



Pune District Education Association's
Annasaheb Magar Mahavidyalaya
Hadapsar, Pune- 411028

Affiliated to Savitribai Phule Pune University, Pune



Self Study Report: 2024 (4th Cycle)



Criterion – 3 **Research, Innovation and Extension**

Key Indicator 3.3- Research Publication and Awards

Metric: 3.3.2 (QnM)

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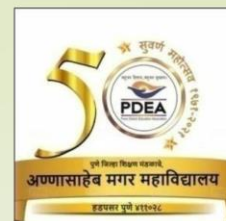
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(Academic Year-2021)

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1. Title: Income tax

Author: Dr. Ghorpade N. L.

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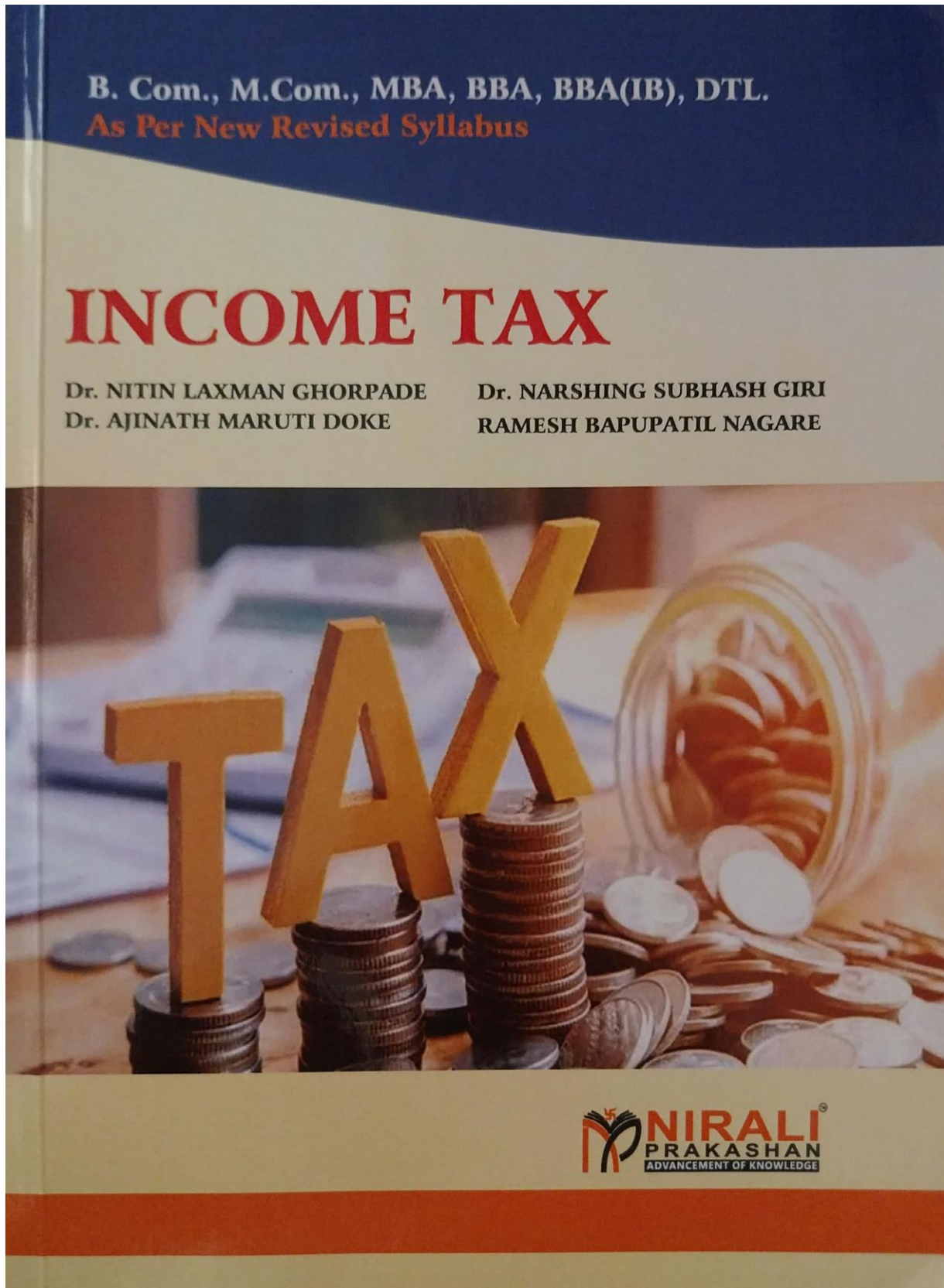
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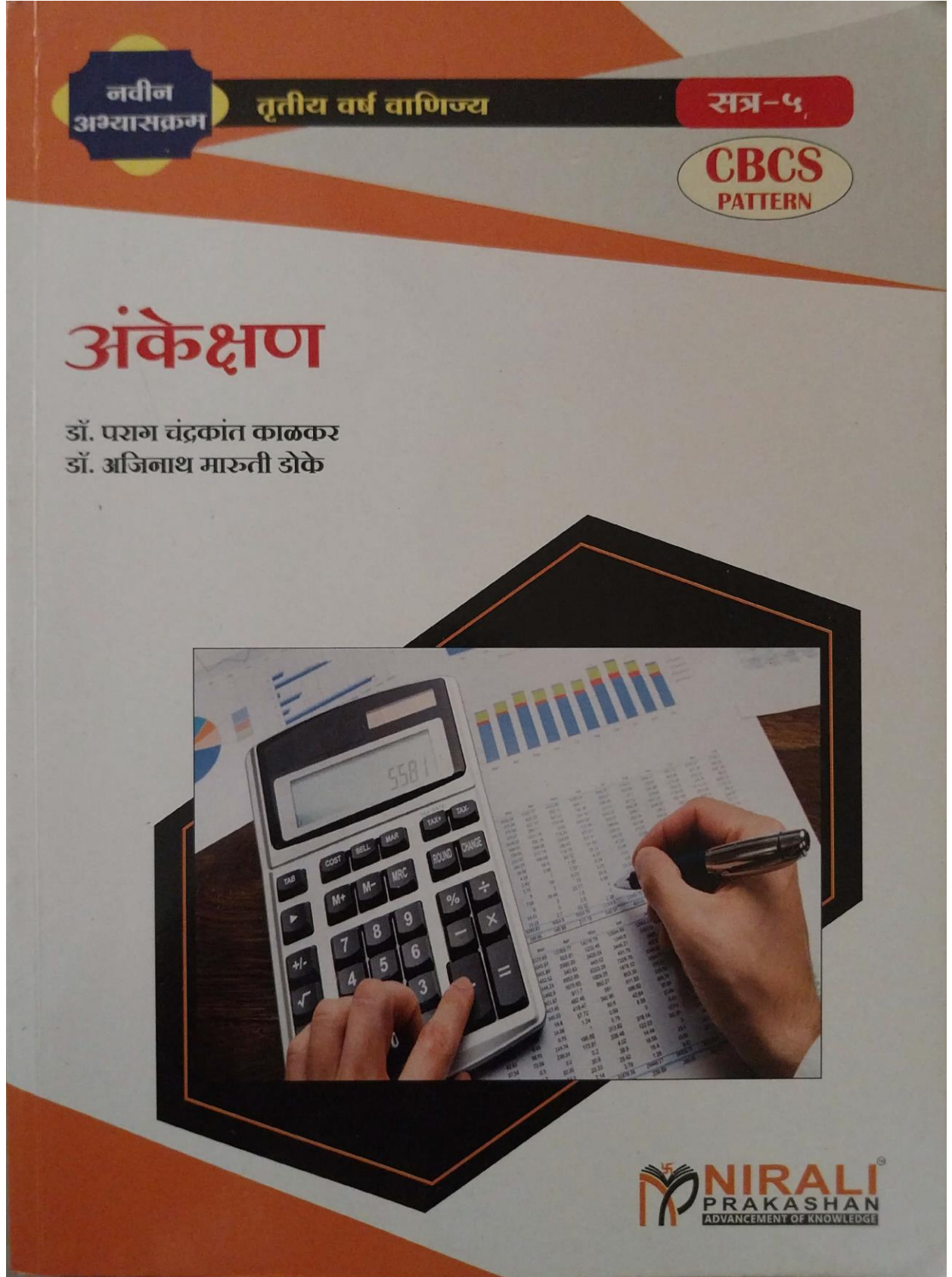
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3. Title: Ankeshakn

Author: Dr. Doke A. M.



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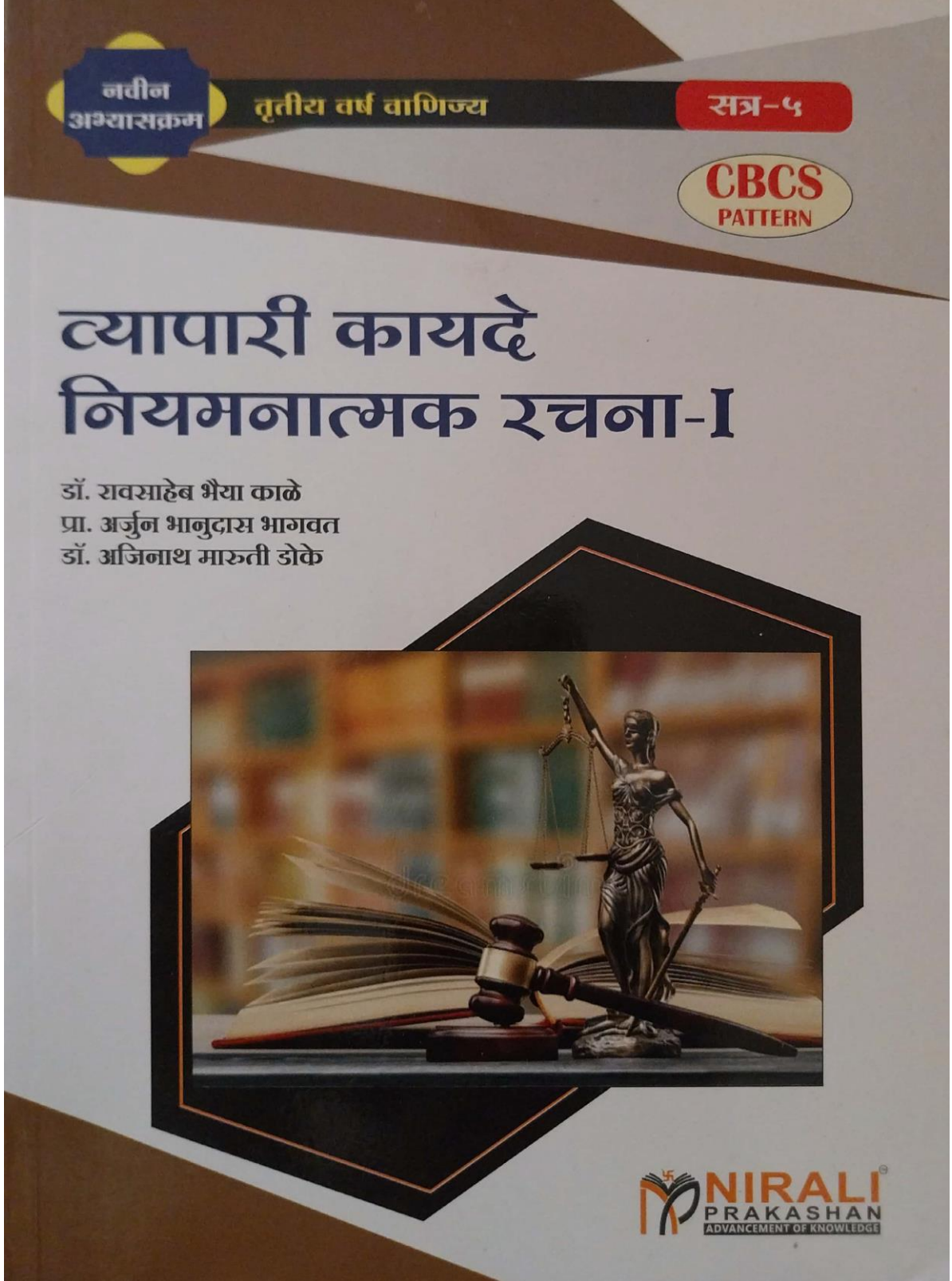
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Author: Dr. Doke A. M.



