



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Pharmacy

Subject Code: BP501TT

SEMESTER: V

Subject Name: Medicinal Chemistry II

**Scope:** This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Objectives:** Upon completion of the course the student shall be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

**Teaching scheme and examination scheme:**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	0	4	80	20	0	0

Sr No	Topics	% weightage
1.	<b>Antihistaminic agents:</b> Histamine, receptors and their distribution in the human body <b>H1-antagonists:</b> Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines succinate, Clemastine fumarate, Diphenylpyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium <b>H2-antagonists:</b> Cimetidine*, Famotidine, Ranitidin <b>Gastric Proton pump inhibitors:</b> Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole <b>Anti-neoplastic agents:</b> <b>Alkylating agents:</b> Meclroethamine*, Cyclophosphamide, Melphalan Chlorambucil, Busulfan, Thiotepa <b>Antimetabolites:</b> Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine <b>Antibiotics:</b> Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin <b>Plant products:</b> Etoposide, Vinblastin sulphate, Vincristin sulphate <b>Miscellaneous:</b> Cisplatin, Mitotane	10
2.	<b>Anti-anginal:</b> <b>Vasodilators:</b> Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole <b>Calcium channel blockers:</b> Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine. <b>Diuretics:</b> Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide. Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide, Loop diuretics: Furosemide*, Bumetanide,	10



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	Ethacrynic acid. Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride. Osmotic Diuretics: Mannitol <b>Anti-hypertensive Agents:</b> Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.	
3.	<b>Anti-arrhythmic Drugs:</b> Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcaïnide hydrochloride, Amiodarone, Sotalol. <b>Anti-hyperlipidemic agents:</b> Clofibrate, Lovastatin, Cholesteramine and Cholestipol <b>Coagulant &amp; Anticoagulants:</b> Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel <b>Drugs used in Congestive Heart Failure:</b> Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.	10
4.	<b>Drugs acting on Endocrine system</b> Nomenclature, Stereochemistry and metabolism of steroids <b>Sex hormones:</b> Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrone, Diethyl stilbestrol. <b>Drugs for erectile dysfunction:</b> Sildenafil, Tadalafil. <b>Oral contraceptives:</b> Mifepristone, Norgestrel, Levonorgestrol <b>Corticosteroids:</b> Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone <b>Thyroid and antithyroid drugs:</b> L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.	8
5.	<b>Antidiabetic agents:</b> Insulin and its preparations Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. Biguanides: Metformin. Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide. Glucosidase inhibitors: Acarbose, Voglibose. <b>Local Anesthetics:</b> SAR of Local anesthetics <b>Benzoic Acid derivatives;</b> Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine. <b>Amino Benzoic acid derivatives:</b> Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate. <b>Lidocaine/Anilide derivatives:</b> Lignocaine, Mepivacaine, Prilocaine, Etidocaine. <b>Miscellaneous:</b> Phenacaine, Dipiperodon, Dibucaine.*	7

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (\*)

### Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1 to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Pharmacy

Subject Code: BP502TP

SEMESTER: V

Subject Name: Pharmacology II

**Scope:** This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.

**Objectives:** Upon completion of the course the student shall be able to

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

**Teaching scheme and examination scheme:**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	4	6	80	20	80	20

Sr No	Topics	% weightage
1.	<b>Pharmacology of drugs acting on cardio vascular system</b> a. Introduction to hemodynamic and electrophysiology of heart. b. Drugs used in congestive heart failure c. Anti-hypertensive drugs. d. Anti-anginal drugs. e. Anti-arrhythmic drugs. f. Anti-hyperlipidemic drugs.	10
2.	<b>Pharmacology of drugs acting on cardio vascular system</b> a. Drug used in the therapy of shock. b. Hematinics, coagulants and anticoagulants. c. Fibrinolytics and anti-platelet drugs d. Plasma volume expanders <b>2. Pharmacology of drugs acting on urinary system</b> a. Diuretics b. Anti-diuretics.	10
3.	<b>Autocoids and related drugs</b> a. Introduction to autocoids and classification b. Histamine, 5-HT and their antagonists. c. Prostaglandins, Thromboxanes and Leukotrienes. d. Angiotensin, Bradykinin and Substance P. e. Non-steroidal anti-inflammatory agents f. Anti-gout drugs g. Antirheumatic drugs	10
4.	<b>Pharmacology of drugs acting on endocrine system</b> a. Basic concepts in endocrine pharmacology. b. Anterior Pituitary hormones- analogues and their inhibitors. c. Thyroid hormones- analogues and their inhibitors. d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.	8



