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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **B.Sc. (Hons) BT/CHE/ENV/MB** | | | | | | | | | | | | | | | |
| **CREDIT FRAME WORK** | | | | | | | | | | | | | | | |
| **Semester** | **Majors** | | | | **Minors** | | **Skill**  **Enhancement** | | **Ability**  **Enhancement** | | **Multidiscipl.** | | **Value Added** | | **Total**  **Credits** |
| **Theory** | | **Lab** | |
| **No. of Papers** | **Credits** | **Lab Hrs** | **Lab**  **Credits** | **No. of Papers** | **Credits** | **No. of Papers** | **Credits** | **No. of Papers** | **Credits** | **No. of Papers** | **Credits** | **No. of Papers** | **Credits** |
| 1 | 1 | 4 | 8 | 4 | 1 | 4 | 1 | 3 | 1 | 2 | 1 | 3 | 1 | 2 | 22 |
| 2 | 1 | 4 | 8 | 4 | 1 | 4 | 1 | 3 | 1 | 2 | 1 | 3 | 1 | 2 | 22 |
| 3 | 1 | 4 | 8 | 4 | 1 | 4 | 1 | 3 | 1 | 2 | 1 | 3 | 1 | 2 | 22 |
| 4 | 3 | 12 | 8 | 2 | 1 | 4 |  |  | 1 | 2 |  |  |  | 2 | 22 |
| 5 | 2 | 8 | 8 | 4 | 1 | 6 | Intrnsp | 4 |  |  |  |  |  |  | 22 |
| 6 | 3 | 12 | 8 | 4 | 1 | 6 |  |  |  |  |  |  |  |  | 22 |
| **Total after 3y** | **11** | **44** | **48** | **22** | **6** | **28** | **3+1** | **9+4** | **4** | **8** | **3** | **9** | **3** | **8** | **132** |
| 7 | 3 | 12 | 8 | 4 | 1 | 6 |  |  |  |  |  |  |  |  | 22 |
| 8 (Research) | 1 | 4 |  |  | 1 | 6 |  | 12 |  |  |  |  |  |  | 22 |
| 8 (Honors) | 3 | 12 | 8 | 4 | 1 | 6 |  |  |  |  |  |  |  |  |
| **Total after 4y** | **17** | **68** | **20** | **30** | **8** | **40** | **3** | **9+4** | **4** | **8** | **3** | **9** | **3** | **8** | **176** |

**Sarvajanik University**

**Faculty of Science**

B.Sc. (Hons)

|  |  |
| --- | --- |
| Faculty: Science | Department: All |
| Program: B.Sc. (Hons) | Type: Minor |
| Subject: Foundation Minors in Applied Sciences-1 | Credits: 4 |
| Semester: 1 | |
| **Course description:**The objectives of this course are to provide students with fundamental scientific knowledge of basics of Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health concepts. It will help students in creating a strong foundation necessary for science based careers. | |
| **Student Learning Outcome:**  **●**Obtained ideas on various branches Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health concepts.  ●Students will be acquainted with the historical account and development.  ●Able to learn scientific principles and scope of Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health.  ●Will be aware of general characteristics and able to gather knowledge about Agriculture & Forestry, Analytical chemistry & Instrumentation, Forensic science, Industrial Fermentation, Medical Lab Technology & Occupational Health. | |

**Unit-1: Introduction forestry:**   **(10 hrs)**  1.1 Concept of forest ecosystem and dynamics of forest succession   
 1.2 Classification of world’s forest vegetation   
 1.3 Productivity and vegetation forms of India and forest composition and classification 1.4 Natural regeneration of species and types of uneven-aged silviculture   
 1.5 Principles of silviculture and physical-ecological factors affecting it.

