Project Ideas:

Idea 1: BracUStudyCircle -Peer Tutoring and Academic Support System

Software Requirements Specification

Prepared by

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1. Purpose

BRACU Study Circle is a comprehensive academic collaboration platform designed to facilitate peer-to-peer learning, research collaboration, and career development for BRACU students. The system creates a unified ecosystem where students can exchange knowledge through peer tutoring, collaborate on research and thesis projects, access a centralized repository of academic resources and past theses, track post-graduation career outcomes, and connect with peers sharing similar academic interests. The platform serves as a bridge between current students, alumni, and faculty, fostering continuous academic engagement and professional development.

2. Product Perspective

BRACUStudyCircle operates as a standalone web-based platform integrated within the BRACU academic ecosystem. The system follows a three-tier architecture with a responsive web interface, Node.js/Express backend handling business logic and API endpoints, and MongoDB for flexible data storage. The platform interfaces with email notification systems, cloud storage services for resource hosting, and supports integration with BRACU's existing authentication system.

User Classes:

Students: Primary users who tutor, learn, share resources, form thesis groups, and track career progress

Alumni: Former students who maintain profiles with post-graduation job status and mentor current students

Faculty: Review thesis submissions, verify resource authenticity, and moderate academic content

Administrators: Manage platform operations, moderate content, and generate analytics

3. Product Features & Backend Impact

3.1 Peer Tutoring Module

Features: Students post tutoring offers or help requests, coordinate sessions through integrated scheduling, rate tutors post-session, and receive AI-powered tutor-student matching based on subject expertise and availability.

Backend Impact:

- User profile management storing subjects, skills, availability, and tutoring history
- CRUD operations for tutoring posts with advanced search and filtering by subject, department, and rating
- Session request workflow (send, accept, reject, confirm) with calendar conflict detection
- Rating aggregation and tutor performance analytics with leaderboard generation
- Real-time messaging system for tutor-learner communication
- Notification engine for session updates, requests, and reviews
- Favorite tutors tracking for quick rebooking

3.2 Resource Sharing & Library Module

Features: Centralized searchable repository of study materials with quality control through ratings and reviews, bookmarking system for personal collections, and AI-driven resource recommendations based on enrolled courses.

Backend Impact:

- File upload/download management with secure cloud storage integration (Cloudinary)
- Metadata storage (subject, uploader, date, file type, ratings) with full-text search
- CRUD operations for resources with access control and bookmark storage
- Rating and review storage with analytics on the most downloaded/viewed resources
- Data visualization for popular subjects and trending materials
- Content moderation with flagging and reporting workflow

3.3 Thesis Collaboration Module

Features: Students create or join thesis groups based on research interests with hierarchical categorization (e.g., Computer Science → AI/ML → Natural Language Processing), receive interest-based matching suggestions, communicate through dedicated group chats, track milestones, and request faculty advisors.

Backend Impact:

- Thesis group entity management (creation, member management, status tracking)
- Hierarchical interest tagging system with matching algorithm suggesting compatible groups
- Group chat message storage and retrieval with real-time capabilities
- Milestone and task management with progress tracking
- Faculty-student relationship mapping for advisor assignments
- Notification system for group invitations, member requests, and advisor responses

3.4 Thesis Repository Module

Features: Digital archive of completed BRACU theses with advanced search by title, author, department, year, and keywords. Faculty members review and verify thesis authenticity with quality ratings. System tracks citation relationships between theses and provides public abstracts with authenticated full-text access.

Backend Impact:

- Thesis document storage with comprehensive metadata (author, department, year, supervisor, abstract, keywords)
- PDF hosting via cloud storage with URL references and version control
- Faculty review workflow (submission → review → approval → publication)
- Authenticity rating system with faculty-weighted scoring
- Citation relationship database linking referenced theses
- Full-text search indexing with access control middleware
- Download tracking, analytics, and automated abstract extraction

3.5 Alumni Career Tracking Module

Features: Alumni update employment status, position, and company details with visual career timelines. Analytics show graduate employment by industry and department. Current students connect with alumni for mentorship, job referrals, and career guidance. Featured success story profiles showcase achievements.

Backend Impact:

- Alumni profile extension with employment history, current position, company, industry
- Career timeline data structure storing job transitions with dates
- Industry and company aggregation for analytics dashboards
- Mentorship request/offer matching system with notification workflow
- Job posting CRUD operations with applicant tracking
- Alumni verification workflow and privacy controls for career information visibility
- Search functionality for finding alumni by company, industry, or graduation year
- Analytics aggregating employment statistics by department, year, and industry

3.6 Study Groups & Events Module

Features: Students create topic-specific or course-specific study groups, schedule study sessions and academic events with RSVP management, view a unified calendar of all academic activities, and share resources within groups.