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	d. Insulin, Oral Hypoglycemic agents and glucagon. e. ACTH and corticosteroids.	
5.	<b>Pharmacology of drugs acting on endocrine system</b> a. Androgens and Anabolic steroids. b. Estrogens, progesterone and oral contraceptives. c. Drugs acting on the uterus <b>Bioassay</b> a. Principles and applications of bioassay. b. Types of bioassay c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT	7

## Practical

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of PA<sub>2</sub> value of prazosin using rat anococcygeus muscle (by Schild's plot method).
12. Determination of PD<sub>2</sub> value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

*Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos*

## Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Pharmacy

Subject Code: BP503TP

SEMESTER: V

Subject Name: Pharmacognosy and Phytochemistry II

**Scope:** The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine.

**Objectives:** Upon completion of the course the student shall be able to

1. to know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. to understand the preparation and development of herbal formulation
3. to understand the herbal drug interactions
4. to carryout isolation and identification of phytoconstituents
- 5.

**Teaching scheme and examination scheme:**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	4	6	80	20	80	20

Sr No	Topics	% weightage
1.	<b>Metabolic pathways in higher plants and their determination</b> a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway. b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.	7
2.	General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites: <b>Alkaloids:</b> Vinca, Rauwolfia, Belladonna, Opium, <b>Phenylpropanoids and Flavonoids:</b> Lignans, Tea, Ruta <b>Steroids, Cardiac Glycosides &amp; Triterpenoids:</b> Liquorice, Dioscorea, Digitalis <b>Volatile oils:</b> Mentha, Clove, Cinnamon, Fennel, Coriander, <b>Tannins:</b> Catechu, Pterocarpus <b>Resins:</b> Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony <b>Glycosides:</b> Senna, Aloes, Bitter Almond <b>Iridoids, Other terpenoids &amp; Naphthaquinones:</b> Gentian, Artemisia, taxus, carotenoids	14
3.	Isolation, Identification and Analysis of Phytoconstituents a) Terpenoids: Menthol, Citral, Artemisin b) Glycosides: Glycyrrhetic acid & Rutin c) Alkaloids: Atropine, Quinine, Reserpine, Caffeine d) Resins: Podophyllotoxin, Curcumin	6
4.	Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine	10



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5.	<b>Basics of Phytochemistry</b> Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.	8
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### Practical List:

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
  - a. Caffeine - from tea dust.
  - b. Diosgenin from Dioscorea
  - c. Atropine from Belladonna
  - d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Distillation of volatile oils and detection of phytoconstituents by TLC
6. Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

### Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16<sup>th</sup> edition, W.B. Saunders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37<sup>th</sup> Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), 1<sup>st</sup> Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.





# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Pharmacy

Subject Code: BP504TP

SEMESTER: V

Subject Name: Pharmaceutical Microbiology

**Scope:** Study of all categories of microorganisms especially for the production of alcohol antibiotics, vaccines, vitamins enzymes etc...

**Objectives:** Upon completion of the course the student shall be able to

1. Understand methods of identification, cultivation and preservation of various microorganisms
2. To understand the importance and implementation of sterilization in pharmaceutical processing and industry
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

**Teaching scheme and examination scheme:**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	4	6	80	20	80	20

Sr No	Topics	% weightage
1.	Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes : Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy	10
2.	Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC). Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators.	10
3.	Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions. Evaluation of bactericidal & Bacteriostatic. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.	10
4.	Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic.	8
5.	Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.	7



# GUJARAT TECHNOLOGICAL UNIVERSITY

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Subject Code: BP504TP

	Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.	
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## Practical List

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

## Recommended books: (Latest Edition)

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hindsill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Pepler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company





# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Pharmacy

Subject Code: BP505TT

SEMESTER: V

Subject Name: Pharmaceutical Biotechnology

## Scope:

- Biotechnology has a long promise to revolutionize the biological sciences and technology.
- Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
- Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs.
- Biotechnology has already produced transgenic crops and animals and the future promises lot more.
- It is basically a research-based subject.