**Unit-2: Scope and importance of analytical chemistry**   **(10 hrs)**  2.1 Introduction and role of analytical chemistry in sciences   
 2.2 Quantitative analysis; major, minor and trace constituents   
 2.3 SI Units: Basic units, Derived units, Conversion between units   
 2.4 Concept of concentration: Mole, Molar mass, Solutions and their concentrations

**Unit-3 Forensic science and Forensic laboratories**   **(10 hrs)**  3.1 Introduction, definition and principles   
 3.2 Laws of forensic science

**Sarvajanik University**

**Faculty of Science**

B.Sc. (Hons)

3.3 Historical aspects of forensic science in India   
 3.4 Need of forensic science in present scenario  
 3.5 Types and divisions   
 3.6 Forensic examination   
 3.7 Organizational set up of forensic science laboratories at central and state level.

3.8 Introduction of BPR& D, NICFS,CDFD,CCMB, IITR, CDTS, NCRB

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| **Unit-4 History and Basic of Industrial Fermentation Processes** 4.1 Historical development of industrial processes  4.2 The range of fermentation processes  4.3 The component parts of fermentation process  4.4 Stages of fermentation process  4.5 Types of fermentation Process – Batch, Continuous & Fed batch  **Unit-5 Organization of the Clinical laboratory and Laboratory Safety**  5.1 Clinical pathology laboratory definition & Laboratory Premises 5.2 Functional components of clinical laboratories   5.3 Various types of laboratories   5.4 Responsibilities of the laboratory worker   5.5 Precautions for prevention of transmission of pathogens   5.6 Precautions regarding fire and explosions   5.7 Important instructions to reduce infections in laboratory workers  **Unit-6 Introduction of Occupational Health**  6.1Basic concepts of Occupational Health and Safety (OHS).  6.2 Hazard identification and prevention techniques at the workplace.  6.3 Occupational Health and Safety Standards.  6.4 Workplace environment monitoring and measurements.  6.5 Occupational health hazards and preventive measures. | **(10 hrs)**  **(10 hrs)**  **(10 hrs)** |

**Practicals:**   
 1.Study of Raunkiaer;s normal frequency distribution of vegetation.

2.Study of anatomical adaptations of hyrophytes (Roots and petiole), Xerophytes (Stem and Root), Mesophytes (monocot and dicot leaf, stem and root).

3.Use and calibration of volumetric equipment (volumetric flasks, pipette’s and burette’s) 4.Preparation of standard solutions of acids and bases   
5.Preparation of standard solution of EDTA and estimation of magnesium using EDTA 6.Determination of specific gravity of petroleum products   
7.To compare physical evidence (Cloth, Thread)   
 8. Introduction to laboratory batch fermenter.

9. Study of safety symbols and waste disposal in clinical laboratories.

10**.** Measurement of Illumination by Lux meter.

**References and Textbooks: (With Author, Edition, Publishers, ISBN)**

**Sarvajanik University**

**Faculty of Science**

B.Sc. (Hons)

**Agriculture & Forestry:**   
●Dwivedi AP. 1992. *Agroforestry: Principles and Practices*. Oxford and IBH.

●Dwivedi AP. 1993. *A Text Book of Silviculture*. International Book Distributors, Dehradun.

●Khanna LS. 1996. *Principle and Practice of Silviculture*. International Book Distributors.

●Smith DM, Larson BC, Ketty MJ & Ashton PMS. 1997. The Practices of Silviculture- Applied Forest Ecology. John Wiley & Sons.

**Analytical Chemistry:**   
●Douglas A. Skoog and Donald M..West: Fundamentals of Analytical Chemistry. ●Adion A. Gordus: Schaum’s Outline of Analytical Chemistry, Tata McGraw-Hill. ●Gary D. Christian : Analytical Chemistry .

●Freifelder and Kealy: Analytical Chemistry

**Forensic Science:**   
●Henry Lee’s Crime Scene Handbook:Henry C Lee

●Forensic Biology:Shrikant H. Lade

●Crime Scene Processing and Laboratory Work Book : Patric Jones

●Forensic Science: An Introduction to Scientific and Investigative Techniques 3rd ed. : Stuart H. James

**Industrial Fermentation Technology:**   
●Patel, A. H. (2016). Industrial Microbiology, 2nd Ed., Trinity press; An imprint of Laxmi publications PVT. Ltd.

●Stanbury, P., Whitaker, A. and Hall, S. J. (2016). Principles of fermentation technol- ogy, 3rd Ed., Butterworth-Heinemann.

