainage system for residence, sanitary apparatus and symbols used.

Unit V

Electrical services – Electrical system, symbols used, three phase and single phase system , simple electrical layouts. Lighting and Illumination - Principles of illumination, types of lighting fixtures, lighting design in residences, offices and stores.

Reference:

1. Gair, , 1999 Artists' Manual, Hopper Collins Publishers, London.
2. Holt, F.T. and Smith, S. 1997. The Artists Manual – Equipments, Materials, Techniques, Grange Books, London.
3. Malhotra and Malhotra, 2001, Drawing Techniques, Blue bird books, Delhi.
4. Monahan, P., Seligman, P. and Clouse, W. 2003, Arts School – A Complete Painters Course, Chancellor Press, London.
5. Stanyer, P. 2003. The Complete book of Drawing Techniques, Areturus Publishing Limited for book mark limited, Leicester.

FIRST ALLIED PAPER - PRINCIPLES OF COMMERCE

Unit I

Fundamentals of commerce – Forms of Business Organizations – Sole Proprietorship, partnership, company, cooperative, public and joint enterprises – Business combinations – Types – causes and control of Monopoly combinations.

Unit II

Banks – kinds – RBI – Structure – Objectives – functions – management – evaluation – SBI – functions – Cooperative Banks – Other Banks – Insurance – Fire – Marine – Deposit insurance – Insurance against theft and loss of profit.

Unit III

Advertisement – importance – Media – Merits and demerits of media – wholesale and retail business – General and Special shops – Chain Stores – Multiple shops – Main Order sales – Department stores – super market – A to Z shops – Transport – role of transport in Business development.

Unit IV

Business Finance – Working Capital and Fixed Capital – Shares and Debentures – Public Deposits – plugging back profits – location of industries – balanced regional development.

Unit V

Scientific management – Management Process – Planning – organization – Staffing – direction – coordination – control – professionalization of management in India.

Reference:

1. OR Kishnasamy – Essentials of Commerce
2. Bhushan – Business Organization
3. Kathiresan and Radha – Business Organization
4. Sherlakar SA-Modern Business Organization and Management.

Paper IV

Planning Residential Space

Objectives

- Understand the concept of life space and principles of planning
- Identify Institutional support for housing
- Learn to draw house plans.

Unit I

Space for living – Concept of life space- Meaning of Macro, Micro and Meso environment, proxemics and personal space, territoriality, claustrophobia and agoraphobia crowding, planning objectives of life space. Need for space occupancy. Ownership style- advantages and disadvantages of owning versus renting, individual houses- flats and row houses.

Unit II

Significance of housing – Functions of house. Selection of site, types of house plan- site plan, floor plan, elevation, cross sectional plan and perspective view. Factors determining housing

Unit III

Principles of house plan- Aspect, prospect, orientation, privacy, grouping roominess, flexibility, circulation, furniture requirements, sanitation and practical consideration. Need for standardization in housing, types of standards, role of BIS.

Unit IV

Allocation of space for various activities-Social spaces, work spaces, private space. Drafting house plan for various income groups.

Unit V

Housing problems in India- Causes and remedial measures. Legal restrictions in housing-plot, easement rights , zoning law, building bye laws. Finance and institutional support for housing – NEERI ,NBO, LIC, Banks, HDFC, and HUDCO.

References:

1. Chaudari, S.N. 2006, Interior Design, Aavishkar Publishers, Jaipur
2. Prabhakar, L.V. (1998), Vasthu- The User's Manual, The Venue Press, Chennai.
3. Rao, C.H.G. (1995), Plans For Small Houses, Jai Ganesh Offset Printers, Chennai
4. Riggs,R. (1992), Materials and Components of Interior Design, Prentice Hall of India Pvt,. Ltd, New Delhi
5. Faulkner, R. and Faulkner S (1987), Inside Today's Home, Rinehart Publishing company, New York.
6. Despande, R.S. (1974), Build your Own Home, United Book Corporation, Poona.