**Objectives:** Upon completion of the course the student shall be able to

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries
4. Appreciate the use of microorganisms in fermentation technology

## Teaching scheme and examination scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
3	1	0	4	80	20	0	0

Sr No	Topics	% weightage
1.	a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences. b) Enzyme Biotechnology- Methods of enzyme immobilization and applications. c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries. d) Brief introduction to Protein Engineering. e) Use of microbes in industry. Production of Enzymes- General consideration -Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase. f) Basic principles of genetic engineering.	10
2.	a) Study of cloning vectors, restriction endonucleases and DNA ligase. b) Recombinant DNA technology. Application of genetic engineering in medicine. c) Application of r DNA technology and genetic engineering in the production of: i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin. d) Brief introduction to PCR	10
3.	Types of immunity- humoral immunity, cellular immunity a) Structure of Immunoglobulins b) Structure and Function of MHC c) Hypersensitivity reactions, Immune stimulation and Immune suppressions. d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity. e) Storage conditions and stability of official vaccines	10



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	f) Hybridoma technology- Production, Purification and Applications g) Blood products and Plasma Substitutes.	
4.	a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting. b) Genetic organization of Eukaryotes and Prokaryotes c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. d) Introduction to Microbial biotransformation and applications. e) Mutation: Types of mutation/mutants.	8
5.	a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. b) Large scale production fermenter design and its various controls. c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin, d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.	7

### Recommended Books (Latest edition):

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Pharmacy**

**Subject Code: BP506TP**

**SEMESTER: V**

**Subject Name: Contributor Personality Development Program**

**Scope:** Improve the employability of students by giving them the right work ethic and thinking that employers are looking for.

- Build their confidence with which they can go into any job and contribute meaningfully.
- Improve their ability to engage better in the workplace and to be able to handle the challenges that come up there.
- Build their career-worthiness and help them develop into future-ready contributors with ability to navigate a career in a volatile, changing world.
- Widen their choices of career and success, so that they are able to open up more opportunities for themselves and take up unconventional career pathways.
- Enable them to recognize how they, as technical professionals, can participate and make a positive contribution to their communities and to their state.

Towards this goal, the Contributor Program has been designed to awaken and strengthen students from within, in terms of building positive self-esteem, increasing their confidence level and I-can attitude, improving their aspirations, giving them new methods of thinking, building their cognitive capacities, exposing them to the skills and practices associated with being contributors in the workplace (not mere employees).

The Program content is also designed to expose students to real-world workplace scenarios and sensitize them to some of the challenges faced in society around them, especially in the local communities around them and in their own state of Gujarat.

The Contributor Program syllabus has been evolved and fine-tuned over several years, (a) to address the changing need and contemporary challenges being faced by industry and what employers of today are looking for in the people they hire and (b) by working extensively with universities and students building an appreciation of their challenges and concerns. At the core, the program is guided by the higher ideas and principles of practical Vedanta in work.



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**Bachelor of Pharmacy**

**Subject Code: BP506TP**

Sr. No.	CO statement	Marks % weightage
<b>Outcome of theory sessions</b>		
CO-1	Students will be able to recognize & appreciate two alternative ideals of work – ideal of a “worker” and ideal of a “contributor”. And why organizations of today expect people they employ to be contributors and not just workers.	10-12%
CO-2	Students will be able to recognize & appreciate alternative ways in which they could define themselves or “who am I” (their identity) – and which are positive identities that will lead to building intrinsic self-esteem and confidence in oneself; in contrast to identities that will lead to extrinsic self-esteem that makes them more dependent on their environment.	10-12%
CO-3	Students will be able to recognize & appreciate a “victim” stance as distinct from a “creator of destiny” stance in the way people approach challenges and situations; and how the latter frees individuals to take on challenges and open up opportunities.	10-12%
CO-4	Students will be able to differentiate between two alternative approaches to success - ‘building one’s engine of success’ and ‘chasing the fruits of success’; they also appreciate the payoffs/ consequences of both and which is more likely to lead to sustainable or lasting success in the long run.	10-12%
CO-5	Students will be able to recognize & appreciate different career models and their value; to help them make more informed career-related choices.	10-12%
CO-6	Students will be able to recognize & appreciate how one can expand the contribution possible in any role, thereby opening up an alternative way of career growth to them.	10-12%
<b>Outcome of practical sessions</b>		
CO-7	Students learn to re-interpret their life and college experiences to showcase their contribution affinities which are relevant for employers.	15%
CO-8	Students learn to apply contributor thinking to real-world or career relevant challenges.	15%