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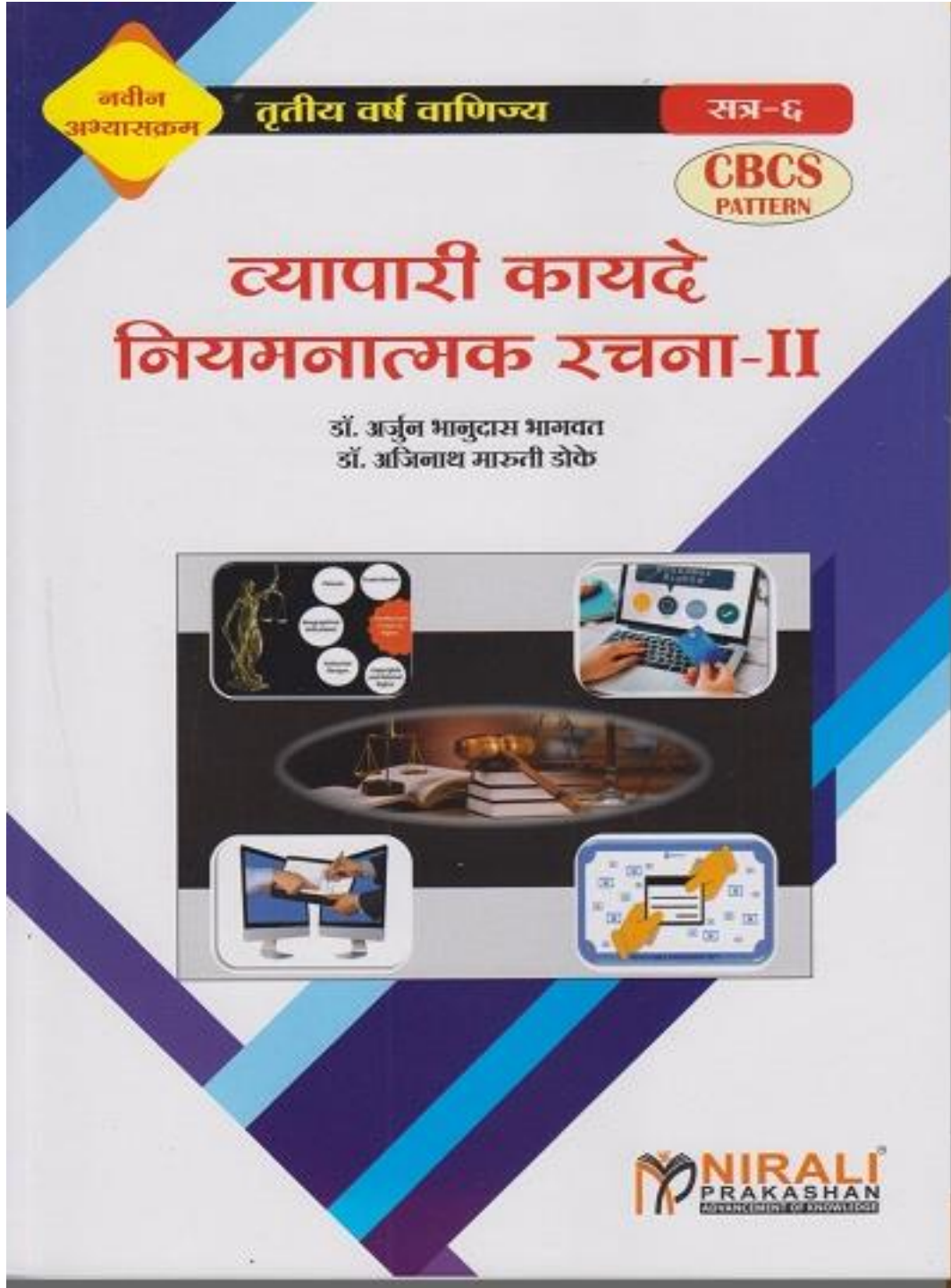
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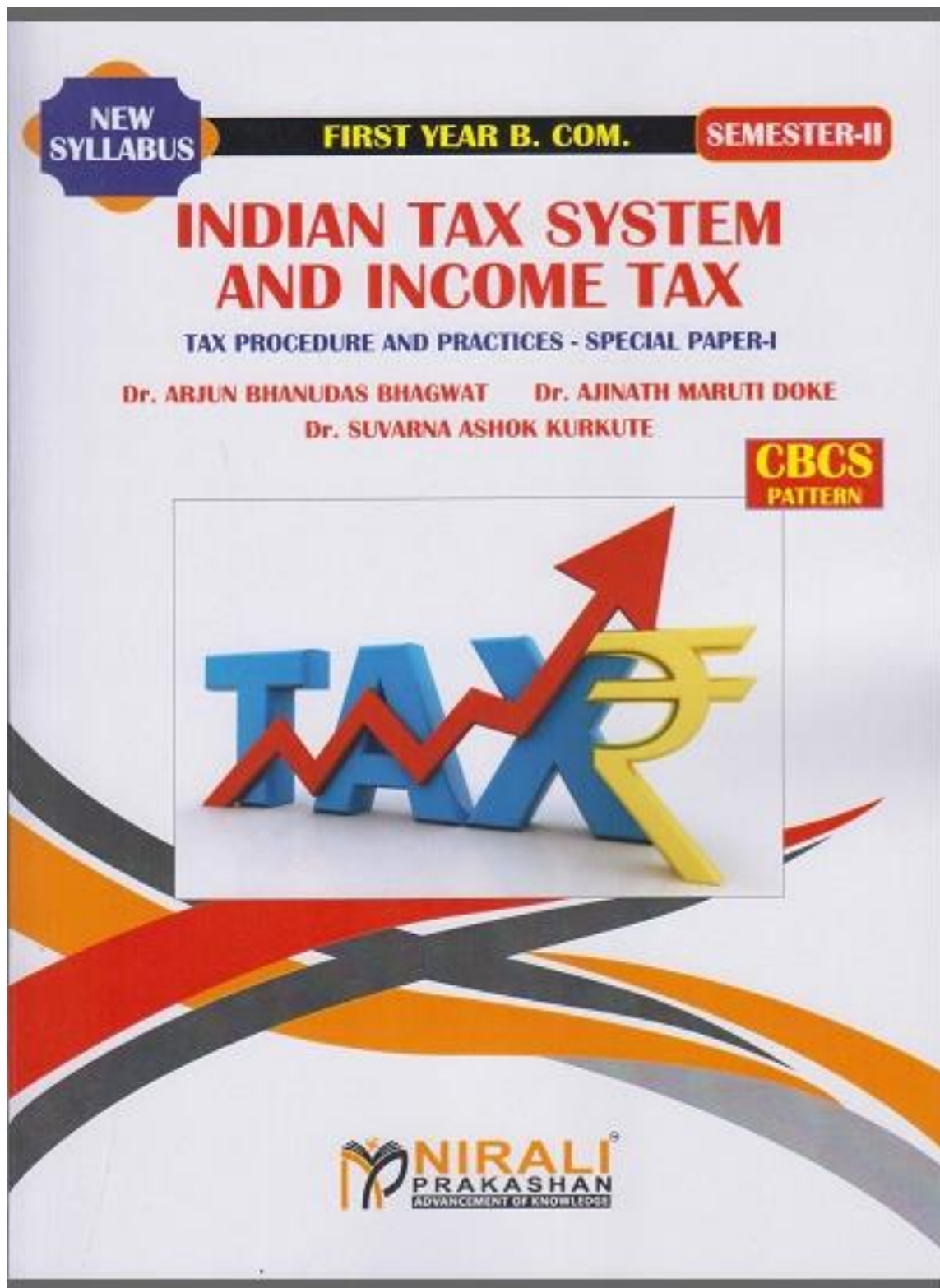
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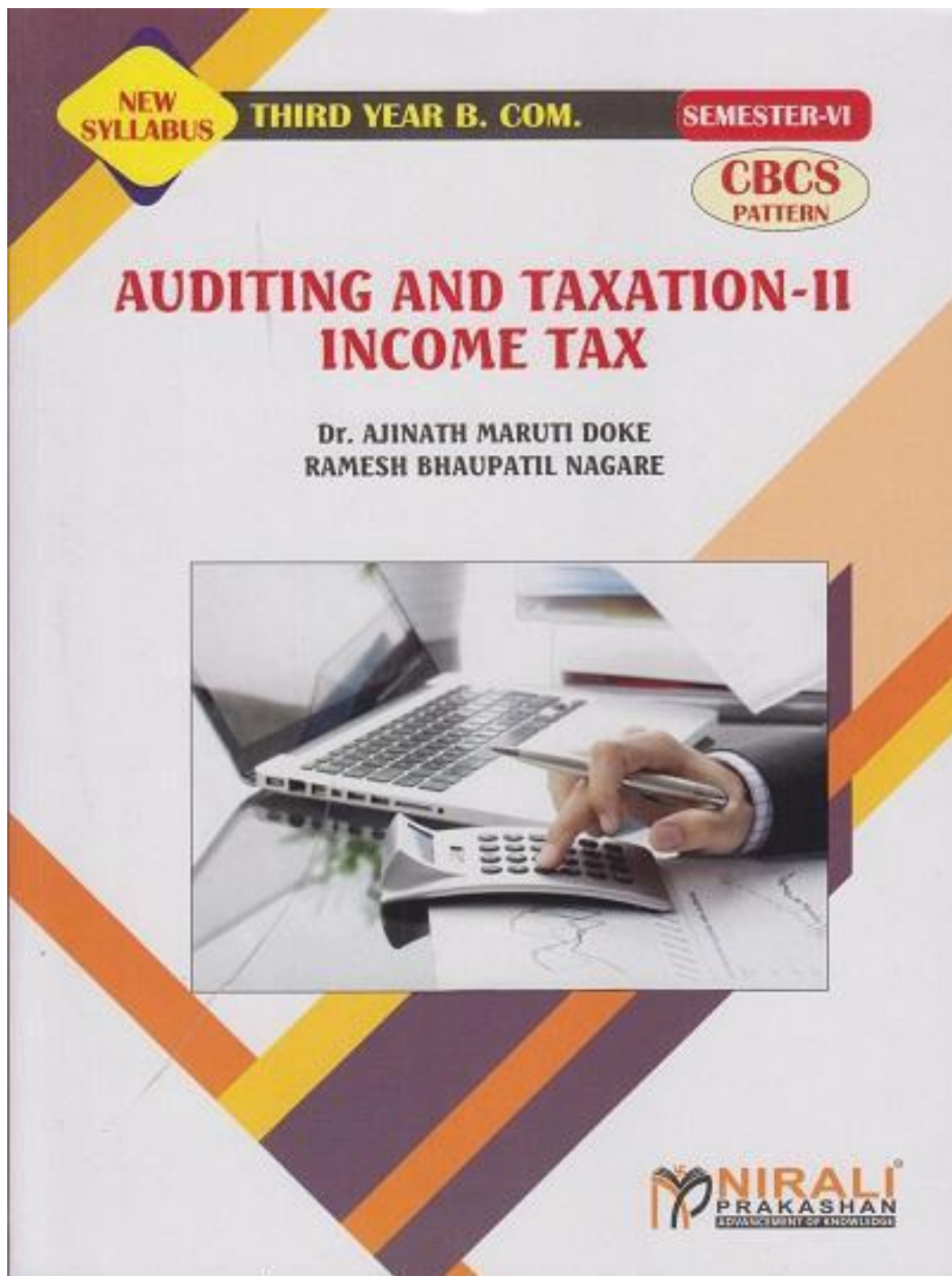