**Medical Laboratory Technology:**   
● P.B. Godkar, (2014), Textbook of Medical Laboratory Technology, Vol I, 3rd ed.,←

Bhalani Publishing House, Mumbai, India. (ISBN: 9789381496190)

●Mukharjee K.L. (1999), Medical Laboratory Technology, Vol I, 2nd ed., Tata MacGraw Hill.

(ISBN: 9789352606818)

**Occupational Health:**

●Mistry K.U (2012): Fundamentals of Industrial Safety & Health-I, Siddharth Prakashan, Ahmedabad.

●Mistry K.U (2012): Fundamentals of Industrial Safety & Health-II, Siddharth Prakashan,

Ahmedabad.

●Benjamin O. Alli (2008): Fundamental principles of occupational health and safety,

International Labour Office; 2nd edition, 978-9221204541.

**Sarvajanik University**   
**Faculty of Science**   
B.Sc. (Hons)

|  |  |
| --- | --- |
| Faculty: Science | Department: All |
| Program: B.Sc. (Hons) | Type: Major |
| Subject: Foundation Majors in Applied Sciences-1 | Credits: 4 |
| Semester: 1 | |
| **Course description:**The objectives of this course are to provide students with fundamental scientific knowledge of basic Biotechnological, Chemistry, Environmental Science and Microbiology concepts. It will help students in creating a strong foundation necessary for science based careers. | |
| **Student Learning Outcome:**  **●**Obtained ideas on various branches Biotechnology, Chemistry, Environmental Science and Microbiology.  ●Students will be acquainted with the historical account and development.  ●Able to learn scientific principles and scope of Biotechnology, Chemistry, Environmental Science and Microbiology.  ●Will be aware of general characteristics and able to gather knowledge about Biotechnology, Chemistry, Environmental Science and Microbiology. | |

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| --- | --- |
| **Unit-1 Basic Biotechnology-1:**  1.1 History and introduction to Biotechnology  1.2 Definition of Biotechnology, Traditional and New  1.3 The World of Biotechnology- Red, Green, White and Blue Biotechnology 1.4 Biotechnology-an Interdisciplinary Pursuit  1.5 Biotechnology- a three-component central core  **Unit-2 Biotechnology in India**  2.1 Role of GSBTM, STBI and GBRC  2.2 Gujarat Biotechnology Policy 2022-27  2.3 Introduction to DBT, Its Mandate and Strategy  2.4 Autonomous and Public sector undertakings of DBT 2.5 BIRAC and ABLE  **Unit-3: Foundation of chemistry**  3.1Qualitative observation Vs quantitative observation 3.2 Theory vs law  3.3 Mass vs weight, Density: Solid, liquid, gas | **(8 hrs)**  **(7 hrs)**  **(7 hrs)** |

**Sarvajanik University**

**Faculty of Science**

B.Sc. (Hons)

3.4 Physical changes and chemical changes

3.5 Chemical bonds (Types, bond length, bond energy)

**Unit-4 Recapitulation of basics of organic chemistry**  **(8 hrs)** 4.1 Introduction to natural and synthetic organic compounds   
4.2 Hybridisation: Shapes of molecules, effect on resonance structure

4.3 Electronic displacements and their applications: Inductive, electromeric, resonance and mesomeric effects and hyperconjugation

4.4 Homolytic and Heterolytic fission with suitable examples   
4.5 Electrophiles and Nucleophiles, Curly arrow rule   
4.6 Types, shape and relative stability of Carbocations, Carbanions, Free radicals and Carbenes 4.7 Introduction to types of organic reactions: Addition, Elimination and Substitution reactions.