### Teaching scheme and examination scheme:

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
4	0	0	4	80	20	30	20

Sr No	Topics	% weightage
1	<p><b>The Contributor Work Ideal</b></p> <p>In this topic, students explore what is their “ideal” of work - is the ideal to be a “worker” or to be a “contributor”? For example, an employee who has the ideal of a “worker” goes to work to pass time, earn a living, get benefits; in contrast to an employee with the ideal of a “contributor” who wants to make a difference, get things done well, create value for the company. This enables students to transform their expectation of themselves in work</p>	1.5 hrs Classroom engagement (including self-discovery/ solutioning sessions)



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2	<b>Identity &amp; Self-esteem</b> In this topic, students engage with the question “who am I?” or on what basis do they define themselves. Is their identity defined by what others think of them (extrinsic self-esteem) or by what they think of themselves (intrinsic self-esteem)? Further, they discover positive identities that lead to intrinsic self-esteem, such as an I-can identity based on one’s capacity and inner strength. This enables them to build confidence and self-esteem.	Same as above
3	<b>Become a Creator of one’s destiny</b> In a “victim stance”, we see the career environment as full of difficulties and hurdles. We feel powerless or blame our circumstances for not having many opportunities. This makes us fearful of uncertainty and makes us settle for jobs where we remain mediocre. In this topic, students discover the “creator of destiny stance” to challenges and situations. This stance frees them to try out new things, open up new possibilities, take on responsibility, see the opportunity hidden in their environment.	Same as above
4	<b>Achieving Sustainable Success</b> In this topic, students discover how to achieve sustainable or lasting success, by building one’s “engine of success”, making them success-worthy. Where their focus shifts to building one’s “engine of success” rather than being on chasing the “fruits of success”. This is important, because over a lifetime of work, all people go through ups and downs – where the fruits are not in their control. People who are focused on the fruits of success, fall prey to disappointment, loss in motivation, quitting too early, trying to find shortcuts – when fruits don’t come. Whereas people focused on building their engine of success continue to contribute steadily, irrespective of whether fruits come or not. And with a strong engine of success, fruits come to them in time.	Same as above
5	<b>Career Development Models</b> In this topic, students explore a range of diverse “career development models” and the possibilities for contribution each opens up to them (e.g. start-up career model, change-maker career model, etc.). This opens their mind to different and even unconventional career models possible, beyond the usual (such as “stable large company career model” where one gets an engineering degree, then MBA, then get a job in a large company). This frees them from a herd mentality when making career choices.	Same as above
6	<b>Expanding contribution in every role</b> In this topic, students explore the many roles they can play in their life & discover the power they have to expand the contribution possible in any role. (E.g. role of student, role of manager, role of a project site engineer). So, the potential of a role is in the individual’s hands. This opens their mind to an alternative way of career growth.	Same as above
7	<b>Finding Solutions</b> The market environment in which organizations are operating, is becoming increasingly dynamic and uncertain. So, employers are increasingly seeking out people who can innovate and figure out solutions in the face of any challenge (unlike in the past when it was the people who were most efficient and productive, who were valued by organizations). At the heart of innovation lies this way of thinking of “finding solutions” rather than “seeing problems or roadblocks”. Students learn how to build this way of thinking, in this topic.	1.5 hrs Classroom engagement (including self-discovery/ solutioning sessions)
8	<b>Creating Value</b>	Same as above