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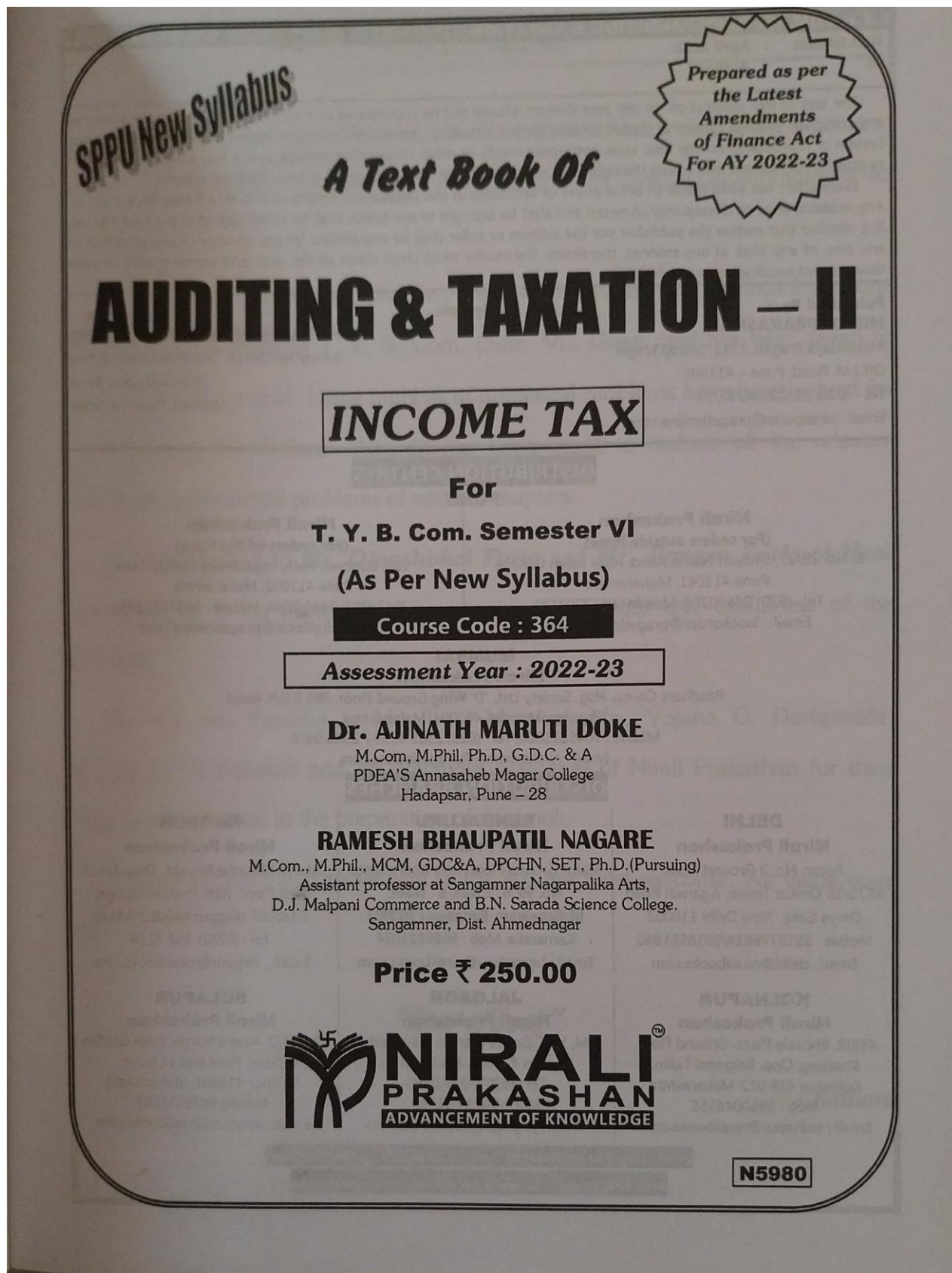
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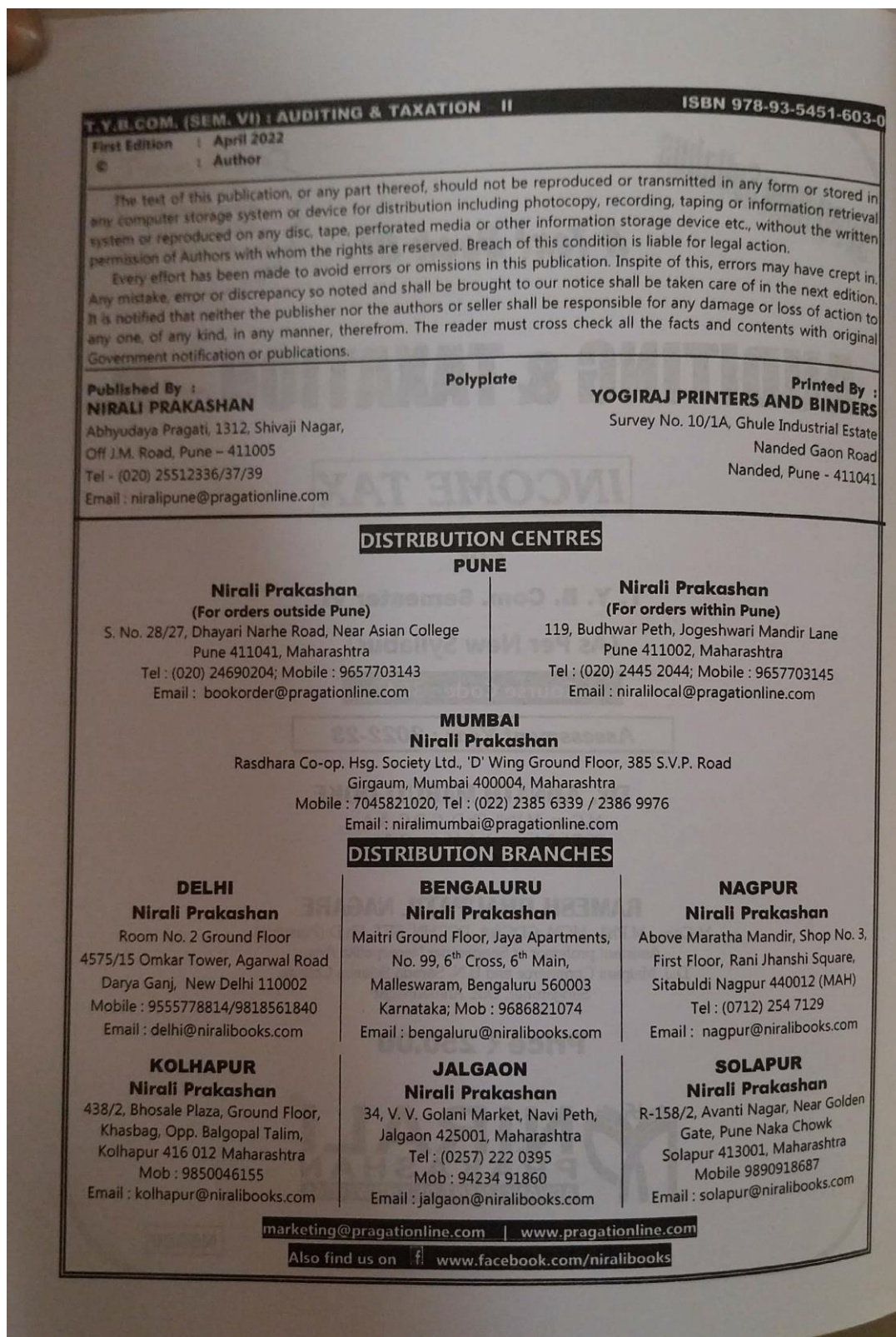
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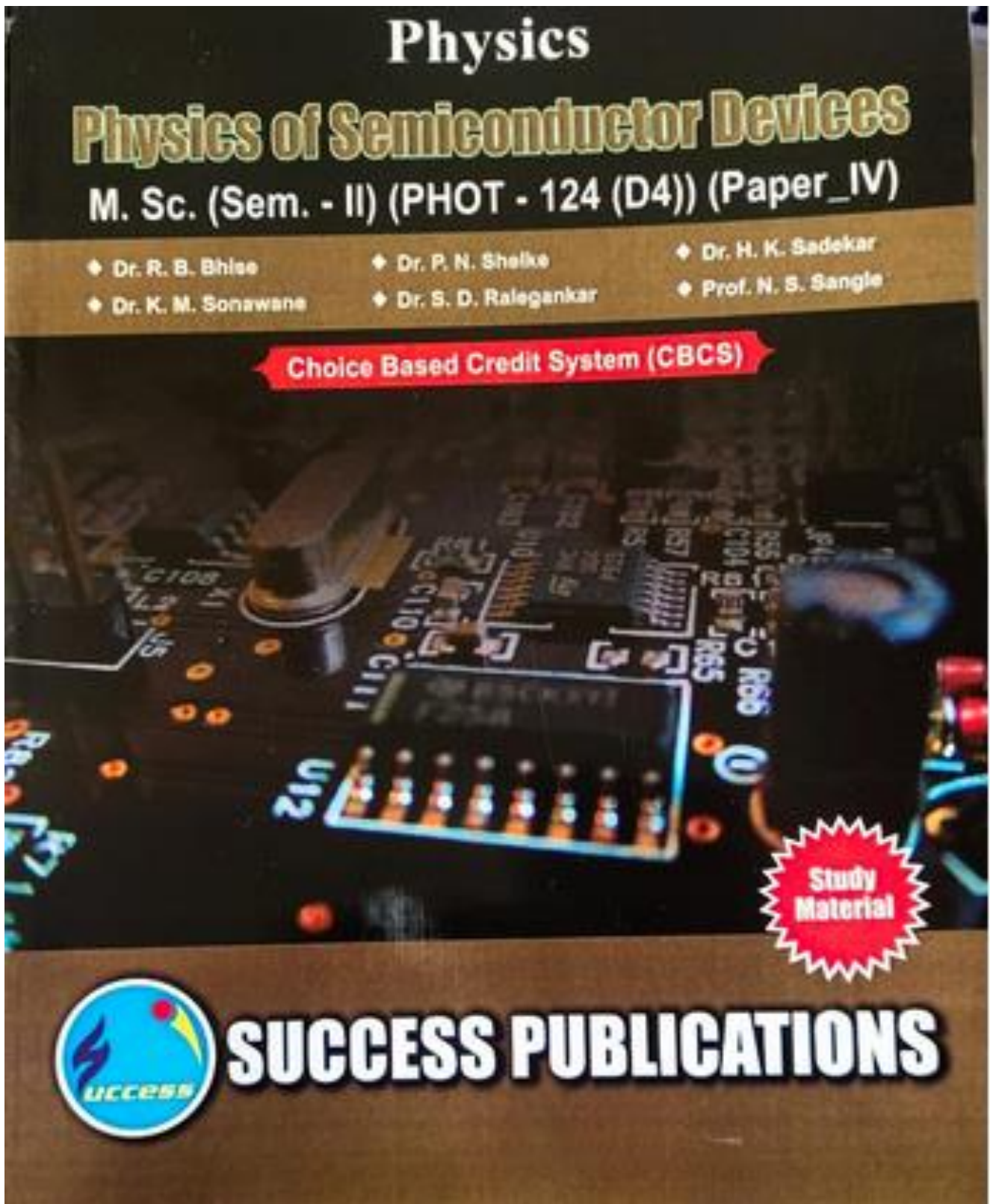
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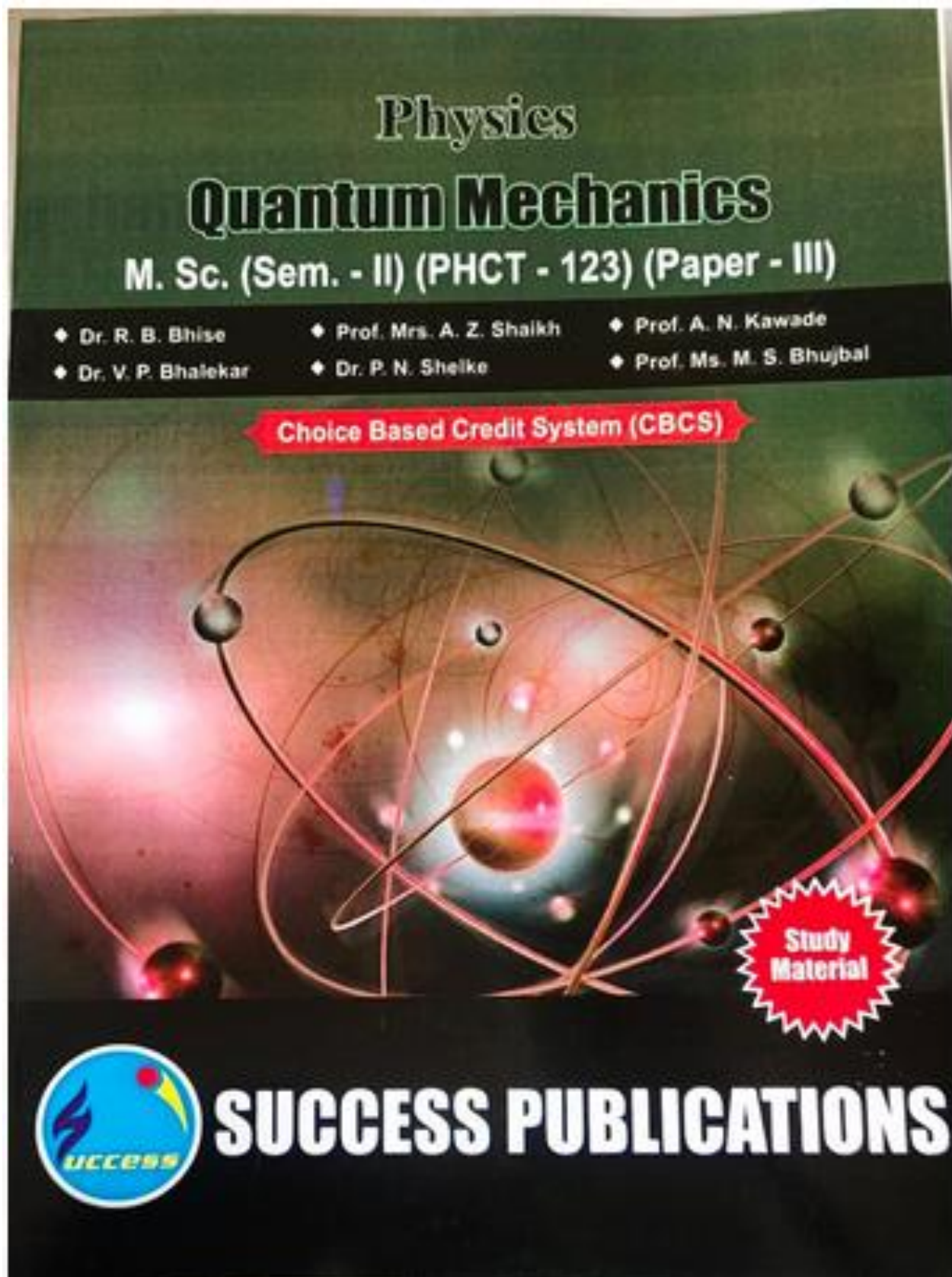
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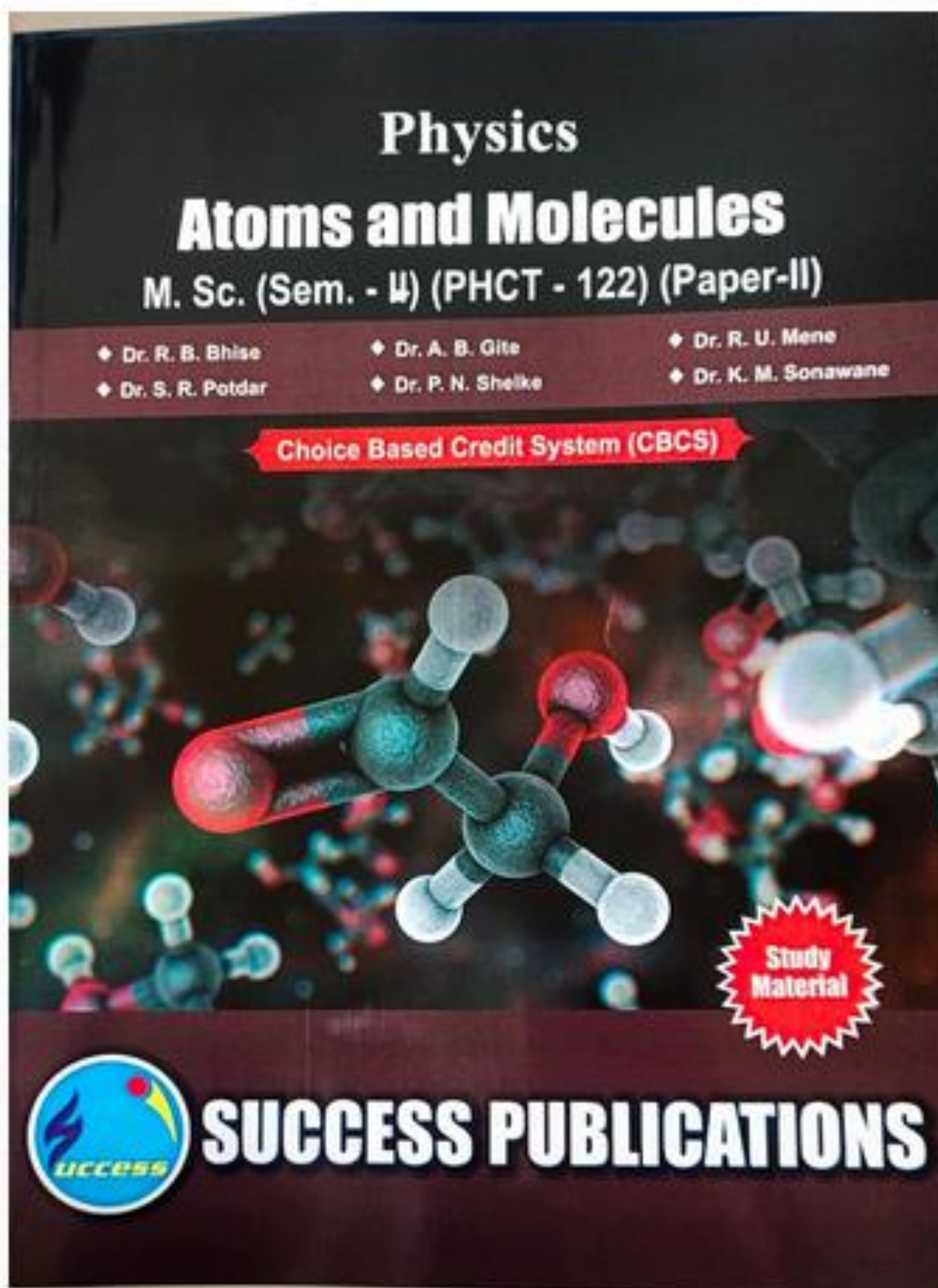


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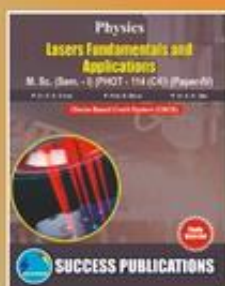
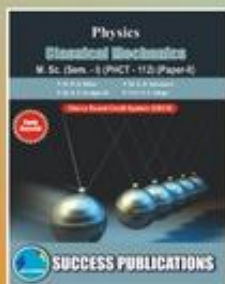
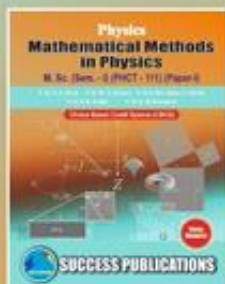