Paper V

Mechanical Services in Interior Design

Objectives:

- Educate the students on basic principles of electrical equipments.
- Acquire knowledge on environment and its impact on the interiors.

Unit -I

Acoustics – Definition, requirements of good acoustics, Properties of sound- Sound waves, wave length, frequency, velocity, resonance, sound levels, loudness, noise, sound reflection, echoes, reverberation, sound absorption- sound absorbent materials, qualities of acoustic materials, qualities for good acoustical design.

Unit – II

Air conditioning – Meaning, need for air conditioning, principles of air conditioning system, Types of air conditioning – Central and packaged, its application in houses, apartments, guest rooms, libraries, museums, hospitals, hostels, restaurants and offices.

Unit – III

Heating- Need for room heating, types of heating system- central, radiant, forced air and solar system. Active solar system and passive solar system. Ventilation – definition, importance, types of ventilation- natural and mechanical, guidelines for natural ventilation.

Unit – IV

Illumination – Principles, types of lighting fixtures, planning lighting for residences ,offices and stores. Electrical services - Electrical system, symbols used, three phase and single phase system, simple electrical layouts.

Unit –V

Environmental control – meaning of environment, importance of environmental control, advantages, elements to be controlled in the interiors- temperature, air quality, sound, sanitation and light.

References

1. Rangawala, S.C. Building Construction, Chartor Publishing House, Anand 1963.
2. Pratap R.M. (1988), Interior Design Principles and Practice, Standard Publisher's Distribution, Delhi
3. Park. K (1995), Textbook of Preventive and Social Medicine, Banaridas Bhanot Publishers, Jabalpur.
4. Faulknerr.S., and Faulkner.R, (1987). Inside Today's Home, Rinehart Publishing Company, New York.
5. www.wixipedia.org. Air Conditioning.
6. Punnia, B.C. (1995), A. Text Book of Building Construction, Lakshmi Publication Pvt. Ltd., New Delhi.

Paper VI

Draftsmanship – 1 (Practical II)

Objectives:

- Understand the basics of residential drawing.
- Develop skill in 2D and 3D manual drawings
- Train to draw 3D view of furniture

Unit -I

Introduction to Draftsmanship – Relationship between two dimensional and three dimensional diagrams.

Unit – II

Drafting tools and Techniques- Drawing table and boards, introduction to handling paper and pencil. Types of scales, tools for curves and irregular forms, drawing aids. Drafting medium-tracing paper, tracing cloth, water colour paper, sketch paper and polyester film.

Unit –III

Lines- types of lines, thickness of lines, hatching of lines. Lettering- requirements of good lettering, size of letters and numerals, space between letters, recommended height of letters and lettering technique.

Unit – IV

Dimensioning- general principles, precaution in dimensioning, method of placing dimensions, unit of dimensioning, method of executing dimension and arrow heads.

Unit – V

Geometrical constructions- Technical sketching, introduction and importance of free hand sketching and principles of free hand sketching.

References:

1. Pratap R.M. (1988), Interior Design, Principles And Practice, Standard Publishers, Distribution, Delhi
2. Natarajan K.V. (1994). A Text Book of Engineering Drawing Self-Publication, Chennai.
3. Birdie.G.S. and Birdie J.S. (2003), Civil Draughtmanship, Theory and Practice, Dhanpat Rai Publishing Company (P) Ltd, New Delhi.
4. Venugopal K. (2004) Engineering Graphics, 5th Edition, New Age International Publishers, New Delhi.

Paper VII

Ergonomics in Kitchen Design

Objectives:

- To enable the students to gain knowledge on importance of ergonomics in work effectiveness.
- Design work areas using ergonomic principles.

Unit-I

Concept of ergonomics – Meaning, importance, factors involved – worker, work place, tools and equipment, environment, climate.

Unit-II

Work environment – Location, space, indoor and outdoor climate, furniture, lighting and ventilation, flooring, noise, storage facilities, kitchen layouts.