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	Companies are also looking for employees who do not just work hard, or work efficiently or productively - but those who will make a valuable difference to the fortunes of the company. This difference may come from innovation, but it may also come from focusing on the right things and identifying what really matters – both to the company and to the customers. In this topic, students learn how to build this capability.	
9	<b>Engaging deeply</b> The environment we live in is becoming increasingly complex because more and more things are getting interconnected, new fields are emerging, technologies are rapidly changing, capabilities and knowledge one is trained in will become fast obsolete. In such a scenario, the student's ability to quickly understand and master what is going on, dive deep, get involved in any area, rapidly learn new capabilities that a job demands, is important. Engaging deeply is a core way of thinking that can help them in this. In this topic, students learn how to engage deeply.	Same as above
10	<b>Enlightened self-interest &amp; collaboration at work</b> The changing nature of work in organizations and in the global environment is increasingly demanding that people work more collaboratively towards shared goals and more sustainable goals. A key to working successfully when multiple stakeholders are involved is “thinking in enlightened self-interest”. In this topic, students learn how to develop this way of thinking (going beyond “narrow self-interest”).	Same as above
11	<b>Human-centered thinking &amp; Empathy</b> In this topic, students explore a human-centric approach to work – where the ability to recognize and respond to other people (whether they are users or customers or team members) as a human being with human needs and difficulties, is essential. This is at the heart of user-centric design of products and solutions, at the heart of genuine customer-centricity in services, and of any successful interaction with other people.	Same as above
12	<b>Trust Conduct</b> The biggest currency in a sustainable career is “trust” i.e. being trusted by team members, bosses, and customers. When we are trusted, people listen to us, they are willing to give us the chance to grow, give us the space to make mistakes, and work seamlessly with each other without always having to “prove ourselves”. In this topic, students learn how to demonstrate conduct that builds the trust of people.	Same as above

### A. Basic reference for both students and teachers

1. Contributor Personality Program textbook cum workbook developed by Illumine
2. Web-based ActivGuide™ for self-exploration of rich media resources to vividly understand many of the ideas, watch role models, learn from industry people, get reference readings – that help them enrich the understanding they gained in the class published by Illumine Foundation

### B. Advanced reference for teachers

1. On Contributors, Srinivas V.; Illumine Ideas, 2011
2. Enlightened Citizenship and Democracy; Swami Ranganathananda, Bharatiya Vidya Bhavan, 1989





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3. Eternal Values for a Changing Society – Vol I-IV, Swami Ranganathananda; Bharatiya Vidya Bhavan
4. Karma Yoga, Swami Vivekananda; Advaita Ashrama
5. Vivekananda: His Call to the Nation, Swami Vivekananda; Advaita Ashrama
6. Six Pillars of Self Esteem, Nathaniel Branden; Bantam, 1995
7. Mindset: The New Psychology of Success, Carol S. Dweck; Random House Publishing Group, 2007
8. Lasting Contribution: How to Think, Plan, and Act to Accomplish Meaningful Work, Tad Waddington; Agate Publishing, 2007
9. Why not?: how to use everyday ingenuity to solve problems big and small, Barry Nalebuff, Ian Ayres; Harvard Business School Press, 2003
10. The value mindset: returning to the first principles of capitalist enterprise (Ch 8 & 9); Erik Stern, Mike Hutchinson; John Wiley and Sons, 2004
11. The Power of Full Engagement: Managing Energy, Not Time, is the Key to High Performance and Personal Renewal, Jim Loehr, Tony Schwartz; Simon and Schuster, 2003
12. Creating Shared Value, Michael E. Porter and Mark R. Kramer; Harvard Business Review; Jan/Feb2011, Vol. 89 Issue 1/2
13. The Speed of Trust: The One Thing That Changes Everything, Stephen M. R. Covey, Rebecca R. Merrill, Stephen R. Covey; Free Press, 2008
14. The Courage to Meet the Demands of Reality, Henry Cloud; HarperCollins, 2009
15. Responsibility at work: how leading professionals act (or don't act) responsibly, Howard Gardner; John Wiley & Sons, 2007



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SEMESTER: V

Subject Name: Integrated Personality Development Course

**Scope:** IPDC aims to prepare students for the modern challenges they face in their daily lives. Promoting fortitude in the face of failures, unity amongst family discord, self-discipline amidst distractions, and many more priceless lessons. The course focuses on morality and character development at the core of student growth, to enable students to become self-aware, sincere, and successful in their many roles - as an ambitious student, reliable employee, caring family member, and considerate citizen.