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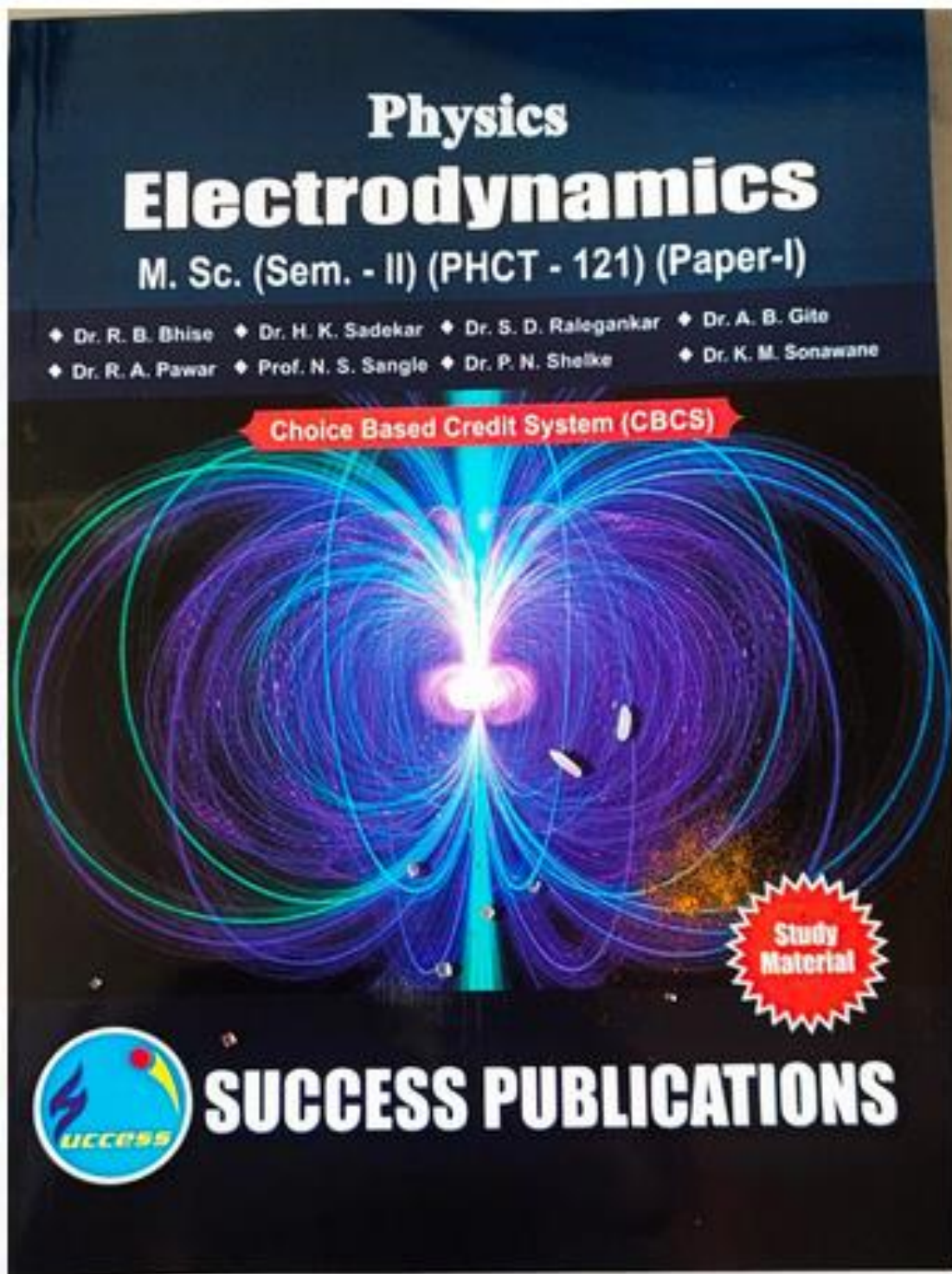
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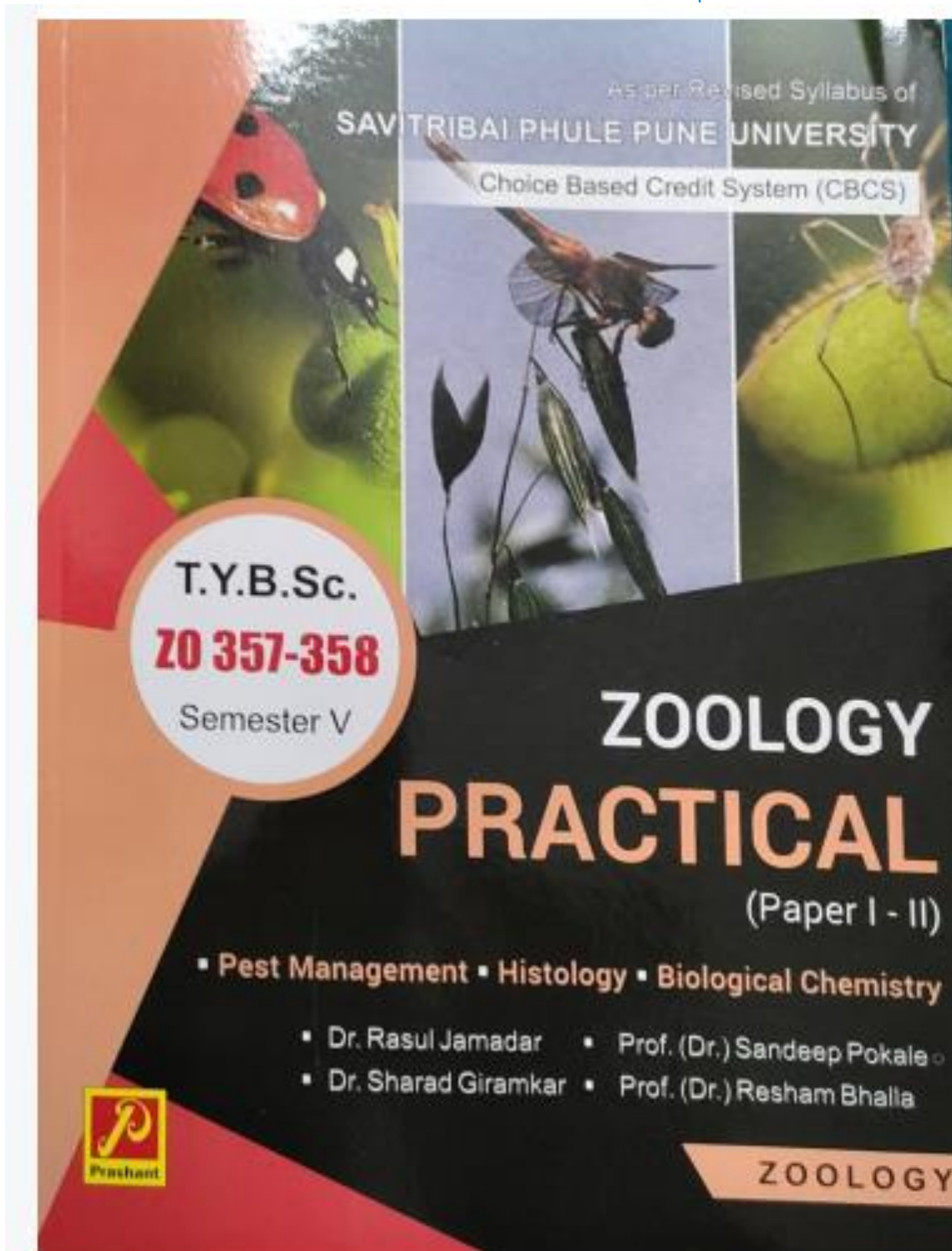
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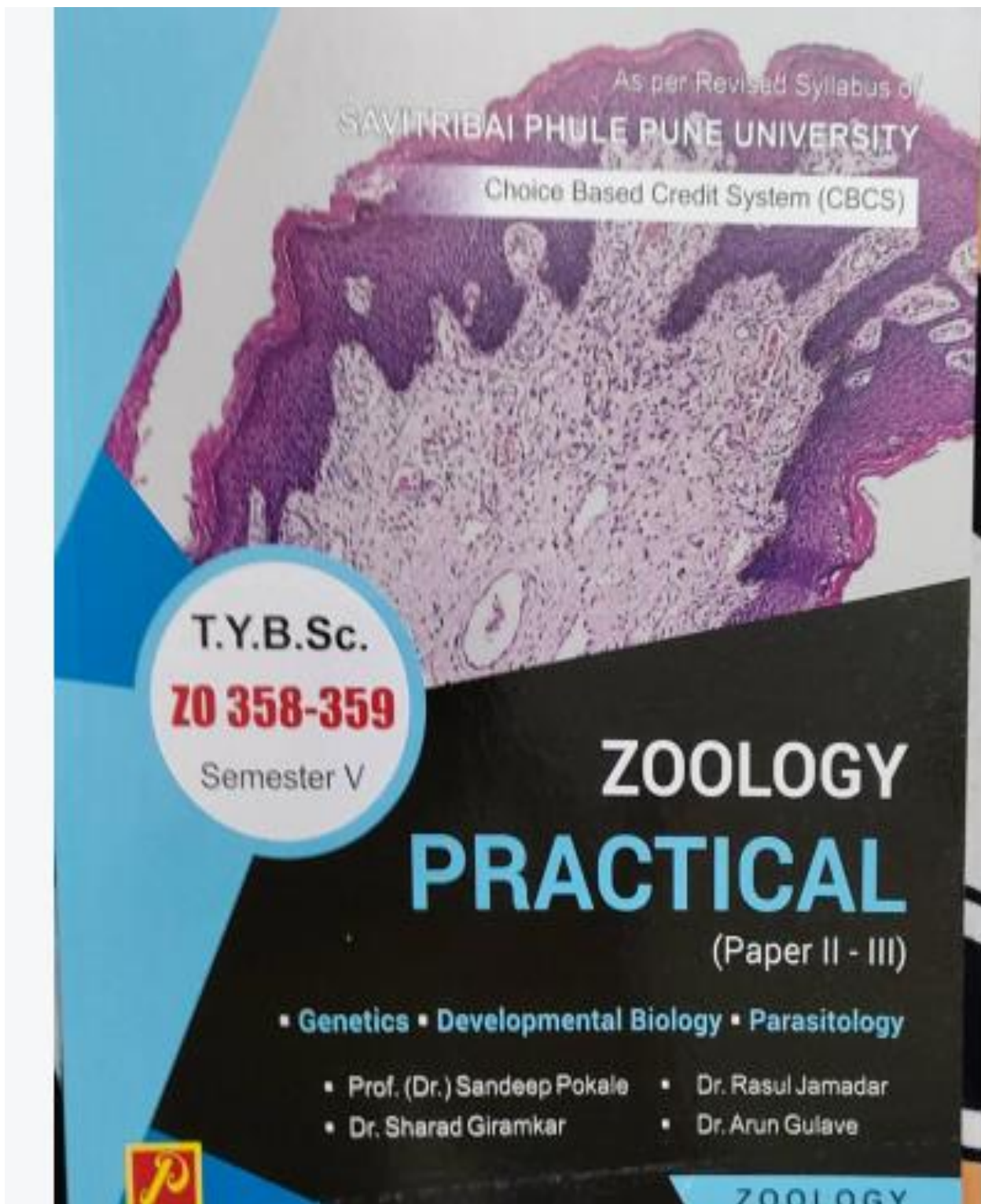


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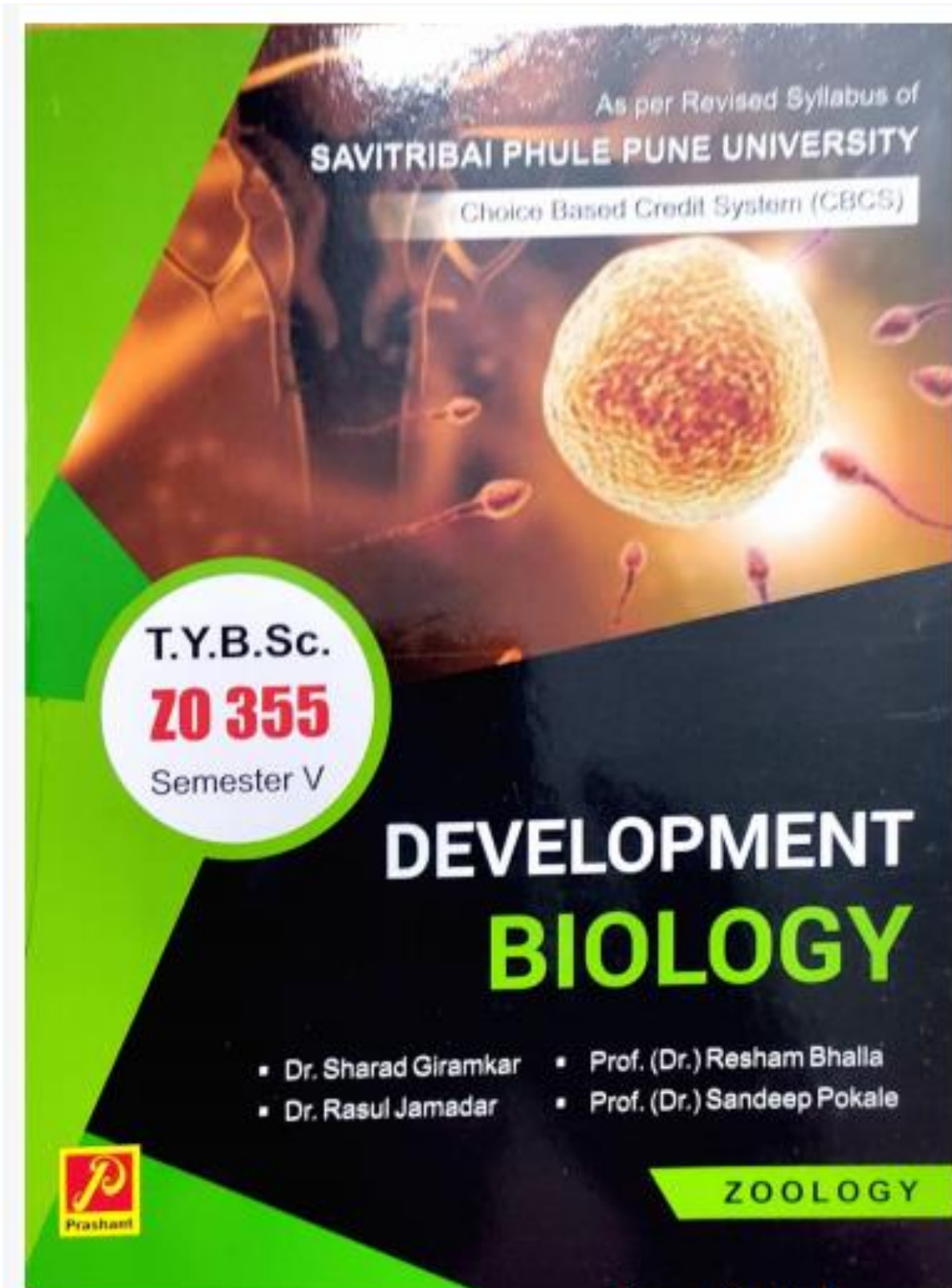