Unit-III

Anthropometry – Anthropometric dimension of workers at work and at rest, normal and maximum vertical and horizontal reaches, work heights when seated and standing, worker in relationship with workspace and activities.

Unit-IV

Improving work efficiency- Concept of efficiency, principles and work and implication technique, effective use of body mechanics, posture involved in different activities, Mundel's classes of change.

Unit-V

Design of work place – Activity analysis – Designing work areas based on ergonomics principles.

References:

1. Barner, R.M., (1980), Motion and Time Study, Design and Measurement of work, John Wiley, New York.
2. Borgert, E. (1982) Housecraft – Principles and Practices, Issac Pitman, London.
3. Chaffin, D.B. and Andersson, G.B.J. (1984), Occupational Biomechanics, John Wiley, New York.
4. Cromwell, L. Weibell, F.J. and Pfeirffer, E.A. (1991), Biomedical Instrumentation and Measurements, Prentice Hall, New Delhi

Second Allied Paper – MARKETING

Unit I:

Definition and meaning of marketing – Modern concept of Marketing – Marketing and selling – Marketing functions – buying transportation – warehousing – standardization – Grading – Packaging

Unit II:

Buyer's behaviour – Buying motive – Market segmentation – Marketing strategies – product development -, introduction of new product – branding – packaging brand loyalty – product life cycle.

Unit III:

Pricing methods and strategies – physical Distribution – wholesaler and retailer – Services rendered by them.

Unit IV:

Promotional methods – Advertising – Publicity – Personal selling – Sales Promotion

Unit V:

Marketing Research – importance in Marketing decisions – Interactive marketing – Use of Internet – Online auction – Recent.

Text Book Recommended:

1. Marketing by Rajan Nair – Sultan Chand Company (or)
2. Marketing management by Sherlekar

Paper VIII

Furnishing the Interiors

Objectives:

- Gain knowledge in selection, use and care of furnishings.
- Know about the various fibres, weaves and finishes.
- Develop skill in estimating the cost of furnishing

Unit I

Furniture – Meaning and Definition, factors influencing selection, materials used. Styles in furniture – traditional, contemporary and modern designs. Furniture for different purpose, rooms, family needs, preference and financial limit.

Unit II

Construction features of furniture – Case goods and upholstered furniture – shaping, carving, turning, fluting, reeding. Different types of joints. Upholstering - Techniques and designs. Familiar furniture materials – different types of wood, metals, plastics, leathers. Care and maintenance – wood finishes and furniture polishes, care of upholstered and wooden furniture.

Unit III

Soft furnishings- Meaning and importance. Types of furnishings- Carpets, rugs, cushion cover, slip cover, bed linen, table linen and bath linen. Window treatments – Curtains, draperies, blinds, shades, valences and pelmets. Care and maintenance- stain removal and storage of furnishings.

Unit IV

Furniture arrangement – Factors to be considered while arranging furniture in different rooms – living rooms, dining room, bed room and kitchen. Furniture cut outs. Wise buymanship of furniture.

Unit V

Accessories- meaning, definition, need and types of accessories- functional, decorative both functional and decorative. Flower arrangement- importance, basic shapes, types- line, mass, line and mass, miniature, floating and hanging, Styles- traditional, modern and oriental. Ikabana - style of flower arrangement.

References

1. Mullick, P, 2000, Text Book of Home Science, Kalyani Publishers, New Delhi
2. Faulkner, R and Faulker, S (1987), Inside Today's Home, Rinehart Winston, New York
3. Century Group, London. Bridges.D, (1990). Flower Arranger's World, Random
4. Stepat, D.D. (1971), Introduction to Home furnishings. The Mac Millan Co, New York.
5. Wilhide, E and Cope Stick, I. (2000) Contemporary Decorating, Conron Octopus Ltd., London.
6. Levine M (1998), Living rooms, Rockport Publishers, USA.
7. Philip B. (2000), Hamlyn Book of Decorating Octopus Publishing Ltd, London,
8. Clifton. C. et al (1991), The complete Home Decorator ,Conran Octopus Ltd, London.
9. Luke. H., (1996), Soft Furnishings, New Holland Publishers Ltd, Singapore.