**Objectives:** Upon completion of the course the student shall be able to

1. To provide students with a holistic value-based education that will enable them to be successful in their academic, professional, and social lives.
2. To give the students the tools to develop effective habits, promote personal growth, and improve their wellbeing, stability, and productivity.
3. To allow students to establish a stronger connection with their family through critical thinking and devolvement of qualities such as unity, forgiveness, empathy, and effective communication.
4. To provide students with soft skills that complement their hard skills, making them more marketable when entering the workforce.
5. To enhance awareness of India's glory and global values, and to create considerate citizens who strive for the betterment of their family, college, workforce, and nation.
6. To inspire students to strive for a higher sense of character by learning from role models who have lived principled, disciplined, and value-based lives.

**Teaching scheme and examination scheme:**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Practical	
				External	Internal	External	Internal
4	0	0	4	80	20	30	20

**Course-Content :**

Each lecture can be taken in a continuous two-hour session, or in two separate one-hour sessions. In addition to the core lectures, an induction and concluding lectures are recommended as shown in the below table.

Lecture No.	Module -Lecture	Lecture Description	% Weightage
Induction	The Need for Values	Students will learn about the need for values as part of their holistic development to become successful in their many roles - as ambitious students, reliable employees, caring family members, and considerate citizens.	2
1	<b>Remaking Yourself</b> Restructuring Yourself	Students learn how self-improvement enables them to secure a bright future for themselves. They will learn 6 powerful thought-processes that can develop their intellectual, physical, emotional, and spiritual quotients.	2
2	<b>Remaking Yourself -</b> Power of Habit	Students will undergo a study of how habits work, the habits of successful professionals, and the practical techniques that can be used to develop good habits in their life.	2



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3	<b>Learning from Legends- Tendulkar &amp; Tata</b>	Students will learn from the inspirational lives of India's two legends, Sachin Tendulkar and Ratan Tata. They will implement these lessons through relatable case studies.	2
4	<b>From House to Home- Listening &amp; Understanding</b>	Active listening is an essential part of academic progress and communications. Students will learn to listen with their eyes, ears, mind, and heart.	2
5	<b>Facing Failures- Welcoming Challenges</b>	This lecture enables students to revisit the way in which they approach challenges. Through the study of successful figures such as Disney, Lincoln and Bachchan, students will learn to face difficulties through a positive perspective.	2
6	<b>Facing Failures- Significance of Failures</b>	Failure is a student's daily source of fear, negativity, and depression. Students will be given the constructive skills to understand failure as formative learning experiences.	2
7	<b>My India My Pride- Glorious Past - Part 1</b>	India's ancient Rishis, scholars, and intellectuals have made tremendous contributions to the world, they developed an advanced, sophisticated culture and civilization which began thousands of years ago. Students will learn the importance of studying India's glorious past so that they could develop a strong passion and pride for our nation.	2
8	<b>My India My Pride- Glorious Past - Part 2</b>	Our ancient concepts can be used to seek revolutionary ideas and to generate inspiration. Students will develop a deeper interest in India's Glorious Past – by appreciating the need to read about it, research it, write about it, and share it.	2
9	<b>Learning from Legends- A.P.J. Abdul Kalam</b>	Dr Kalam's inspirational life displayed legendary qualities which apply to students (1) Dare to Dream (2) Work Hard (3) Get Good Guidance (4) Humility (5) Use Your Talents for the Benefit of Others	2
10	<b>Soft Skills- Networking &amp; Leadership</b>	Students are taught the means of building a professional network and developing a leadership attitude.	2
11	<b>Soft Skills- Project Management</b>	Students will learn the secrets of project management through the Akshardham case study. They will then practice these skills through an activity relevant to student life.	2
12	<b>Remaking Yourself- Handling Social Media</b>	Students will learn how social media can become addictive and they will imbibe simple methods to take back control.	2
13	<b>Facing Failures- Power of Faith</b>	Students will learn about the power and necessity of faith in our daily lives.	2
14	<b>From House to Home- Bonding the Family</b>	Students will understand the importance of strong family relationships. They will learn how to overcome the generation gap and connect with their family more.	2
15	<b>Selfless Service- Seva</b>	Students will learn that performing seva is beneficial to one's health, wellbeing, and happiness. It also benefits and inspires others.	2
16	<b>Remaking Yourself- Begin with the End in Mind</b>	Students will learn to visualize their future goals and will structure their lives through smart goals to give themselves direction and ultimately take them to where they want to go.	2