**Unit-5 Natural Resources and Management**  **(7 hrs)** 5.1 Classification of natural resources; renewable and non-renewable resources

5.2 Resource degradation & resource conservation; resource availability and factors influencing

its availability

5.3 Types of resources: Land resources; Water resources; Fisheries and other marine resources;

Energy resources; Mineral resources

5.4 Impact on natural resources: Human impact; ecological, social and economic dimension of

resource management

**Unit-6 Ecology and Environment**  **(8 hrs)** 6.1 Types, classification, structure and function of Ecology   
6.2 classification, characterization and importance of population and population dynamics and population ecology   
6.3 Concept of Community Ecology and Ecological Succession   
6.4 Auto ecology of Species and Ecological Amplitude

**Unit-7 Introduction and major themes of Microbiology**  **(7 hrs)** 7.1Microbiology & it’s important   
7.2 Structure and Activities of Microbial cell   
7.3 Evolution and Diversity of Microbial Cell   
7.4 Microorganisms and Their Environment   
7.5 The Impact of Microorganisms on Humans

**Unit-8 Microbiology in historical context**  **(8 hrs)** 8.1 The Discovery of Microorganisms   
8.2 Pasteur & Spontaneous Generation   
8.3 Koch, Infectious Disease and Pure Cultures   
8.4 The Rise of Microbial Diversity

**Sarvajanik University**

**Faculty of Science**

B.Sc. (Hons)

**References and Textbooks: (With Author, Edition, Publishers, ISBN)**

**Biotechnology:**   
●John Smith., (2009). Biotechnology, Cambridge Press. ISBN 9780521711937   
●Ratledge, C., & Kristiansen, B., (2006). *Basic Biotechnology*, Cambridge University Press.

ISBN 9780521549585   
●R.C. Dubey (2014) Advanced Biotechnology S.Chand ISBN 81-219-4290-X ●Sobti and Pachauri (2009) Essential of Biotechnology, Ane Books Pvt. Ltd.

ISBN-81-8052-160-5   
**Chemistry:**   
●Organic Chemistry, Volume-1,2, I.L.Finar, 6 th Edn., 2002, , Pearson

●Organic Chemistry, Seventh Edition, By R.T.Morrison, R.N.Boyd, S.K. Bhattacharjee 2010, Pearson   
●Advance Organic Chemistry, Arun Bahl and B S Bahl, 2012, S.Chand   
●Organic Chemistry, W.H. Perkin and F. S. Kipping, 2012, Nabu Press   
**Environmental Science:**   
●P. D. Sharma (Rastogi Publications, New Delhi), Ecology and Environment. ISBN: 8171338143.

●Keller E.A (2012): Introduction to Environmental Geology, Pearson Publication, USA. ●Sagar Rajendra (2014): Geochemistry and Environmental Geology, Anmol Publications Pvt. Ltd., New Delhi.

●Francois Ramade 1984. Ecology of Natural Resources. John Wiley & Sons Ltd ISBN-13: 978- 0471906254.

**Microbiology:**   
●Brock, T. D., Madigan, M. T., Martinko, J. M., & Parker, J. (2014). Brock biology of microorganisms.14th edi., Upper Saddle River (NJ): Prentice-Hall.

● M. K.Cowan and H. Smith. (2018). Microbiology: Systems Approach, 5th edi., McGraw-Hill Publishing Company

**Sarvajanik University**   
**Faculty of Science**   
B.Sc. (Hons)

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| --- | --- |
| Faculty: Science | Department: All |
| Program: B.Sc. (Hons) | Type: Major |
| Subject: Foundation Laboratory in Applied Sciences-1 | Credits: 4 |
| Semester: 1 | |
| **Course description:**The objectives of this practical course is to introduce and explain basic skills of Biotechnological, Chemistry, Environmental Science and Microbiology techniques. | |
| **Student Learning Outcome:**  **●** Practical part of the paper will help to understand various laboratories and their fundamental work.  ●It will also help in development of basic preparation & handling skills of glasswares and instruments available in Biotechnology, Chemistry, Environmental Science and Microbiology laboratories. | |

**List of Practicals:**   
 1. Introduction to three Biotechnology laboratories and Instrumentation Room.

2. Introduction to Biosafety and Biohazards.

3. Qualitative analysis of unknown organic compounds containing monofunctional groups (carbohydrates, aryl halides, aromatic hydrocarbons, nitro compounds, amines and amides) and simple bifunctional groups, for e.g. salicylic acid, cinnamic acid, nitrophenols etc.

(Minimum Seven)   
4. Determination of minimum quadrat size by species-area curve method.