Paper IX

Floriculture and Landscaping

Objectives:

- Acquire skill in identifying ornamental plants
- Understand the methods of cultivation aspect of economic flowers
- Develop skills in making floral design and marketing

Unit –I

Floriculture- Meaning, concept and importance. Ornamental plants- classifications- Annuals, Biennials and perennials, annuals for summer, winter and rainy seasons. Flowering and foliage shrubs and trees, climbers and creepers, cacti and succulents, ferns, palms, hardy bulbs and tender bulbs.

Unit – II

Propagation Methods- Sexual and asexual methods of propagation- division, cutting, layering, grafting, budding and tissue culture.

Unit - III

Ornamental plant protection methods- plant after care, plant protection- cultural, chemical and mechanical. Pest and diseases. Manure application.

Unit – IV

Landscaping- Meaning and importance, Types of garden, garden components, Garden design- formal and informal, principles of landscape gardening. Lawn- importance, preparation, methods of cultivation, use, maintenance, type of lawn, indoor plants- potting and repotting techniques.

Unit –V

Modern trends in gardening – Terrace garden, Rock garden, Bonsai culture, - Roof garden, Hanging garden.

References

1. Ross. R. (1999), Colorful Gardening – Climbers, Ryland Peters and Small, London
2. Ross.R. (1999), Colourful Gardening – Bulbs, Ryland Peters and Small, London
3. Scott- James, A. (1995), Perfect Plant Perfect Garden, Corner Octopus limited, London.
4. Too Good, A. (1995), Designing with House Plants, Grange Books Publication, London.
5. Carter, G. (1977), Gardening with Containers, Ryland Peter and Small, London.

Paper X

Commercial Design and Autocad

Objectives

To enable the students to

1. Develop skill in drawing using computer
2. Develop skill in presenting CAD drawing

Unit I

Basic shapes – Line, Arc, Circle, Rectangle, Polygon, Ellipse- Drafting settings, limits, units, zoom.

Unit II

Editing the Plan – Modifications, Move, Copy , Rotate, Mirror, Trim, Offset, Array, Scale-Extend, Stretch, Lengthen, Fillet, Chamfer.

Unit III

Apply Texture – Object properties, Colour, Line type, line weight, layers, Text, M Text- Bhatch, Pline, ID, List, Dist, Area

Unit IV

Add measurements for the Drawing- Dimensioning, Linear, Aligned, Radius, Diameter, Angular, Qleader, Baseline, Continue, Tolerance

Unit V

Project Submission – Create complete plan for a building with all details – rendering, dimension-elevation, plan and perspective view.

References:

1. Autocad 2006 – CADD Centre
2. Autocad 2007 – Sham Tickoo
3. Autocad 2007 – Autodesk Inc
4. Autocad 2005- Engineers India
5. Autocad 2007 – CAD TRAINING
6. Autocad 2007 – CAD FORUM
7. Autocad 2007 – Design news

Paper XI

Green Building Technology

Objectives:

- Educate the students on basic principles and history of alternate energy sources
- Understand the importance of green buildings.
- Acquire knowledge on different types of green building materials.

Unit – I

Green building technology – Meaning, concept, impact of green building on human health and natural environment, need, importance and benefits of green buildings.

Unit - II

Materials and finishes used in green building- bamboo, straw, wood, dimension stone, recycled stone, non-toxic metals. Earth blocks – compressed, rammed, baked; vermiculites, flax linen, sisal, wood fibers, cork, coconut, polyurethane block

Unit-III

Green building practices and technologies. Roof, walls, floor- electrical, plumbing, windows and doors, heating, ventilation and air condition (HVAC), insulation, interior finishes, landscaping.