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17	<b>Remaking Yourself- Being Addiction-Free</b>	Students will explore the detrimental effects of addictions on one's health, personal life, and family life. They will learn how to take control of their life by becoming addiction free.	2
18	<b>Selfless Service- Case Study: Disaster Relief</b>	Students will apply previous lessons of seva, to analyse the case study of the Bhuj earthquake relief work.	2
19	<b>Soft Skills- Teamwork &amp; Harmony</b>	Students will learn the six steps of teamwork and harmony that are essential for students' professional and daily life.	2
20	<b>My India My Pride- Present Scenario</b>	To implement the transformation of India from a developing country into a developed country it is necessary to have a value-based citizen. Students will see how the transformation to a greater India relies on the vision and efforts of themselves as a youth.	2
21	<b>Learning from Legends- Leading Without Leading</b>	Students will explore a new approach to leadership, through humility.	2
22	<b>My India My Pride- An Ideal Citizen - 1</b>	Students will learn that to become value-based citizens, they must first develop good values in their lives. They start by exploring the values of responsibility and integrity.	2
23	<b>My India My Pride- An Ideal Citizen - 2</b>	Students will learn that by developing the values of loyalty, sincerity, and punctuality; they become indispensable and can leave a strong impression. They will start developing these values by trying to keep perfection in every small task and by looking at the bigger picture.	2
24	<b>Facing Failures Timeless Wisdom for Daily Life</b>	Students will learn the role wisdom plays in finding long-term stability. They will use ancient wisdom to solve their modern-day challenges.	2
25	<b>From House to Home- Forgive &amp; Forget</b>	Students will understand the importance and benefits that forgiveness plays in their personal and professional life. They will learn to apply this knowledge in realistic situations.	2
26	<b>Remaking Yourself- Stress Management</b>	Students will learn to cope with current and future causes of stress.	2
27	<b>Remaking Yourself- Better Health Better Future</b>	A healthy body prevents disease and stress; increases positivity, productivity, and brainpower. Students will learn to maintain good health through regular exercise, healthy eating habits, and regular and sufficient sleep.	2
28	<b>Learning from Legends - Words of Wisdom</b>	A panel of learned and experienced mentors will personally answer practical questions that students face in their daily life.	2
29	<b>Soft Skills – Financial Planning</b>	Students will develop a variety of practical financial skills that prepare them to become financially stable throughout their future careers.	2
30	<b>Remaking Yourself Impact of Company</b>	Students will understand that the type of company that we keep, has a crucial role in determining who we are and who we will	2



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		become. They will develop the ability to create a positive environment around them.	
Concluding	Life After IPDC	This concluding lecture encourages students to keep practising these priceless lessons and prepares them for the next steps in their lives.	2

## COURSE MATERIAL / MAIN COURSE WORKBOOK -

1. IPDC Workbook-1 (presented by B.A.P.S. Swaminarayan Sanstha)

2. IPDC Workbook-2 (presented by B.A.P.S. Swaminarayan Sanstha)

## IPDC REFERENCES –

These are the reference material for the IPDC lectures. This is not compulsory reading for the students as the essential information is contained in the workbooks.