Backend Impact:

- Study group entity management with member roles and permissions
- Event creation and management with date, time, location, and capacity tracking
- RSVP tracking with confirmation and reminder logic
- Calendar data aggregation from multiple sources (sessions, events, group meetings)
- Group-specific file storage with access restrictions
- Notification scheduling for upcoming events and attendance tracking

3.7 Administration & Moderation Module

Features: Comprehensive admin dashboard for content moderation, user management with role-based access, platform analytics showing usage metrics and trends, report management for flagged content, and data export in CSV/PDF formats.

Backend Impact:

- Role-based access control (RBAC) system with admin privileges
- Content flagging and reporting workflow with moderation tools
- User CRUD operations with soft delete for data retention
- Aggregation pipelines for analytics (sessions, resources, thesis submissions)
- Report generation algorithms with visualizations and statistics
- Data export functionality to CSV/PDF formats
- Audit logging for all administrative actions
- Dashboard API endpoints serving real-time platform metrics

4. Functional Requirements

4.1 User Management

FR-1.1: Students register with a university email and create profiles, including name, ID, department, interests, skills, and contact information

FR-1.2: Secure authentication via email/password or university SSO integration

FR-1.3: Users update profile,s including tutoring subjects, availability, and privacy settings

FR-1.4: Role-based access (student, alumni, faculty, admin) determines feature availability

FR-1.5: Alumni update post-graduation employment status, including job title, company, industry, and location

4.2 Tutoring System

FR-2.1: Students create tutoring offer posts specifying subject, availability, meeting mode, and rate

FR-2.2: Students create help request posts describing needed topics and preferred schedule

FR-2.3: Search and filter tutoring posts by subject, department, rating, availability, and price

FR-2.4: Send session requests to tutors who can accept or reject with optional messages

FR-2.5: Calendar view displays scheduled tutoring sessions for both tutors and learners

FR-2.6: Rate tutors (1-5 stars) and write reviews after completed sessions

FR-2.7: Leaderboard displays top-rated tutors based on ratings and completed sessions

FR-2.8: Notifications for session requests, confirmations, upcoming sessions, and reviews

FR-2.9: In-platform messaging for session coordination between tutors and learners

FR-2.10: Mark tutors as favorites for quick future access

4.3 Resource Sharing & Library

FR-3.1: Upload study materials (PDFs, documents, presentations) with metadata and tags

FR-3.2: Centralized library with search across titles, descriptions, subjects, and tags

FR-3.3: Rate resources (1-5 stars) and write reviews indicating quality

FR-3.4: Bookmark resources to personal collections for quick access

FR-3.5: Track download and view statistics for each resource

FR-3.6: AI recommendations based on enrolled courses, search history, and bookmarks

FR-3.7: Report inappropriate or low-quality resources to administrators

FR-3.8: Filter by subject, department, resource type, upload date, and rating

4.4 Thesis Collaboration

FR-4.1: Create thesis groups specifying research interests, group size, and member qualifications

FR-4.2: Browse and join existing thesis groups based on compatible interests

FR-4.3: Interest-based matching suggests groups and members based on declared thesis interests

FR-4.4: Hierarchical categorization of thesis interests (e.g., CS → AI/ML → NLP)

FR-4.5: Dedicated group chat functionality for research discussions and coordination

FR-4.6: Track milestones and progress through customizable task lists

FR-4.7: Request faculty advisors with acceptance workflow

FR-4.8: Notifications for member requests, group updates, and milestone completions

4.5 Thesis Repository

FR-5.1: Submit completed theses with PDF, abstract, keywords, and metadata

FR-5.2: Faculty review and approval required before repository publication

FR-5.3: Faculty rate thesis authenticity and quality on a standardized scale

FR-5.4: Advanced search by title, author, department, year, keywords, and research area

FR-5.5: Public abstracts with authenticated full-text access for BRACU users

FR-5.6: Track citation relationships between theses

FR-5.7: Analytics showing most-viewed theses, popular research areas, and citation networks

FR-5.8: Download approved theses in PDF format

FR-5.9: Version control for thesis submissions with faculty approval for updates

FR-5.10: Faculty flag theses for quality concerns or academic integrity issues

4.6 Alumni Career Tracking

FR-6.1: Alumni create employment profiles with job title, company, industry, location, and dates

FR-6.2: Build career timelines showing job progression from graduation

FR-6.3: Analytics dashboards showing graduate employment by department, year, and industry

FR-6.4: Search for alumni by company, industry, position, or graduation year

FR-6.5: Alumni offer mentorship to current students in their field

FR-6.6: Students send mentorship requests with notification and acceptance workflow