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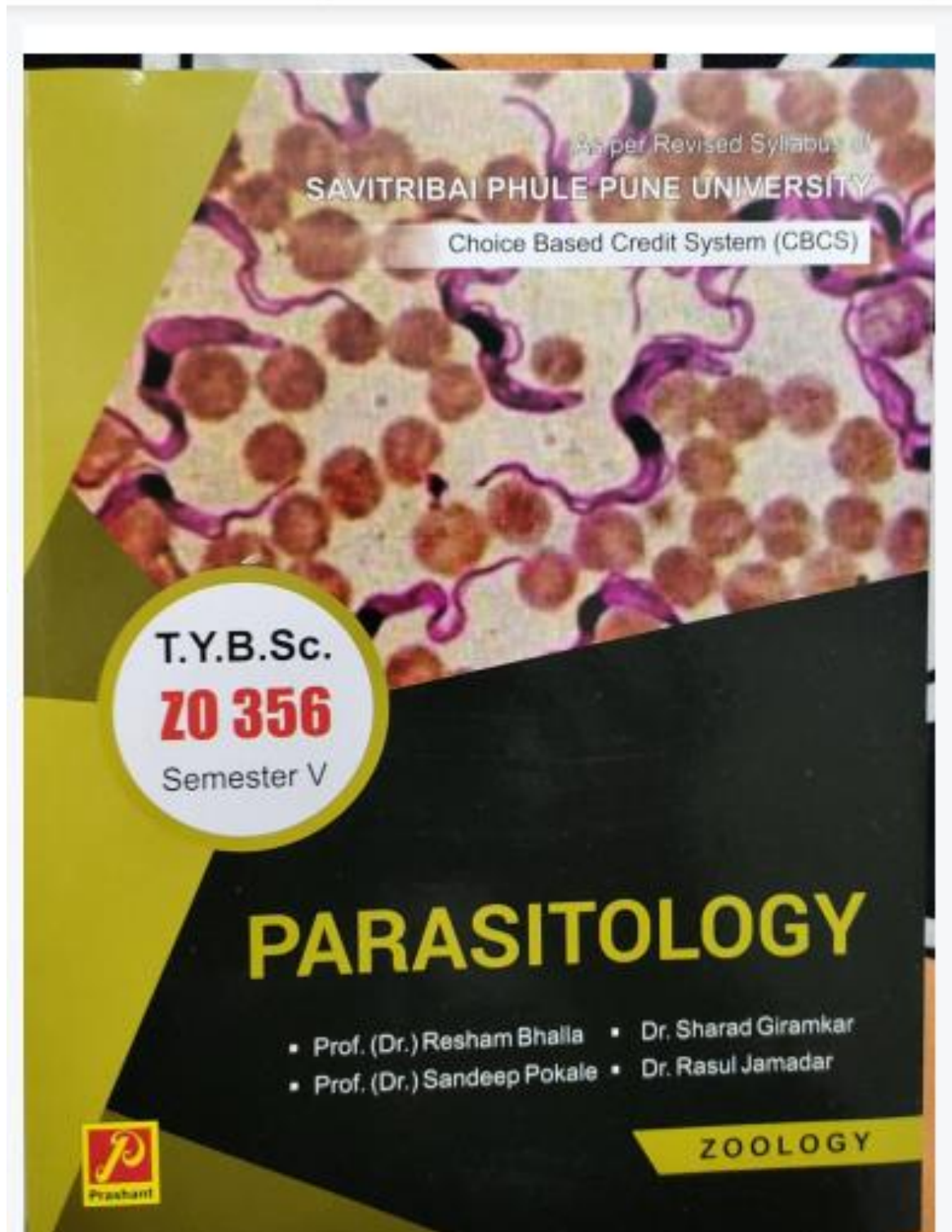
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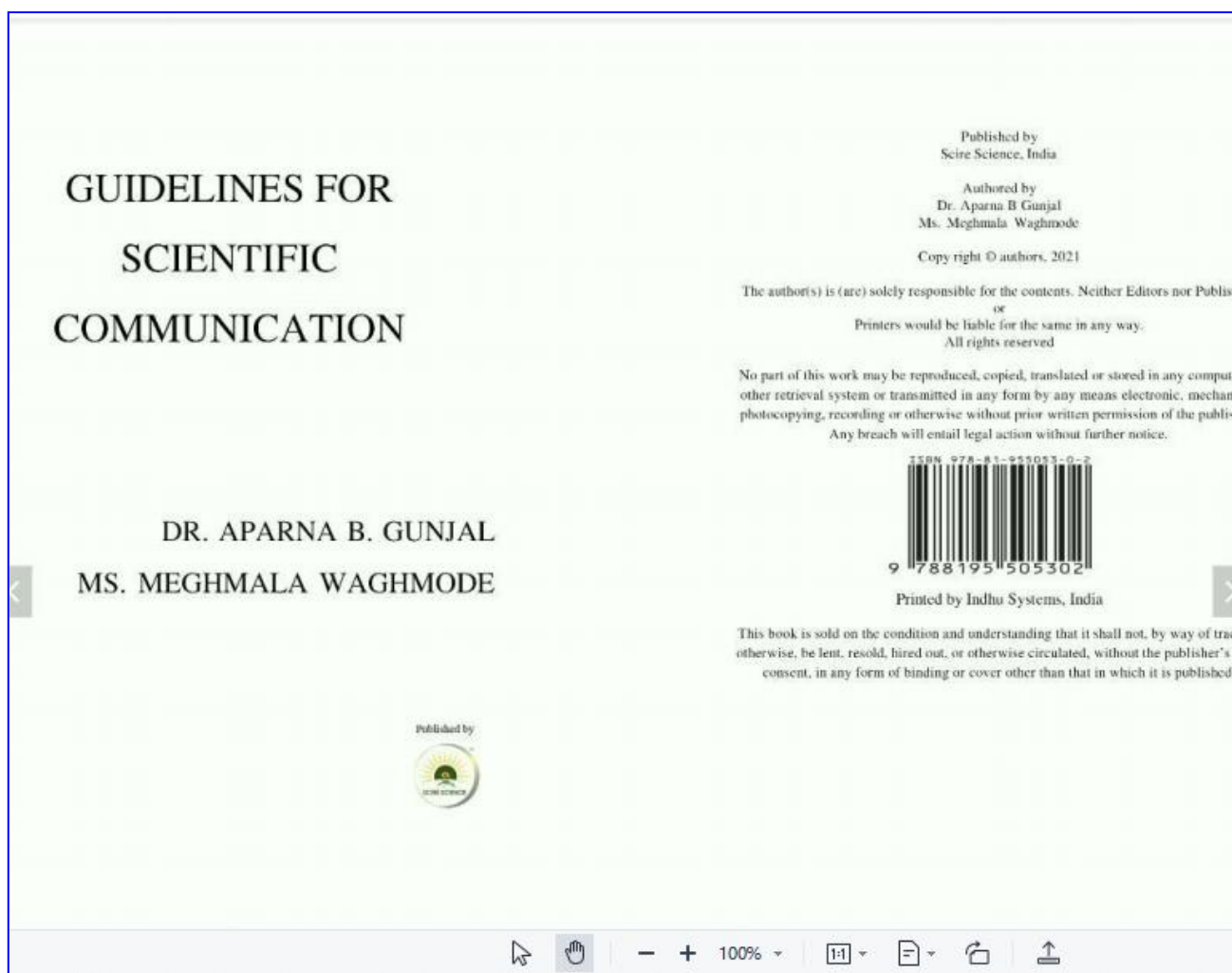
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3. Phytoremediation of Heavy Metals

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Introduction

Heavy metals are generated through various anthropogenic and natural activities. Heavy metals have an atomic number greater than 20 and an elemental density greater than 5 g cm³. Heavy metals include cadmium (Cd), chromium (Cr), mercury (Hg), lead (Pb), arsenic (As), silver (Ag), cobalt (Co), copper (Cu), zinc (Zn), iron (Fe), nickel (Ni), and platinum group elements (Ali et al. 2013; Ali and Khan 2018a, Saxena *et al.*, 2020). Soils contaminated by different heavy metals and waters pose significant environmental and human health problems due to their non-biodegradable nature. Different physicochemical methods like ion exchange, precipitation, reverse osmosis, evaporation and chemical reduction and mechanical methods have been employed for their removal from the environment.

Effect of heavy metals on the environment

Chromium (Cr) is one of the pollutants mentioned as a non-essential element and ranks seventh in abundance in the earth's crust. Cr's major pollution or contamination is by the leather tanning industries, electroplating, and stainless steel industries (Dheri *et al.*, 2007). Chromium pollution showed an impact on

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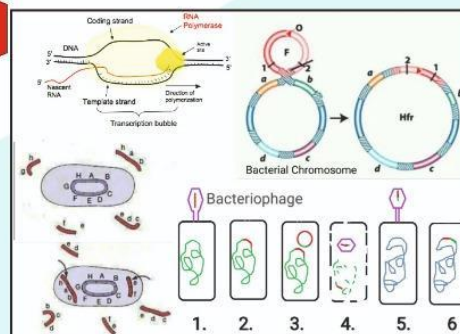
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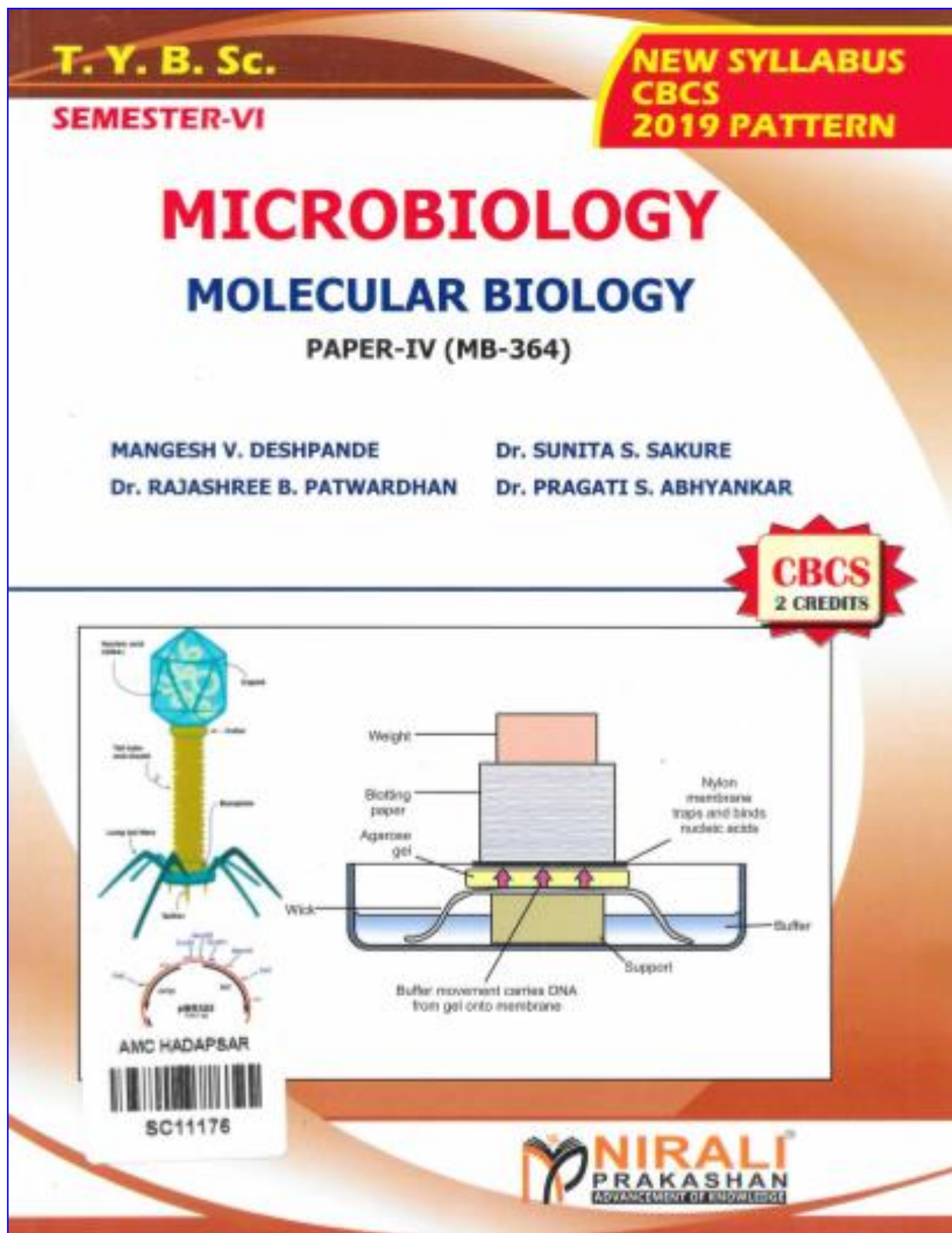


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Composition and Interconnections in Phyllosphere

Meghmala Waghmode¹, Aparna Gunjal², Neha Patil¹, and Sonali Shinde³

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15.1 Introduction

The co-evolution of the microorganisms and their plant hosts has helped to understand many interactions between microorganisms and plants. This has helped to improve the environmental stability. One such interface above-ground surface or aerial habitat in plants affected by microbes is termed as the phyllosphere and its microbial inhabitants as epiphytes and endophytes (Lindow and Brandl 2003).

The members of *Proteobacteria*, *Firmicutes*, and *Actinobacteria* are majorly present in the plants phyllosphere region. Reports are available on the fungal community found in the phyllosphere of oak trees (*Quercus macrocarpa*). The microbial community in the phyllosphere of oak trees include *Devriesia*, *Mycosphaerella*, *Ramularia*, *Stenella*, *Dioszegia*, *Paraphaeosphaeria*, *Phaeosphaeria*, *Sphaceloma*, *Davidiella*, *Microsphaeropsis*, etc. (Jumpponen and Jones 2009).

Plant connects two enormously different universes, above- and below-ground and serves as a channel to flow the energy and nutrient. Phyllosphere microbiota forms the micro-ecosystem where chemical communication and compounds get exchanged between microbial communities that include bacteria, viruses, archaea, and eukaryotic taxa (Christian et al. 2015; Penuelas and Terradas 2014). The phyllosphere microbes colonization arises from propagules dispersed from the air, rain herbivores, and, leaf litter (Beattie and Lindow 1999; Clay et al. 2005). Plant surfaces harbor huge number of beneficial microbes, whereas others act as pathogens, symbionts, and saprobes for host plants (Busby et al. 2016; Mejia et al. 2014). Most studies revolve around the pathogenic microbes, because of severe economic crop loss (Dik et al. 1991). A stronger pathogenic effect denotes negative feedback, indicating lack of co-adaptation, coexistence and, reduced fitness (Mordecai 2011; Rua et al. 2016). Instead, host species which supports defensive response under high parasite pressure leads to good response (Whitaker

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Composition and Interconnections in Phyllosphere Microbiome

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³Annasaheb Kulkarni, Department of Biodiversity, MES Abasaheb Garware College, Pune, Maharashtra, India

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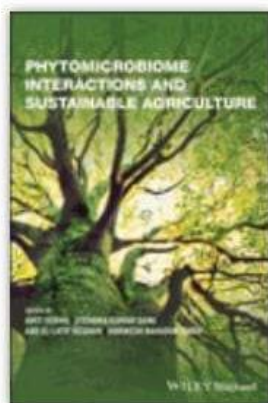
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29. Title: Precipitation assisted hydrothermally derived TiO₂ nanostructured for DSSC application

Author: Dr. Shelke P. N.

Precipitation Assisted-Hydrothermally Derived TiO₂ Nanostructures for DSSC application

