Git & GitHub Complete Guide for Computer Science Students

SECTION 1: Fundamentals (Beginner)

- Git: Version control system to track code changes.
- GitHub: Cloud hosting for Git repositories, enabling collaboration.

Install Git: https://git-scm.com
Setup:

```
  git config --global user.name "Your Name"
  git config --global user.email "you@example.com"
```

Basic Commands:

```
  git init
  git status
  git add .
  git commit -m "msg"
  git log
  git diff
  git reset
  git rm --cached <file>
```

SECTION 2: GitHub Basics

- Connect local repo to GitHub:

```
  git remote add origin https://github.com/user/repo.git
  git push -u origin main
```

Workflow:

```
  git clone <repo-url>
  git pull
  git add .
  git commit -m "msg"
  git push
```

SECTION 3: Branching and Merging

Branching:

```
  git branch dev
  git checkout dev
  git checkout -b dev
  git merge dev
  git branch -d dev
```

Merge Conflicts:

```
  Manually resolve code between <<<< and >>>>
  git add .
  git commit
```

SECTION 4: Advanced Git

Undoing:

```
  git revert <commit>
  git reset --hard <commit>
  git reset --soft <commit>
```

Stash:

```
  git stash
  git stash apply
  git stash list
```

Clean:

```
  git clean -fd
```

SECTION 5: GitHub Team Collaboration

Fork and Pull Requests:

- Fork -> Clone -> Create Branch -> Push -> PR

Teams:

```
  git pull origin main (before push)
```

Push code after resolving conflicts.

SECTION 6: SSH Setup

SSH Setup:

```
  ssh-keygen -t rsa -b 4096 -C "you@example.com"
```

Add key to GitHub (Settings -> SSH Keys)

Test: `ssh -T git@github.com`

SECTION 7: Best Practices

Best Practices:

- Meaningful commits
- Commit small changes
- Use .gitignore

.gitignore example:

```
  node_modules/
  .env
  *.log
```

SECTION 8: GitHub Features

Features:

- Issues (bug tracking)
- Projects (task boards)
- Actions (CI/CD)

  - Wiki (docs)
  - Releases (versions)
  - Insights (analytics)

SECTION 9: Use Cases

- Personal Projects
- Team Assignments
- Internships
- Open Source Contributions

IDE Integration

[VS Code] VS Code:

  - Install Git + GitHub extension
  - Use Source Control panel
  - Login via GitHub popup or SSH

[IntelliJ] IntelliJ:

  - VCS > Enable Git
  - File > Settings > Git > Set path
  - Git > Share Project on GitHub
  - Commit & Push directly from IDE