Unit – IV

Renewable energy resources- meaning and importance, solar energy – advantages, principles and functions of solar devices- solar room heater, solar lights, solar water heater, solar air conditioners.

Unit – V

Water conservation technologies-Rain water harvesting – importance, requirements of rain water harvesting structure, types of rain water harvesting systems, advantages.

References

1. Rai G.D. (1996), Solar Energy Utilization, Khanna Publishers, Delhi
2. Riggs, J.R. (1992), Materials and components of Interior Design, Regents Hall, New Jersey.
3. Faulkner, R., and Faulkner, S., (1987) Inside Today's Home, Rinehart publishing house, Newyork.
4. Rao, M.P. (1998), Interior Design, Principles and practice, Standard publishers, Delhi.
5. Despande, R.S. (1974) Build your own home, United book corporation, Poona.

Paper XII

Professional Practice and Entrepreneurship Development

Objectives:

To enable the students to:

- Understand the nature of entrepreneurial activities
- Know the schemes and programmes in relation to entrepreneurship development
- Seek self employment ventures

Unit I

Concept of Entrepreneurship and Motivation – Entrepreneurship - Meaning, reasons for taking self employment, Scope of entrepreneurship, Types, Classification, Concept of EDP, (EDP Programmes in India – EDII). Motivation – Meaning, Concept and Theories. Successful Entrepreneurs – Values, Goals and other personality traits leading to success.

Unit II

Initiating and Establishing Enterprise – Procedure – Application writing, Proposal, Finance, Raw materials, Personal supervision, Machinery installation, Accounting, Marketing, and other records. Steps for starting a small scale industry, registration. Types of organization. (Agencies for training – infrastructure, financial help marketing. Government and Non Government – Voluntary, CODISSIA, DIC, SISI, ICWE, CSWB, KVIC, Commercial banks).

Unit III

Project Planning and Formulation – Project identification, Classification / Characteristics, Constraints and objectives, Sources of ideas and trade fairs. Project formulation elements – Feasibility analysis, Techno-economic, Project design and network analysis, Input analysis, Financial analysis, Social cost benefit analysis and Project appraisal. (Project profile writing – Preliminary project Report, Detailed Project Report) (PPR + DPR). Planning, objectives and Premising.

Unit IV

Project and Profitability Appraisal – Concept, methods, Methods of minimizing risks, Components of fixed and working capital and requirements of fixed and working capital. Calculating fixed capital, working capital and operational costs. (Concept of capitalization and trading, marketing functions). Leasing and leasing arrangements.

Unit V

Limitations in Entrepreneurship – Problems in project formulation, implementation and co-ordination. (Limitations for women entrepreneurs – Physical economic, social and psychological. Suggestions for overcoming). 6

References:

1. Desai, N. (1985). Women, Change and Challenges in the International Decade, Bombay, Popular prakashana pvt. Ltd.
2. Desai, V. (1996). Entrepreneurial Development – Principles, Programmes and Policies (Vol.I), Formulation, Appraisal and Financing (Vol. II) and Programmes and Performance (Vol. III), Bombay, Himalaya Publishing House.
3. Desai, V. (1997). Dynamics of Entrepreneurial Development and Management, Mumbai, Himalaya Publishing House.
4. Devi, I. (1987). Changing Status of Women, New Delhi, Sterling Publisher.
5. Ghadially, R. (1998). Women in Indian Society, Bombay, Saga Publishers.
6. Gupta, G.L. (1988). Indian Women – Problems, Plights and Programmes, New Delhi, Inter India Publications.
7. Gupta, C.B. and Srinivasan, N.P. (1987). Entrepreneurship Development in India, New Delhi, Sultan Chand.
8. Saravanavel, P. (1997). Entrepreneurial Development – Principles, Policies and Programmes, Madras, Ess Pee Kay Publishing.
9. Winze, M.D. (1987). Women Entrepreneurs in India, New Delhi, Mital Publications.