5. Determination of porosity, bulk density, water holding capacity and field capacity of soil.

6. Study of bright field microscope   
7. Examination of Hay infusion by wet mount technique

**Sarvajanik University**   
**Faculty of Science**   
B.Sc. (Hons)

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| **Faculty:** Science | **Department:** All |
| **Program:** B. Sc. (Hons) | **Type:** Skill Enhancement Course |
| **Subject:** Arogya Mitra | **Credits:** 3 |
| **Semester:** 1 | |

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| Unit 1: Overview of ABPMJAY  Unit 2: Daily Operation Process  Unit 3: Software and Systems: BIS, TMS, Support Unit 4: Hardware | (08 hours)  (08 hours)  (07 hours)  (07 hours) |

**Training:**   
45 Hours training as Arogya Mitra   
**Reference:**   
Participant’s Handbook by Healthcare Sector Skill Council

Skill Enhancement Course: Soap and Detergent Making

|  |  |
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| **Faculty:** Science | **Title:** Soap and Detergent Making |
| **Program:** B.Sc. (Hons) | **Total Credit: 3** |
| **Semester:** 1 | **Type:** Skill Enhancement Course |

**1.Student Learning Outcomes (SLOs):**   
 ●Skill development for detergent cake and liquid soap, shampoo, handwash making.

●Knowledge of basic concepts and techniques of soap and detergent industry. ●Understanding of oil, fat and their sources in India.

**2.References and Textbooks:**   
 ●Ajay Kr. Gupta, Handbook on Soaps, Detergents & Acid Slurry , 3rd revised edition; NIIR Board publication. ISBN: 9789381039472   
 ●P. K. Chattopadhyay, Modern Technology of Soaps, Detergents & Toiletries (with Formulae & Project Profiles) 4th Revised Edition, NIIR Board publication; ISBN: 9789381039700   
 ●H. Panda, Herbal Soaps & Detergents Handbook, NIIR Board publication; ISBN: 9789381039007

**Unit-1: Introduction to oil and fats: (6 hours)** 1.1 Classification, structure and sources of oil and fats   
1.2 Natural sources of oils and fats in India

**Unit-2: Soaps: (7 hours)** 2.1 introduction to soaps, synthetic detergents, raw materials and its selection 2.2 principles of soap making and chemistry of soap   
2.3 Boiling, saponification process

**Unit-3: Detergents: (7 hours)** 3.1 Types of detergents, classification of detergents (anionic, cationic, nonionic, amphoterics), biodegradability.

3.2 Inorganic compounds of detergents (builder & other additives, phosphates, silicates, zeolites, etc)

**Unit-4: Synthetic detergents: (10 hours)** 4.1 Organic raw materials for manufacturing of fatty acids, olefins, alkylbenzene, methyl esters, fatty amines, ethylene oxide, propylene oxide sources and manufacture.

4.2 Inorganic raw material for sulphonation viz; sulphuric acid, sulphonic acid, oleum, sulphur trioxide, chlorosulphonic acid.

4.3 Sulphonation of organic raw materials like fatty acids, fatty acids ethoxylates plants and processes.

4.4 Sulphonation of alkylbenzene, olefins & vegetable oils, plants and processes.

**Practicals:**   
 1. Determination of physico-chemical characteristics of oil and fats

1. Moisture content

2. Acid value

3. Iodine value

4. Saponification reaction and Saponification value

2. Manufacture of liquid soap (shampoo) and laundry soap.

3. Project Work: Industrial training for one month duration.

**Sarvajanik University**   
**Faculty of Science**   
B.Sc. (Hons)

|  |  |
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| **Faculty:** Science | **Department:** All |
| **Program:** B. Sc. (Hons) | **Type:** Ability Enhancement Course |
| **Subject:** MIL Gujarati-1 | **Credits:** 2 |
| **Semester:** 1 | |

Unit 1: �ુજરાતી સા�હ�   
● �ુજરાતી સા�હ�નો ઇ�તહાસ   
● �ુજરાતી સા�હ�ના ન�ધપા� લેખકો અને કિવઓનો પ�રચય