Module No.	Module	References
1	Facing Failures	<ol style="list-style-type: none"><li>1. Thomas Edison's factory burns down, New York Times Archives, Page 1, 10/12/1914</li><li>2. <a href="#">Lincoln Financial Foundation</a>, Abraham Lincoln's "Failures": Critiques, Forgotten Books, 2017</li><li>3. <b>J.K. Rowling Harvard Commencement Speech   Harvard University Commencement, 2008</b></li><li>4. Born Again on the Mountain: A Story of Losing Everything and Finding It Back, <a href="#">Arunima Sinha</a>, Penguin, 2014</li><li>5. Failing Forward: Turning Mistakes Into Stepping Stones for Success, <a href="#">John C. Maxwell</a>, Thomas Nelson, 2007</li><li>6. Steve Jobs: The Exclusive Biography Paperback, <a href="#">Walter Isaacson</a>, Abacus, 2015</li><li>7. Failing Forward: Turning Mistakes Into Stepping Stones for Success, <a href="#">John C. Maxwell</a>, Thomas Nelson, 2007</li></ol>
2	Learning from Legends	<ol style="list-style-type: none"><li>1. Chase Your Dreams: My Autobiography, Sachin Tendulkar, Hachette India, 2017</li><li>2. Playing It My Way: My Autobiography, Sachin Tendulkar, Hodder &amp; Stoughton, 2014</li><li>3. The Wit and Wisdom of Ratan Tata, Ratan Tata, Hay House, 2018</li><li>4. The Tata Group: From Torchbearers to Trailblazers, Shashank Shah, Penguin Portfolio, 2018</li><li>5. The Leader Who Had No Title, Robin Sharma, Jaico Publishing House, 2010</li><li>6. In the Joy of Others: A Life-Sketch of Pramukh Swami Maharaj, Mohanlal Patel and BAPS Sadhus, Swaminarayan Aksharpith, 2013</li></ol>
3	My India My Pride	<ol style="list-style-type: none"><li>1. Rishis, Mystics, and Heroes of India, Sadhu Mukundcharandas, Swaminarayan Aksharpith, 2011</li><li>2. Physics in Ancient India, <a href="#">Narayan Dongre</a>, <a href="#">Shankar Nene</a>, National Book Trust, 2016</li><li>3. <a href="#">The Rise of Civilization in India and Pakistan</a>, Raymond Allchin, Bridget Allchin, Cambridge University Press, 1982</li><li>4. <a href="#">The Āryabhaṭīya of Āryabhaṭa: An Ancient Indian Work on Mathematics and Astronomy</a> (1930), <a href="#">Walter Eugene</a> Clark, University of Chicago Press, reprint, Kessinger Publishing, 2006</li></ol>



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4	Remaking Yourself	<ol style="list-style-type: none"><li>1. Power of Habit, Charles Duhigg, Random House Trade Paperbacks, 2014</li><li>2. Change Your Habit, Change Your Life, Tom Corley, North Loop Books, 2016</li><li>3. The Seven Habits of Highly Effective People, Stephen Covey, Simon &amp; Schuster, 2013</li><li>4. Seven Habits of Highly Effective Teens, Sean Covey, Simon &amp; Schuster, 2012</li><li>5. Atomic Habits, James Clear, Random House, 2018</li><li>6. How a handful of tech companies control billions of minds every day, Tristan Harris, TED Talk, 2017</li></ol>
5	From House to Home	<ol style="list-style-type: none"><li>1. “What Makes a Good Life? Lessons from the Longest Study on Happiness”, R. Waldinger, Ted Talks, 2015</li><li>2. <b>Long Walk To Freedom, Nelson Mandela, Back Bay Books, 1995</b></li><li>3. Outliers, Malcolm Gladwell, Back Bay Books, 2011</li></ol>
6	Soft Skills	<ol style="list-style-type: none"><li>1. The 17 Indisputable Laws of Teamwork, John Maxwell, HarperCollins, 2013</li><li>2. Team of Teams: New Rules of Engagement for a Complex World, Stanley McChrystal, Portfolio, 2015</li><li>3. Predictably Irrational, Revised and Expanded Edition: The Hidden Forces That Shape Our Decisions, <a href="#">Dan Ariely</a>, Harper Perennial, 2010</li></ol>
7	Selfless Service	<ol style="list-style-type: none"><li>1. Open: An Autobiography, Andre Agassi, Vintage, 10 August 2010</li><li>2. The Physiological Power of Altruism [online], James Hamblin, The Atlantic, December 30, 2015, <a href="https://www.theatlantic.com/health/archive/2015/12/altruism-for-a-better-body/422280/">https://www.theatlantic.com/health/archive/2015/12/altruism-for-a-better-body/422280/</a> [last accessed June 10, 2020]</li><li>3. TBI Blogs: From Entrepreneurs to Doorkeepers, Everybody Serves with Love &amp; Warmth at This Ahmedabad Café [online], <a href="#">The People Place Project</a>, The Better India, May 29, 2017, <a href="https://www.thebetterindia.com/102551/small-way-serve-ahmedabad-seva-cafe/">https://www.thebetterindia.com/102551/small-way-serve-ahmedabad-seva-cafe/</a>, [last accessed June 10, 2020]</li></ol>