FR-6.7: Alumni post job openings or internship opportunities for students

FR-6.8: Privacy controls limit visibility of career information

FR-6.9: Featured success story profiles showcase notable alumni achievements

FR-6.10: Periodic reminders for alumni to update employment status

4.7 Study Groups & Events

FR-7.1: Create study groups for specific courses or topics with optional membership approval

FR-7.2: Schedule study sessions and events with date, time, location, and capacity limits

FR-7.3: Unified calendar view of tutoring sessions, group meetings, and academic events

FR-7.4: RSVP functionality for confirming attendance at scheduled events

FR-7.5: Reminder notifications for upcoming events to confirmed attendees

FR-7.6: Share resources within study groups with member-only access

FR-7.7: Track attendance for completed events to identify active participants

4.8 Administration & Moderation

FR-8.1: Admin CRUD operations for user accounts, including role assignments and deactivation

FR-8.2: Review and moderate flagged content with options to remove, edit, or approve

FR-8.3: Analytics dashboard showing usage metrics, popular subjects, and engagement trends

FR-8.4: Generate and export reports in CSV and PDF formats

FR-8.5: Audit log of all administrative actions for accountability

FR-8.6: Broadcast announcements to all users or specific segments

FR-8.7: Manage reported issues with status tracking and resolution notes

FR-8.8: Faculty tools to moderate thesis submissions and verify resource authenticity

4.9 Notifications & Communication

FR-9.1: Real-time or email notifications for session requests, confirmations, cancellations, and reminders

FR-9.2: Notifications for new reviews or ratings received

FR-9.3: Alerts for thesis group activity, member requests, and milestone updates

FR-9.4: Alumni notifications for mentorship requests and job application responses

FR-9.5: Notification preference settings for customizing types and delivery methods

4.10 Search & Discovery

FR-10.1: Full-text search across tutoring posts, resources, theses, and user profiles

FR-10.2: AI-driven tutor recommendations based on course enrollment and session history

FR-10.3: Resource recommendations based on browsing patterns and bookmarks

FR-10.4: Suggested thesis groups and collaborators based on research interests

FR-10.5: Advanced filtering across all modules by multiple criteria simultaneously

5. Non-Functional Requirements

Performance:

1. Pages load within 2 seconds under normal conditions
2. Search queries return results within 1 second for up to 10,000 records
3. Support 500 concurrent users without degradation

Security:

1. Password hashing using bcrypt
2. Malware scanning for file uploads
3. HTTPS for all data transmission
4. Session tokens expire after 24 hours of inactivity

Usability:

1. Intuitive interface requiring minimal training
2. Clear, actionable error messages

Maintainability:

1. Industry-standard coding conventions with comprehensive documentation
2. Modular architecture allowing independent component updates
3. API versioning for backward compatibility

Environment & Architecture Setup

Goal: Establish development infrastructure and team workflow

Environment Configuration

1. Set up Node.js, MongoDB, and development tools
2. Configure Git repository with branching strategy (main, dev, feature branches)
3. Set up ESLint, Prettier for code standards
4. Create .env templates for configuration management

Project Architecture

1. Initialize MERN boilerplate structure
2. Set up an Express server with basic routing
3. Configure MongoDB connection and database schemas
4. Implement JWT-based authentication middleware

Development Workflow

1. Create project documentation structure
2. Set up issue tracking and a sprint board
3. Define the code review process
4. Establish a daily standup schedule

Deliverables: Working dev environment, basic server running, team workflow established

Layered Structure:

- **Presentation Layer**: React components, UI logic
- **API Layer**: Express routes, request/response handling
- **Business Logic Layer**: Core application logic, algorithms, validations
- **Data Access Layer**: MongoDB operations, ORM/ODM (Mongoose)
- **Integration Layer**: External services (email, cloud storage, notifications)

Workload Distribution Recommendations

1. **Feature-wise distributions (4 members)**
    - Robiul Islam Ashik: Peer Tutoring Module + Resource Sharing
    - Shahed Parves Kallol: Thesis Collaboration+ Thesis Repository
    - Jawad Ferdous: User Management + Alumni Tracking
    - Sumaiya Tasnim Khan: Administration +Study Groups
2. **Full-Stack/Integration Tasks (All members)**
    - Database schema design and MongoDB configuration
    - API integration and testing
    - Deployment and DevOps setup
3. **Load Balancing Strategy**
    - Rotate on Resource Sharing & Search/Discovery features
    - Pair programming for complex features (AI recommendations, matching algorithms)
    - Weekly code reviews to ensure consistency

Class Diagram:

https://www.mermaidchart.com/app/projects/a5b0f34b-54cc-45a7-b93d-2d8842bc9429/diagrams/dfc1ff9d-8b5d-42d2-ba56-d0bb5f950846/version/v0.1/edit