P. N. Wani^{1, 2}, P. R. Yawale³, P. N. Shelke⁴, Vidhika Sharma⁵, Y. B. Khollam^{6, a)}
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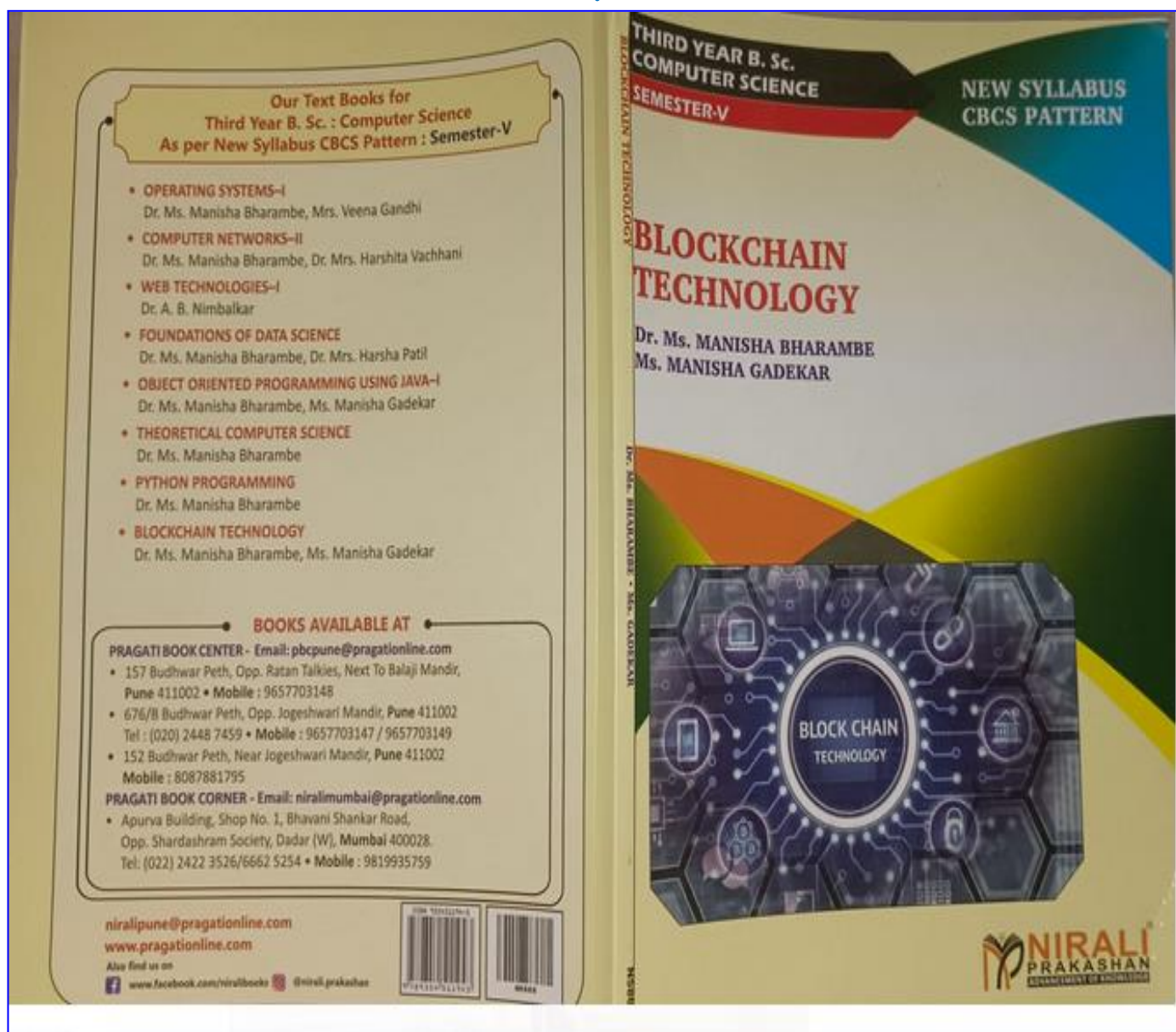
Abstract. Herein, dye sensitized solar cell (DSSC) application of precipitation assisted-hydrothermally derived TiO₂ nanostructures is realized through extensive analysis. The TiO₂ nanostructures are derived by precipitation reaction of titanium tetra-isopropoxide (TTIP) followed by annealing of resultant precipitate at 300°C and then hydrothermal reaction of as-annealed precipitate in alkaline media at 120, 130, 140 and 150 °C for 24 hr. The resultant nano-structured powders are examined by XRD, UV-Visible spectroscopy and FESEM. The material characterization of as-derived nanostructured powders revealed the crystallization of phase pure TiO₂ nanostructures like nanoparticles (NPs), nanochains (NCs) and nanotubes (NTs) with anatase symmetry. The N719 sensitized solar cells are fabricated by using photoanodes prepared with as-derived TiO₂ nano-structured powders and electrolyte solution (0.05 M iodine, 0.5 M LiI, and 0.5 M 4-tertbutylpyridine in 3-methoxypropionitrile). The DSSC characteristics are obtained by using solar simulator under illumination of as-fabricated cells with light of AM 1.5 (100 mWcm⁻²) intensity. The photoconversion efficiency is found to be increasing from 1.10 to 3.06 % by changing the morphological features from nanoparticles (NPs) to nanotubes (NTs). The profound effect of change in morphology of TiO₂ based photoanode on photoconversion efficiency is found.

INTRODUCTION

The search of new alternative potential materials for effecting the needs of energy is due to the present and future huge demand of energy. During last two decades, dye sensitized solar cell (DSSC) is noted to be potential candidate for fulfilling the energy demand due to its low-cost, nontoxicity, high flexibility, effectiveness even on flexible sheets, semi-transparency, simple manufacturing process, environment-friendly fabrication as compared to hetero-junction photovoltaic cells^{1, 2}. The DSSC assembly consists of metal oxide semiconductor as photoanode, dye as photosensitizers, electrolyte as redox couple and counter electrode. Different semiconductor oxides like ZnO, CdO, SnO₂, TiO₂, CeO₂, In₂O₃, TiO₂, ZnO, WO₃, Fe₂O₃, Nb₂O₅, Ta₂O₅ are used as promising photoanode material in DSSC assembly²⁻⁴. Due to unique photovoltaic-photochemical properties, better chemical stability and high and requisite position in conduction band edge, nanocrystalline TiO₂ is observed to be the most possible photoanode for DSSC application. Different physico-chemical routes are reported for the synthesis of the nanocrystalline TiO₂ powders^{5, 10}. However, conventional hydrothermal is demonstrated as simple, easy in operation, cost effective and low temperature processing technique for the synthesis of materials. It is very useful processing technique for the

30. Title: Block chain technology

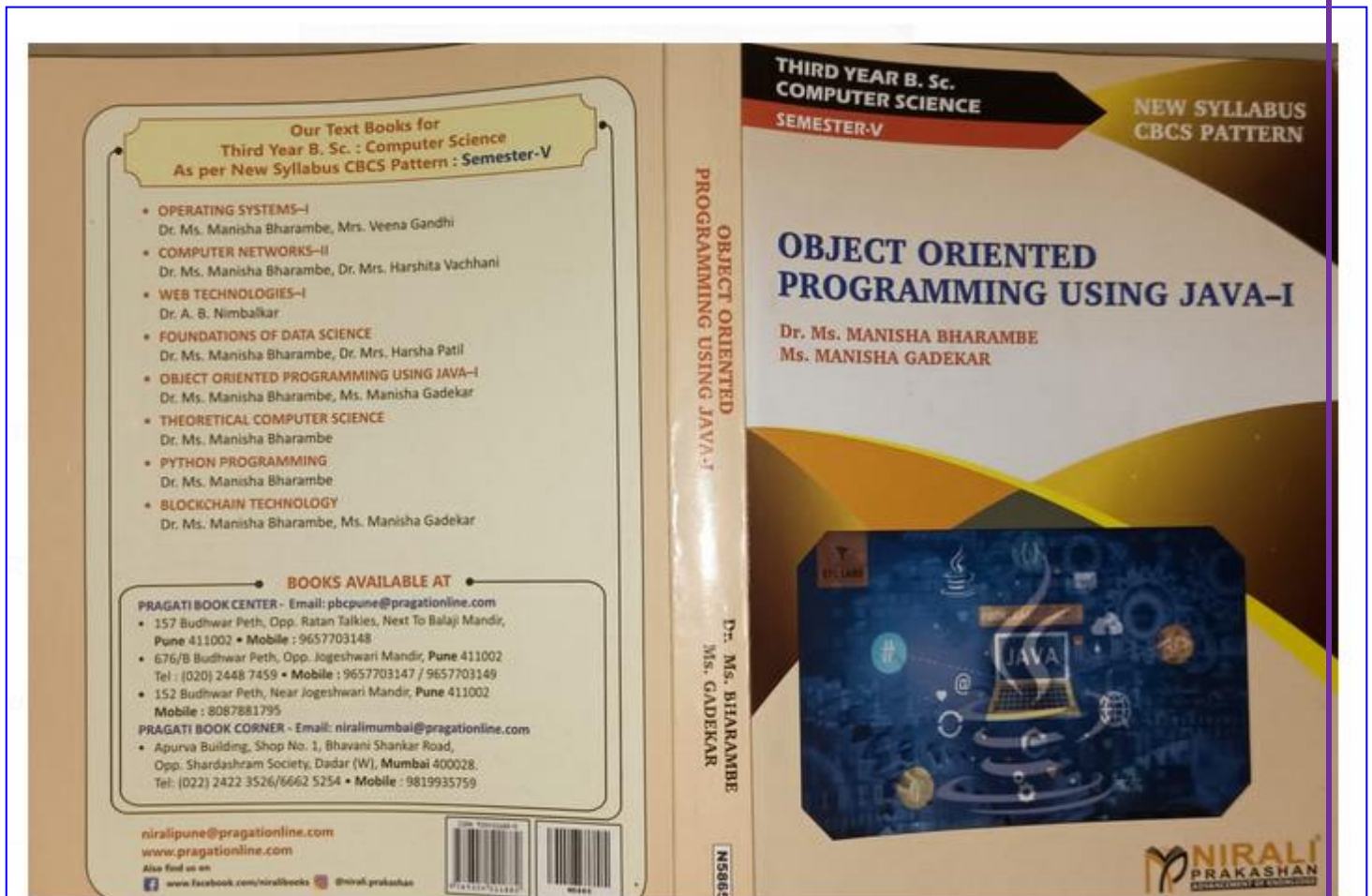
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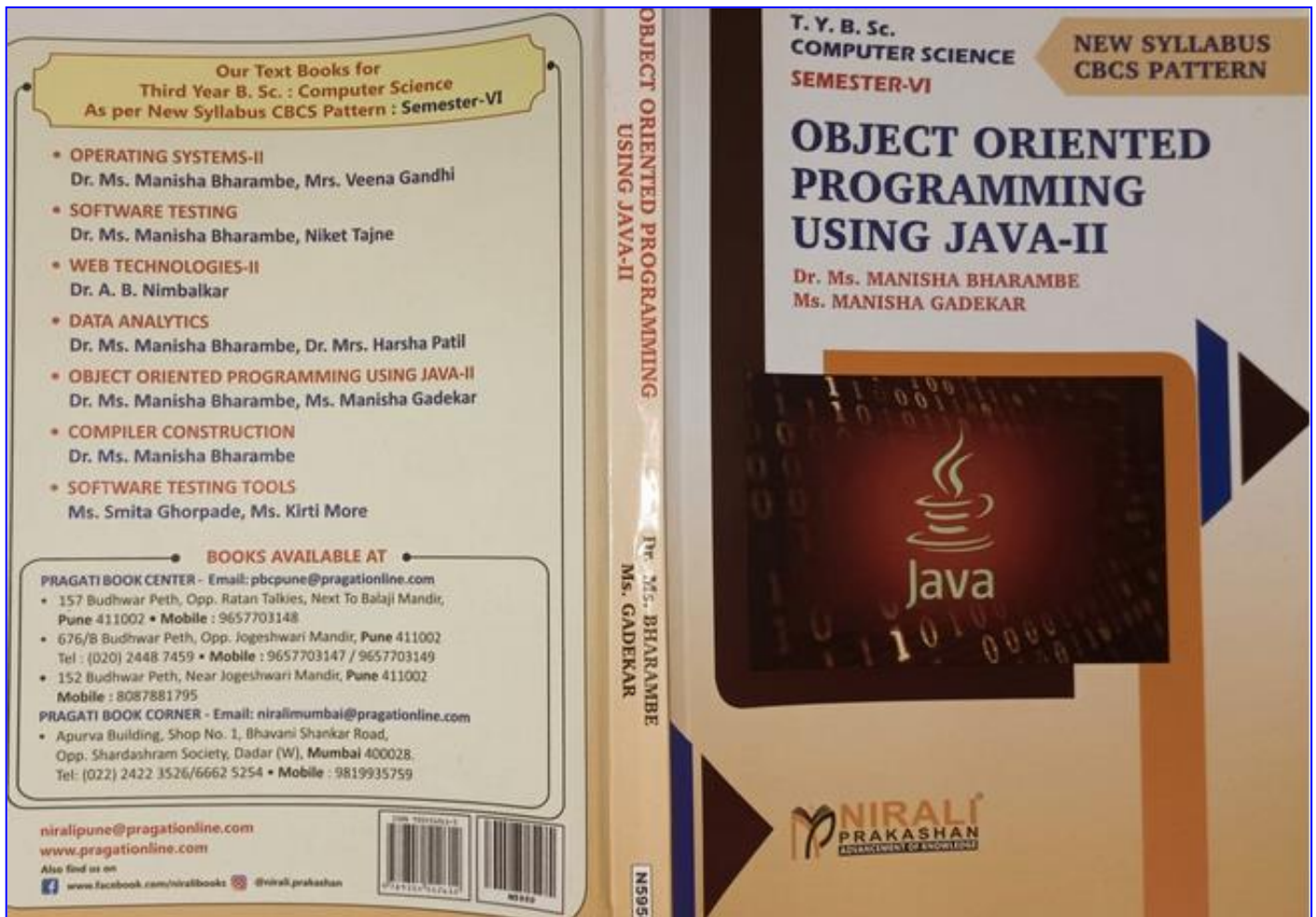
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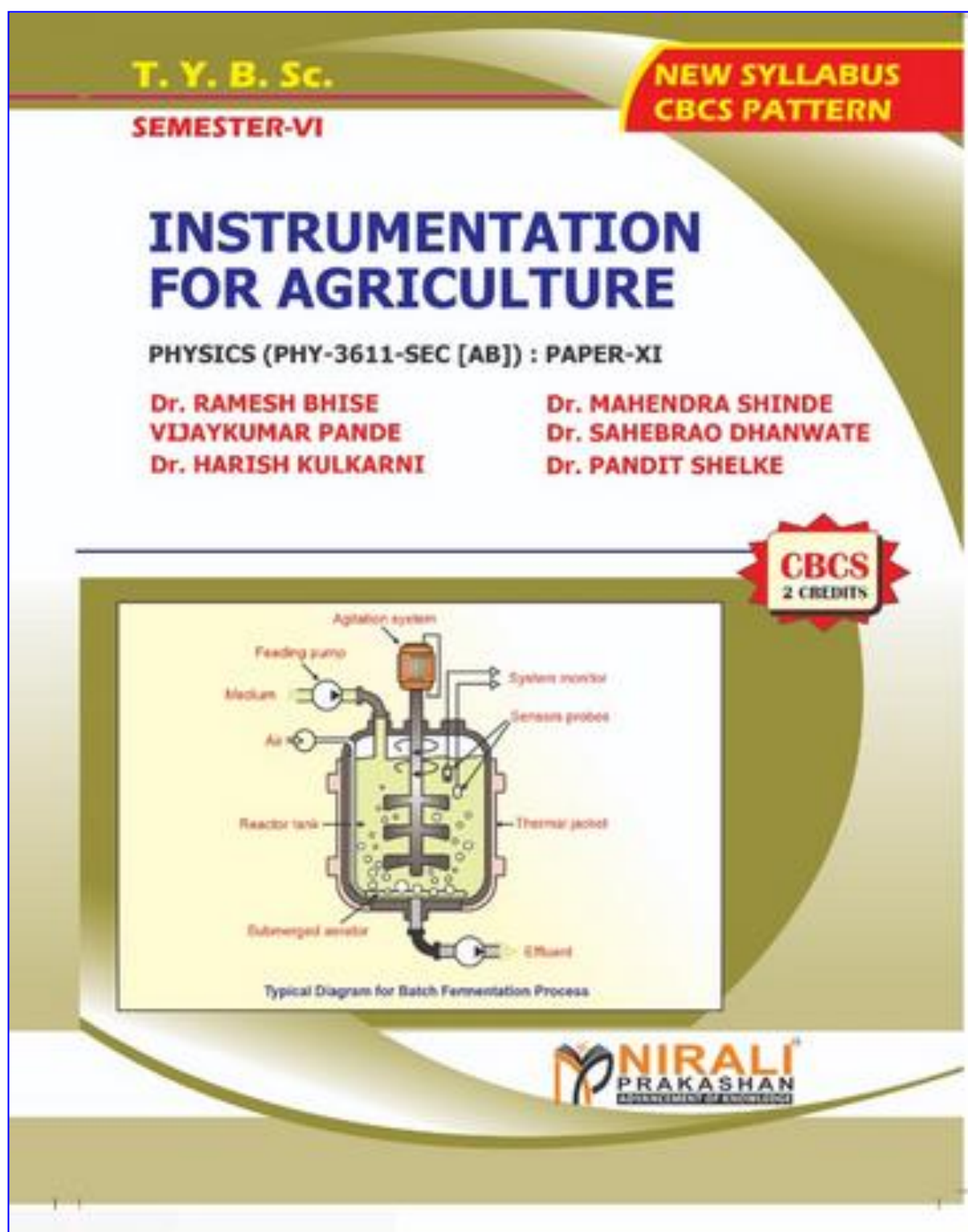
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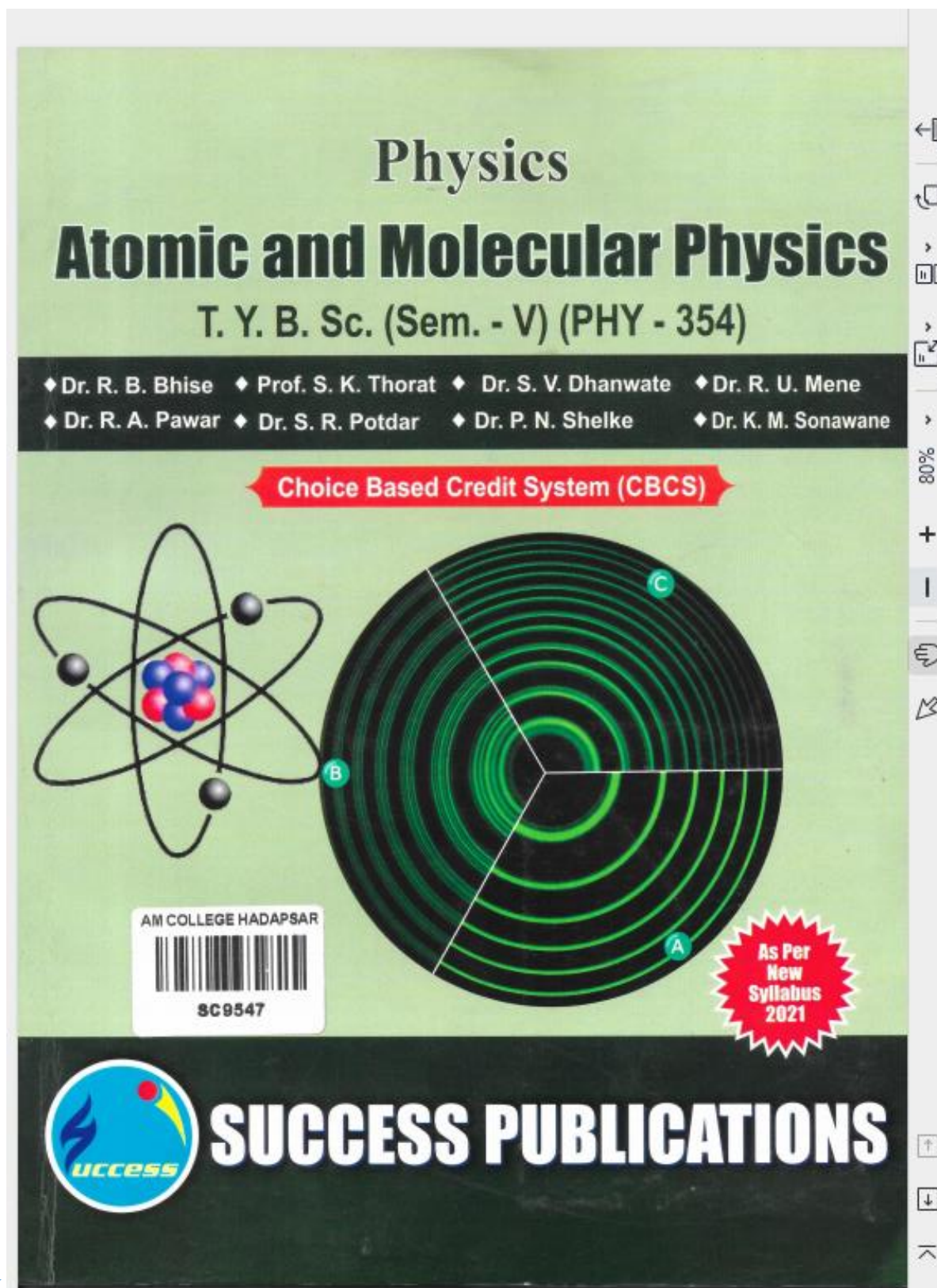
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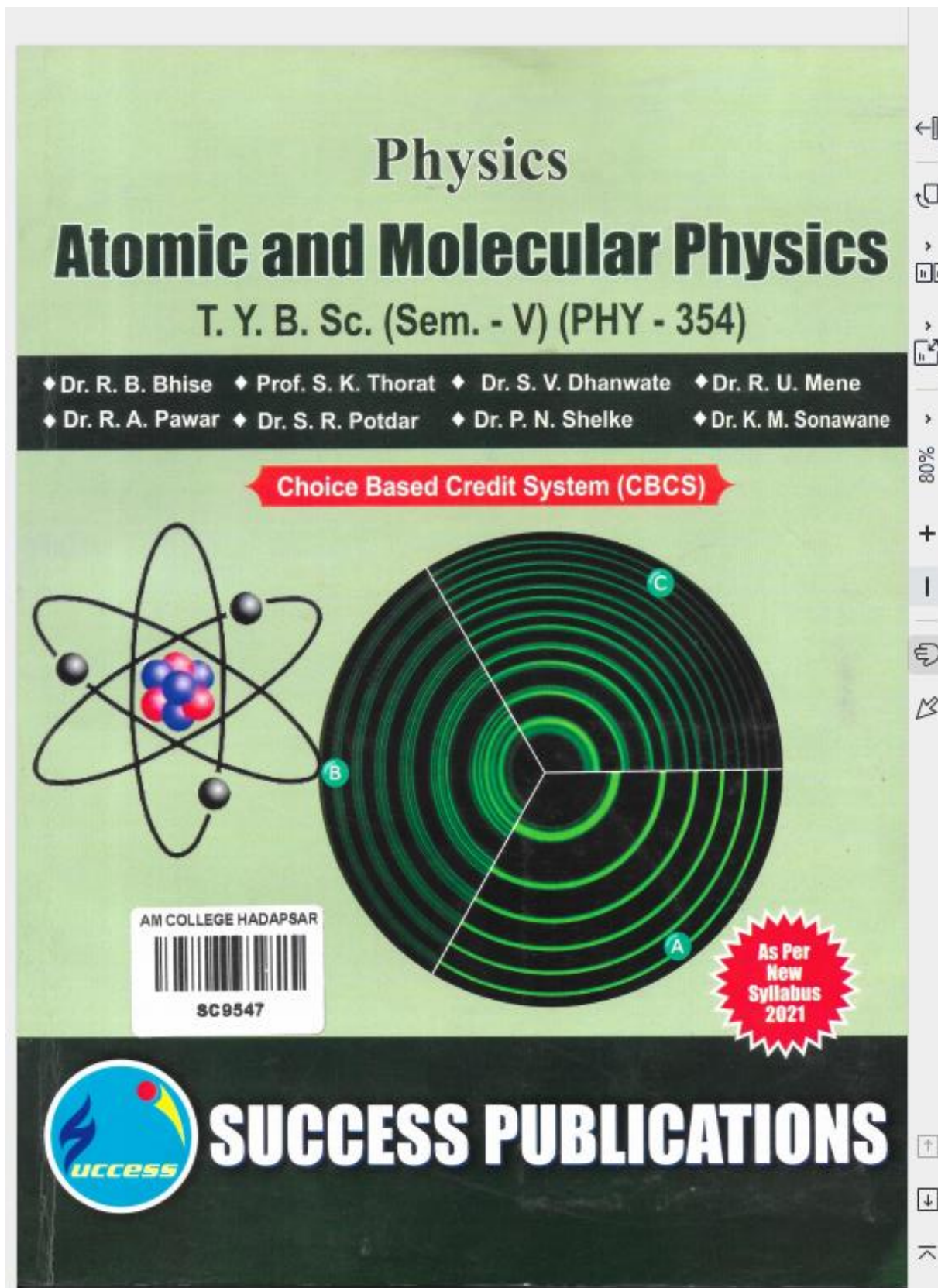