Unit 2: �ુજરાતી �યાકરણ  
● �ઢ��યોગોના અથ� અને તેનો વા��યોગ   
● કહ�વતોનો અથ�   
● સમાસનો િવ�હ કર� તેની ઓળખ   
● છંદ ઓળખાવો   
● અલંકાર ઓળખાવો

Unit 3: �ુજરાતી �યાકરણ  
● શ�સ�ૂહ માટ� એક શ�   
● �ડણી �ુ��   
● લેખન �ુ�� / ભાષા �ુ��   
● સં�ધ �ડો ક� છોડો   
● વા�રચનાના અંગો / વા�ના �કાર / વા� પ�રવત�ન

Unit 4: સં�ેપીકરણ અને સમી�ા  
● ગ�ખંડમ�થી આશર� ૧/૩ ભાગમ� સં�ેપ   
● ગ�ખંડના આધાર� �ૂછેલા ��ોના જવાબ

**Sarvajanik University**   
**Faculty of Science**   
B.Sc. (Hons)

**Sarvajanik University**

**Faculty of Science**

B.Sc. (Hons)

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| Faculty: Science | Department: All |
| Program: B.Sc. (Hons) | Type: Value Added Course (VAC) |
| Subject: Indian Knowledge System (Foundation) | Credits: 2 |
| Semester: 1 | |

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| Unit 1: Foundational Literature of Indian Civilisation | (08 hours) |

●The Vedic Corpus   
●Caturdaśa vidyāsthāna-s: 14 branches of learning in ancient India- purāṇa, nyāya, mīmāṁsā, dharmaśāstra, six vedānga-s: (śikṣā, vyākaraṇa, nirukta, chanda, jyotiṣa, kalpa) and four Veda-s- rgveda, yajurveda, sāmaveda and atharvaveda; introductory information on them  
●Upaveda-s and Upaniṣads: introductory information on them  
●śāstra-s and some introductory information on them  
●18 purāṇa-s: Their names and five general characteristics   
●The Itihasas: Ramayana and Mahabharata (Learnings from them in brief)

Unit 2: Indian Philosophical System (07 hours)

●Four Purusartha: Dharma, artha, kama and moksha (Definitions and Meaning) ●Astika and Nastika Darshan   
●Tarkashastra   
●Hetu-lakṣaṇa and hetvabhāsa lakṣaṇa (Cause and Fallacies)   
●Paṃca adhikaraṇa System-viṣaya, saṃśaya, pūrvapakṣa, uttarapakṣa and saṃgati ●The purpose of knowledge: Para Vidya and Apara Vidya

Unit 3: Indian Mathematics and Astronomy (08 hours)

●Important texts on Indian Mathematics   
●Development of numbers, fractions, decimals, algebra, trigonometry and calculus ●Further continuity of Indian Mathematics: Kerala school and Ramanujan, their influence ●Important texts on Indian Astronomy   
●Observations and records on the movement of celestial bodies, equinoxes, solctices, eclipses   
●Planetary model of Aryabhata and its revision by Nilkantha   
●Further continuity of Indian astronomy by Jaisingh, Sankaravarman, Chandrasekhara Samanta.

**Sarvajanik University**

**Faculty of Science**

B.Sc. (Hons)

Unit 4: Indian Sciences (07 hours)

●Important Texts of Ayurveda   
●Basic concepts of Ayurveda   
●Surgical practices, inoculation, current revival of Ayurveda and Yoga   
●Indian agriculture as mentioned by the Greek historians and later travelers   
●The Ery system of south India   
●Indian attitude towards agriculture based on Walker   
●Indian texts which refer to metallurgy   
●Mining and manufacture in India of Zinc, Iron, Copper, Gold, etc., from ancient times

References:

1.Sivananda S. All about hinduism. Sivananda literature research institute; 1988.

2.Dharampal G. Essential Writings of Dharampal. Publications Division Ministry of Information & Broadcasting; 2017 Nov 3.

3.Bajaj J, Śrīnivāsa MD. Sanatana Bharat, jagrita Bharat= Timeless India, resurgent India: a celebration of the land and people of India. (No Title).