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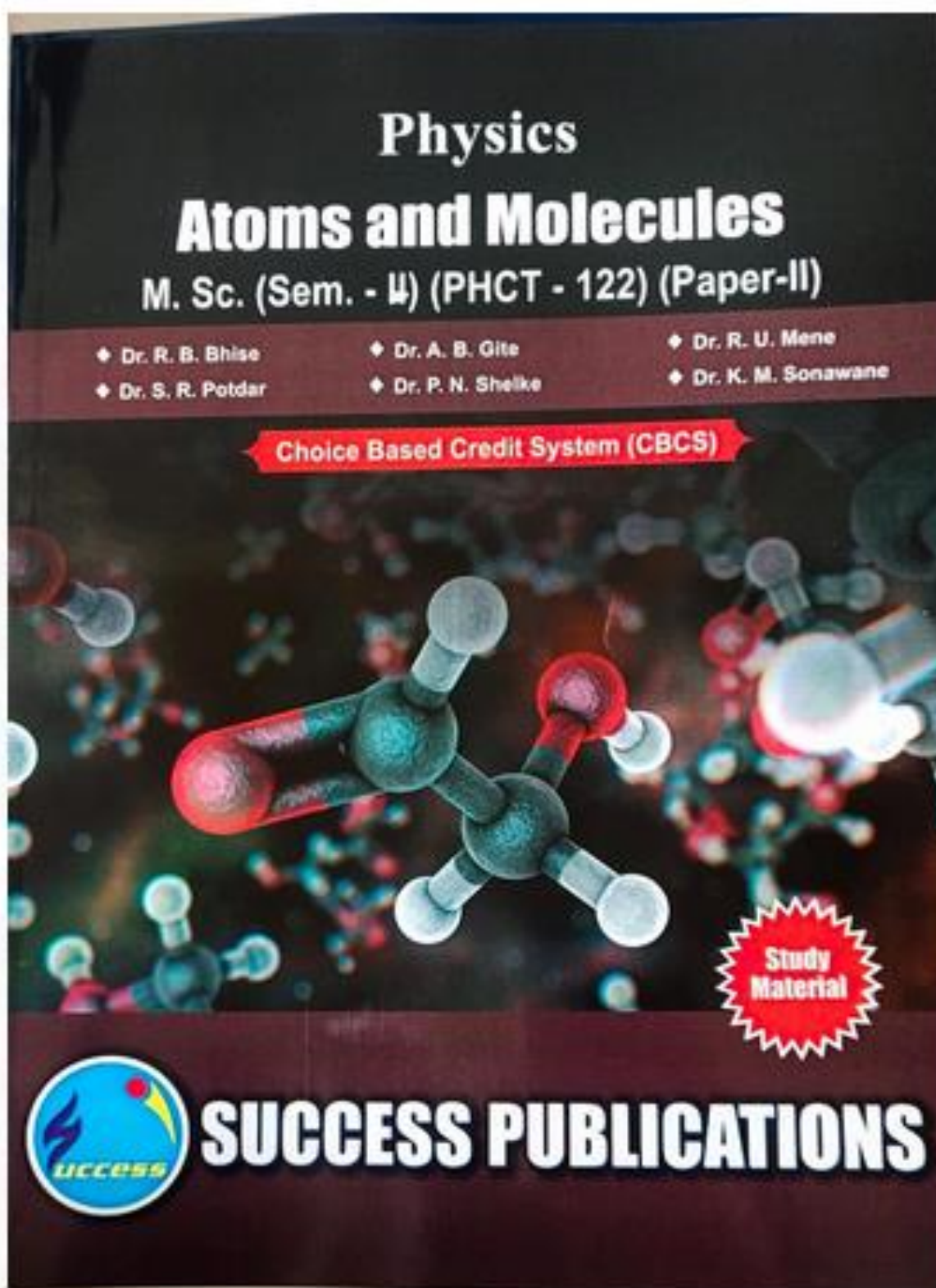
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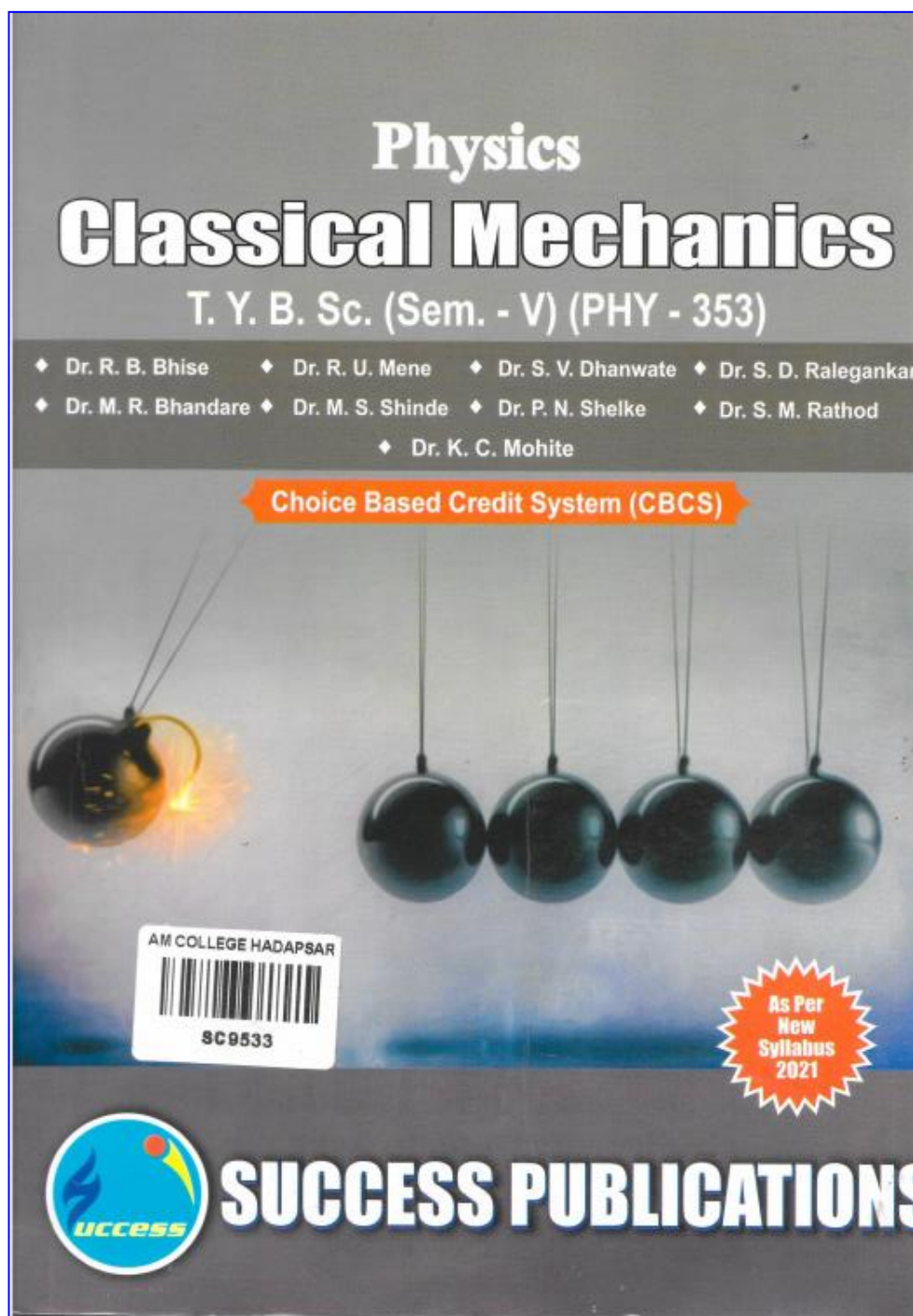
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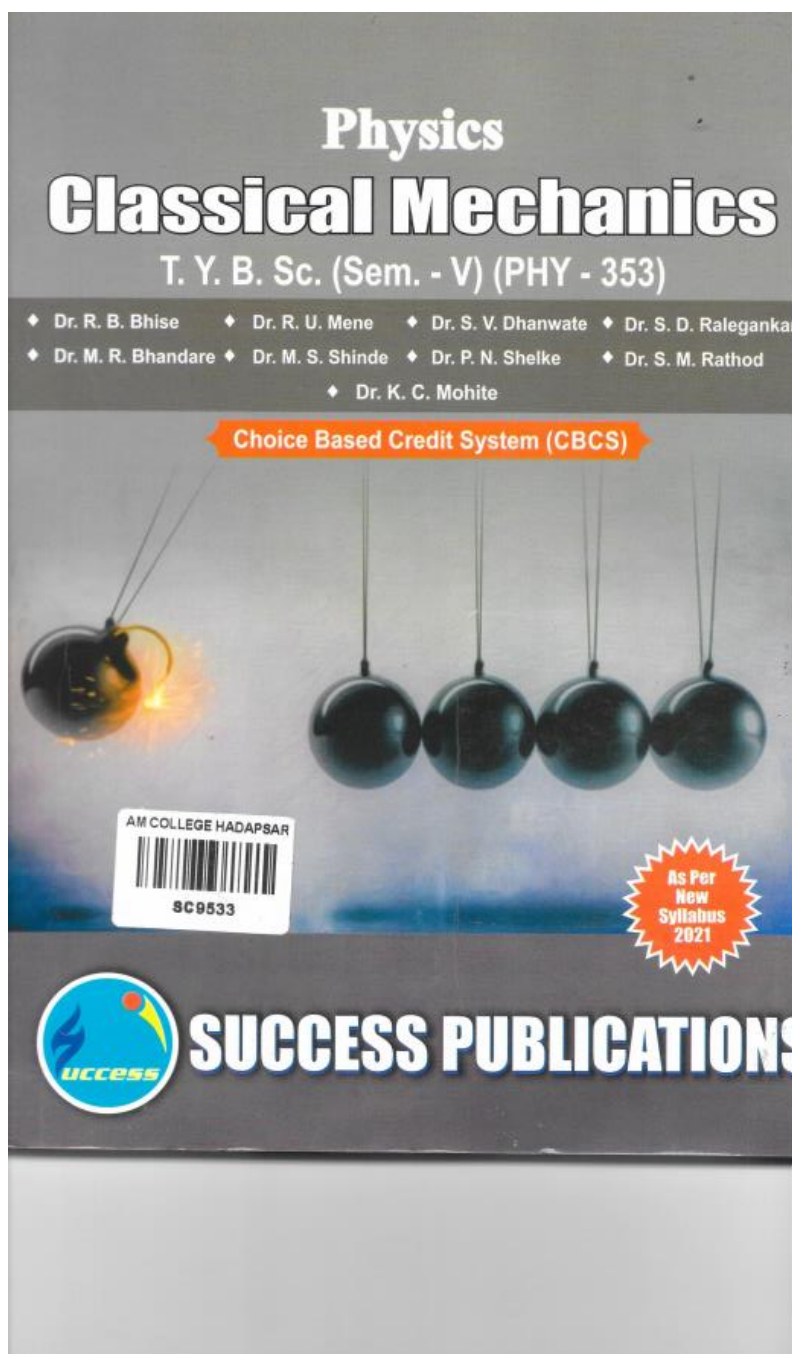


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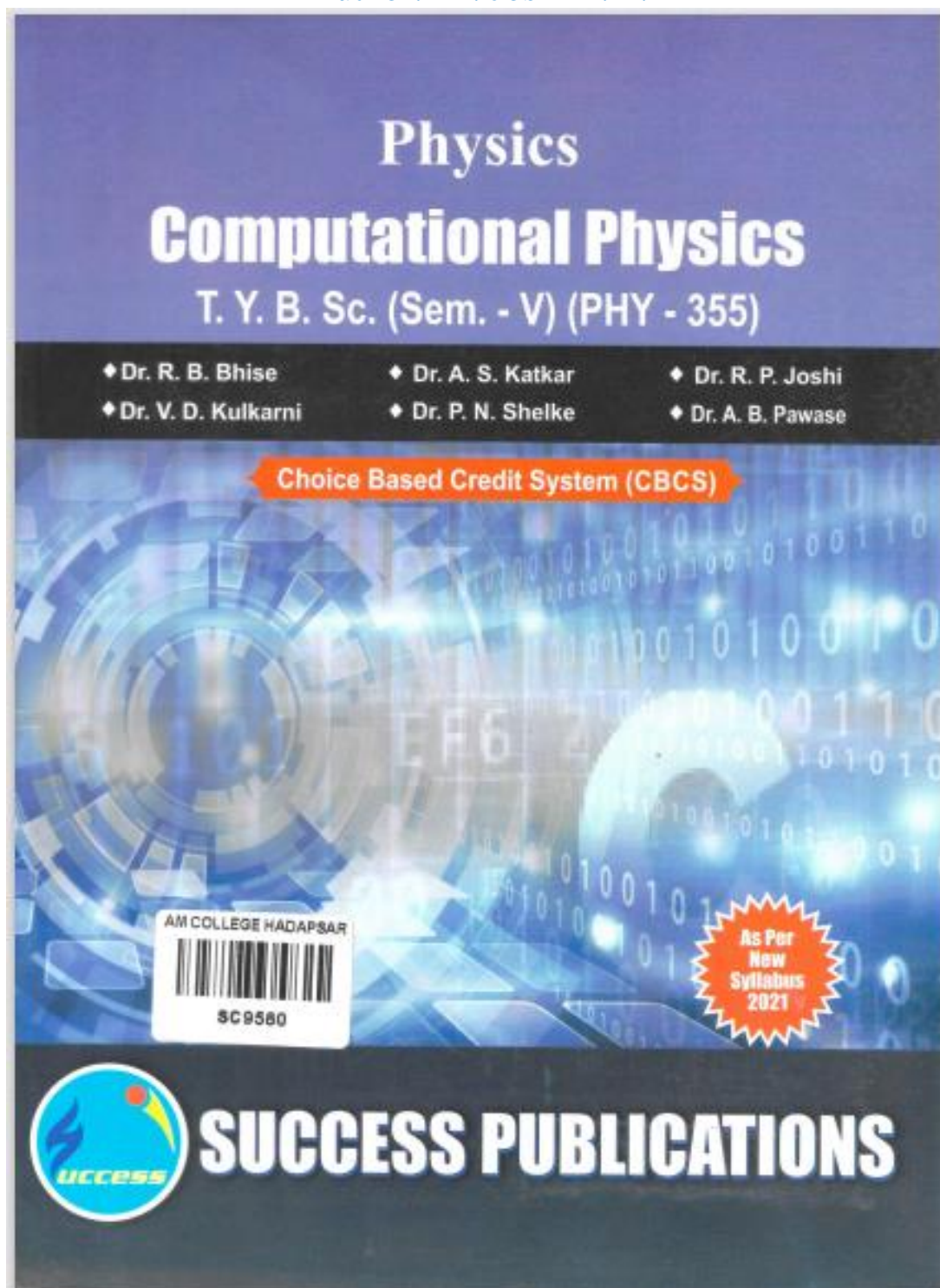
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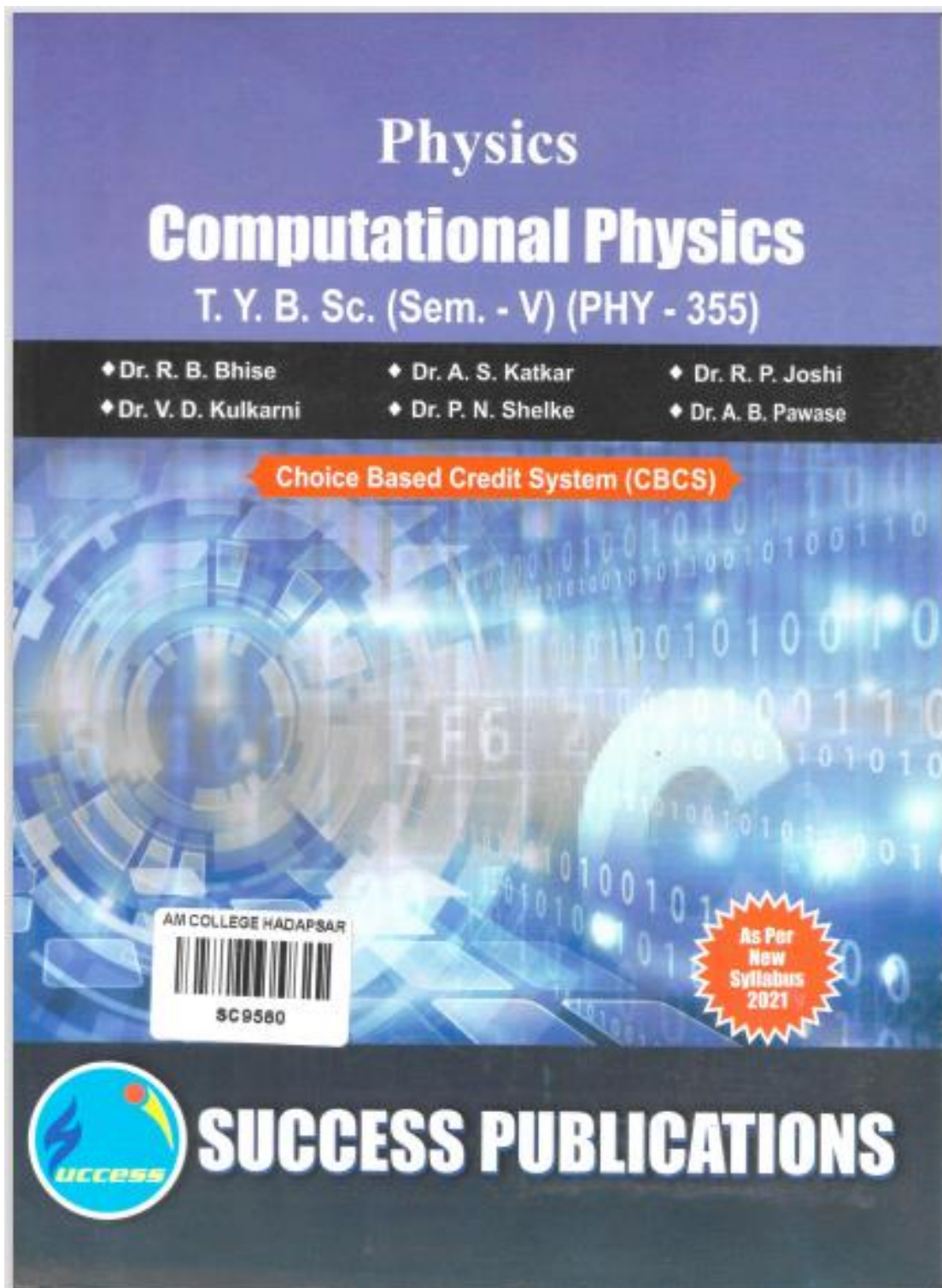
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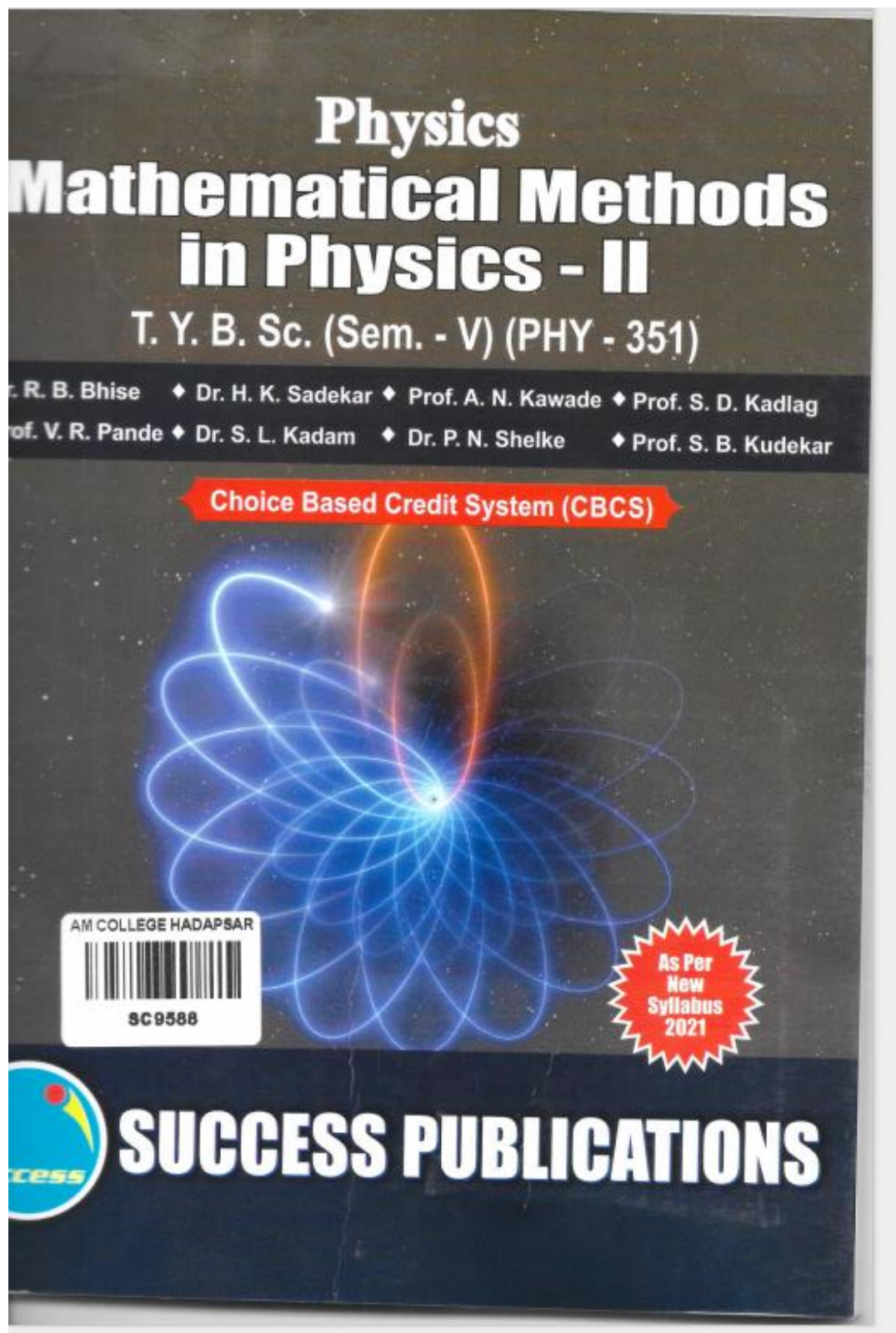
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